UNIVERSITÀ DEGLI STUDI DI PADOVA

Dipartimento di Agronomia Animali Alimenti Risorse Naturali e Ambiente

Corso di Laurea Triennale in Scienze e Tecnologie Agrarie

Variabilità aromatica nelle infiorescenze di *Humulus lupulus* L. fresche, essiccate e in pellet

Relatore

Prof. Stefano Bona

Correlatrice

Dott.ssa Anna Perbellini

Laureando

Laura Rosso

Matricola 2006860

ANNO ACCADEMICO 2022-2023

Sommario

Riassunto

Il luppolo (*Humulus lupulus* L.) è una pianta erbacea perenne, le cui infiorescenze femminili rappresentano l'ingrediente fondamentale per conferire aroma ed amaro alla birra. In questo studio, sono state coinvolte sei cultivar di luppolo: Chinook, Cascade, Calicross, Comet, Target e Yeoman. I rispettivi coni di luppolo sono stati analizzati prima freschi, poi essiccati e infine trasformati in pellet tramite HS-SPME-GC. Sono stati estratti e determinati i profili delle componenti volatili presenti in ciascun campione.

Le tecniche statistiche utilizzate hanno permesso di identificare la presenza di variabilità aromatica tra le diverse varietà di luppolo. Inoltre, hanno evidenziato eventuali differenze o modifiche nelle quantità delle molecole aromatiche nei tre trattamenti delle infiorescenze: fresche, essiccate e in pellet.

Abstract

Hops (*Humulus lupulus* L.) is a perennial herbaceous plant, and its female inflorescences are the essential ingredient for imparting aroma and bitterness to beer. This study involved 6 hop cultivars: Chinook, Cascade, Calicross, Comet, Target, and Yeoman. The respective hop cones were analyzed using HS-SPME-GC, first when fresh, then after drying, and finally transformed into pellets. The profiles of volatile components of each sample were extracted and determined.

The statistical techniques used allowed for the identification of aromatic variability among the different hop varieties. Furthermore, they highlighted any differences or modifications in the quantities of aromatic molecules in the three treatments of inflorescences: fresh, dried, and pelletized.

1 Introduzione

Il luppolo (*Humulus lupulus* L.) è una pianta rampicante perenne, che predilige soprattutto i climi freschi; è spontanea e cresce adeguatamente alle nostre latitudini in zone marginali o abbandonate (Veneto Agricoltura, 2021). Viene coltivato nelle regioni a clima temperato, a latitudini comprese tra 35° e 55° negli emisferi settentrionale e meridionale (Almaguer et al., 2014), in quanto è limitato principalmente dalle esigenze fotoperiodiche (Rossini et al., 2021).

Per la crescita ottimale delle piante di luppolo, la resa e la qualità del cono, sono necessarie condizioni climatiche specifiche, come l'esposizione a basse temperature durante la dormienza in inverno, temperature miti in primavera, sufficiente umidità, che può derivare dall'irrigazione o dalle precipitazioni, e un clima secco durante il raccolto (Rossini et al., 2021).

Dando uno sguardo al passato, Plinio il Vecchio denominò il luppolo "Lupulus salictarius", per la tendenza a cercare sostegni.

Ad oggi, il luppolo è utilizzato quasi esclusivamente come ingrediente per la produzione di birra. Tuttavia, questa pianta possiede numerose proprietà che la rendono un ottimo ingrediente anche in ambito erboristico e alimurgico. In particolare, l'impiego dei giovani germogli apicali, raccolti da piante sia maschili che femminili, soprattutto spontanee, è comune nella tradizione culinaria di molte regioni italiane. In Veneto si parla di "bruscandoli" o "bruscansi", ma in altre città italiane questi germogli primaverili sono conosciuti con diversi termini dialettali, che testimoniano la diffusione della pianta sul territorio nazionale. Possono essere usati e venduti come erbe fresche oppure essiccati ed inseriti in formulazioni per la preparazione di infusi di tradizione locale (Perbellini et al., 2023).

Questa pianta è sempre rientrata nelle tradizioni culinarie di diverse culture. Essa veniva servita come antipasto o insalata verde già nell'antica Grecia, ma ancor oggi, in Europa centrale, i giovani germogli di luppolo sono consumati come verdura da insalata. Inoltre, il luppolo ed i suoi derivati sono stati utilizzati per scopi differenti: le fibre degli steli sono state usate nella fabbricazione di spago e di un tessuto simile al lino in Svezia; un estratto è stato adoperato come risciacquo per i capelli in Russia; il luppolo esausto è stato riciclato come foraggio o compost. I medici prescrivevano per molti mali dell'uomo il luppolo da consumarsi fresco o in varie preparazioni liquide in quanto ne riconoscevano le proprietà medicinali, legate soprattutto agli effetti benefici sull'apparato digerente (Edwardson, 1952).

Sebbene il primo rapporto sugli effetti benefici del luppolo, e in particolare sull'attività antinfiammatoria di questa pianta sia stato pubblicato nell'XI secolo dall'arabo Medicus Mesue, alcuni autori indicano una storia di oltre 10.000 anni di utilizzo della pianta del luppolo nella medicina tradizionale (Rutnik et al., 2022). Infatti, l'olio essenziale di luppolo possiede una vasta gamma di

proprietà benefiche per salute umana; è sedativo, lenitivo, digestivo, antiossidante, antitumorale, antimicrobico, antinfiammatorio ed è un potenziale pesticida naturale (Pereira et al., 2022) (Rutnik et al., 2022).

I primi documenti scritti che segnalano la coltivazione del luppolo risalgono all'VIII secolo e soltanto nell'822 d.C., in Germania, l'abate Adalardo di Corbie emanò alcuni statuti che indicavano l'utilizzo del luppolo nella birrificazione. Dopo solamente tre secoli, la badessa Hidelgard di Bingen confermò che il luppolo, se bollito insieme al mosto, migliorava il gusto della birra e ne favoriva la conservazione (Hieronymus, 2020). Successivamente, l'importanza del luppolo per la produzione nella birra fu confermata nel 1516 da Guglielmo di Baviera che emanò un decreto dove stabiliva il prezzo della birra e obbligava l'utilizzo esclusivo di acqua, malto d'orzo, lievito e luppolo (Prandi, 2015).

Per la produzione brassicola, vengono impiegate le infiorescenze delle piante femminili, chiamate anche "coni" o "strobili". Esse, infatti, contengono luppolina, una resina di colore giallo prodotta ed immagazzinata in apposite ghiandole secretorie. Grazie alla loro composizione chimica, le infiorescenze vengono utilizzate nel processo di birrificazione per conferire il sapore amaro e diversi aromi alla birra, ma anche per il loro effetto di stabilizzazione della schiuma e per l'azione antiossidante e sterilizzante. Esse sono disponibili in commercio in molteplici forme: fresche, essiccate, in plugs (coni pressati e compattati), in forma pellettata (coni triturati e successivamente pressati) o in polvere, ed infine anche in estratti concentrati. Dopo la raccolta, i coni vengono essiccati e successivamente pressati e compattati in plugs, oppure triturati e pressati con macchinari specializzati per la produzione di pellet di luppolo. Il processo di essiccazione e trasformazione in pellet permette di preservare quantità e qualità di resine e oli essenziali e di aumentare la praticità d'uso di questo prodotto, che risulta molto suscettibile all'ossidazione. In aggiunta, l'estratto concentrato di luppolo presenta ulteriori vantaggi in relazione a conservabilità e praticità d'uso. Questo, infatti, non solo si conserva più facilmente, ma offre anche la possibilità di dosare in modo più omogeneo le sostanze attive in esso contenute; i costi di spedizione e conservazione sono ridotti, dando la possibilità di un migliore utilizzo con ridotte perdite di mosto. Questi vantaggi degli estratti controbilanciano il loro costo per unità di amaro che può apparire più alto rispetto ai coni interi o ai pellet (Hieronymus, 2020).

Nell'Unione Europea il luppolo è coltivato in 14 Paesi; vi sono 2.600 aziende che producono luppolo, per un totale di 26.500 ettari corrispondenti al 60% della superficie totale destinata alla produzione del luppolo a livello mondiale. La Germania rimane uno dei centri principali del mercato mondiale del luppolo; detiene il primato con il 60% della superficie coltivata (17.000 ettari), che equivale ad un terzo della superficie coltivata a luppolo nel mondo. Altri importanti produttori sono la Repubblica

Ceca, la Polonia e la Slovenia. Il luppolo è coltivato anche in Nord America, Asia e nelle zone temperate di Sud America, Africa, Nuova Zelanda e Australia (Pistelli et al., 2018). La produzione annua mondiale di luppolo oscilla tra 80.000 e 100.000 tonnellate, invece quella dell'Unione Europea è di circa 50.000 tonnellate, dalla quale si ricavano 5.000 tonnellate di α-acidi. In Europa, così come nel resto del mondo, la superficie destinata al luppolo sta diminuendo, a causa della crescente resa in α-acidi e del loro uso più ridotto nella birra. Infatti, la quantità media di α-acidi è passata da 6,3 g/ettolitro di birra a 4,1 g/ettolitro. Proprio per questo motivo, sebbene la produzione mondiale di birra sia in crescita, la domanda di α-acidi non sta aumentando molto e di conseguenza l'offerta attuale di luppolo risulta più che sufficiente a compensare le necessità del mercato, non solo europeo. Nel commercio estero, l'Unione Europea è usualmente stata esportatrice netta. Negli ultimi anni l'eccedenza è stata pari a circa 20.000 tonnellate di coni però nei dati Ismea del 2019 viene indicato un import nazionale pari a quasi 4.200 tonnellate in forma di coni secchi o di pellet, soprattutto di origine tedesca. L'acquirente principale è la Russia, seguita dagli Stati Uniti e dal Giappone (Direzione generale dell'Agricoltura e dello sviluppo rurale, s.d.)

Per definizione, la birra è una bevanda alcolica che nasce dalla fermentazione di un mosto di malto d'orzo amaricato e aromatizzato con luppolo. Negli ultimi tre decenni si è assistito ad un aumento del consumo di birra fino a raggiungere un consumo medio pro-capite italiano di circa 37,8 litri/anno nel 2022, avvicinandosi al consumo medio di vino (circa 41 litri pro-capite/anno) (AssoBirra, 2022).

Analogamente ai consumi, è cresciuta anche la produzione interna industriale e artigianale. Quest'ultima soprattutto sta riscontrando un certo successo, tanto che nel 2022, secondo i dati dell'ultimo rapporto annuale di Assobirra, il numero di microbirrifici e brewpub (a parte beer film) in Italia ha raggiunto le 870 unità registrando il dato più alto dal 2016 (AssoBirra, 2022). In linea con questo incremento della produzione nazionale, specialmente da parte di birrifici artigianali e agricoli, si sta sviluppando un interesse crescente verso le materie prime locali. Nell'industria di birra, il luppolo rimane la materia prima più complessa e costosa (Duarte et al., 2020). Lunghe sperimentazioni hanno portato alla creazione delle prime varietà di luppolo italiano in Emilia-Romagna, derivanti da genotipi selvatici autoctoni. Data la complessità dello sviluppo varietale di piante come il luppolo, l'associazione di studi genetici e chimici può favorire da un lato i processi di incrocio e valutazione di nuove varietà, dall'altro le modalità di impiego di queste varietà nella produzione brassicola.

2 Aspetti botanici

Il luppolo (*Humulus lupulus* L.) è una pianta erbacea perenne, rampicante, dioica, fotoperiodica appartenente al genere *Humulus*, alla famiglia delle Cannabacee e all'ordine di Rosales (Almaguer et al., 2014).

Il genere Humulus comprende tre specie: Humulus lupulus, Humulus japonicus (o scandens) e Humulus yunnanensis.

Solamente la prima specie, *Humulus lupulus,* è dotata di ghiandole che producono luppolina; le altre due, invece, ne sono prive, e pertanto non hanno alcun valore ai fini della produzione della birra. Ciononostante, l'*Humulus japonicus* è diffusamente coltivato come forte rampicante e spesso si utilizza nei giardini come uno schermo decorativo e frondoso (Almaguer et al., 2014). Nel Regno Unito, nel 2011, il World Checklist Programme decise di assegnare alla specie *Humulus japonicus,* così denominata in tutta la letteratura in lingua inglese, il suo nome cinese *Humulus scandens* per sottolinearne l'origine asiatica (Hieronymus, 2020).

È stato creduto per anni che il genere *Humulus* fosse rappresentato solo da due specie: il "luppolo comune", *Humulus lupulus* L., e il "luppolo giapponese", *Humulus japonicus.* Solo nel 1936 fu descritta per la prima volta la specie *Humulus yunnanensis*. Tuttavia, questa specie è rimasta relativamente sconosciuta; si suppone che abbia avuto origine ad altitudini elevate nella provincia meridionale dello Yunnan Cina (Almaguer et al., 2014).

I tassonomi hanno classificato 5 sottospecie di *Humulus lupulus*: *lupulus*, *neomexicanus*, *lupuloides, pubescens* e *cordifolius*. La maggior parte del luppolo destinato alla produzione della birra deriva dalla sottospecie "*lupulus*", diffusa prevalentemente in Europa (Haunold, 2010).

I germogli annuali emergono all'inizio della primavera dal portainnesto perenne, detto corona, si sviluppano in verticale arrampicandosi su sostegni quali pali e fili sempre in senso orario. La loro crescita arriva fino a 25 cm in un solo giorno ed è massima e con internodi lunghi se favorita dalla presenza di sostegni verticali. Pertanto, le piante possono raggiungere altezze superiori ai 7 metri (Leles et al., 2023) (Edwardson, 1952) (Haunold, 2010). Invece, quando i supporti sono leggermente inclinati la crescita continua per un periodo più lungo ed è maggiore (Edwardson, 1952). All'inizio della fase vegetativa, vengono selezionati soltanto da quattro a dieci germogli per pianta per la coltivazione del luppolo, mentre gli altri vengono rimossi (Vidmar et al., 2019).

Il luppolo è una pianta longidiurna e la durata dell'esposizione della luce è un fattore critico per la crescita vegetativa, ma soprattutto per la fioritura. Infatti, necessita di almeno 16 ore di luce per fiorire (Leles et al., 2023) (Alfred, 2015). La fioritura inizia alla fine di giugno o all'inizio di luglio nell'emisfero settentrionale, con variazioni in funzione del tipo di cultivar (Haunold, 2010).

Solitamente inizia sui rami laterali dai nodi all'altezza di circa 2,5-3 m sul fusto principale e procede gradualmente verso la parte basale e l'apice della pianta (Alfred, 2015). La riproduzione avviene tramite impollinazione anemofila; il polline rimane vitale per diversi giorni (Haunold, 2010) e può percorrere distanze di diversi chilometri senza perdita di vitalità (Alfred, 2015). In assenza di piante maschili, i fiori femminili rimangono ricettivi fino a tre settimane prima che gli stigmi inizino a cadere (Alfred, 2015). Le piante maschili, salvo che sono essenziali nei programmi di miglioramento genetico per sviluppare nuove varietà, vengono solitamente rimosse dalle aree di coltivazione per evitare la fecondazione delle piante femminili e la produzione di semi. È stato dimostrato che i luppoli senza semi sono generalmente più ricchi di oli essenziali e resine rispetto a quelli con semi. Quest'ultimi inoltre sono indesiderabili per la produzione brassicola perché si crede che l'ossidazione degli acidi grassi del seme produca sapori sgradevoli alla birra (Almaguer et al., 2014).

Le infiorescenze staminate sono pannocchie cimose molto ramificate e prendono origine all'ascella dei germogli principali o laterali. Esse si differenziano dalle infiorescenze femminili per morfologia e dimensioni, ma soprattutto perché non producono luppolina. Le infiorescenze femminili pistillate, che possono essere chiamate "strobili" o "coni", hanno un aspetto a punta, nascono all'ascella delle foglie del fusto principale o di consueto dei rami laterali e rappresentano il luppolo commerciale. L'asse dello strobilo è un rachide spesso e ricoperto di fine pelo lanuginoso, su cui sono inseriti assi laterali, alla base dei quali è inserito un paio di brattee e ciascuno porta quattro fiori pistillati sottesi ad una bratteola. Nel momento dell'impollinazione le brattee sono piccole e soltanto quelle basali sono visibili, invece gli stigmi sono numerosi e atti ad intercettare i granuli portati dal vento. Successivamente, gli stimmi cadono e le bratteole si ingrossano, il seme inizia lo sviluppo e la forma del cono assomiglia sempre più a quella di una pigna. Se l'impollinazione non avviene, non si forma alcun seme e le bratteole rimangono piccole. Le ghiandole di luppolina si sviluppano sulla coppa del perianzio, su brattee e bratteole; sono di colore dorato e trasparente nel luppolo giovane mentre di colore giallo cedro e opache nel luppolo maturo. Dalle singole cellule epidermiche di perianzio, brattee e bratteole, durante l'allungamento delle brattee, si sviluppano tricomi ghiandolari, ovvero delle strutture allungate dalle quali viene prodotta una secrezione interna sottostante la cuticola. La classica figura di cupola si forma dal rigonfiamento della cuticola a causa della secrezione che aumenta. Il prodotto di ogni tricoma ghiandolare è un granulo di luppolina. La quantità e la qualità della luppolina ne determina il valore commerciale (Edwardson, 1952). La composizione della luppolina verrà trattata in maniera più approfondita nei capitoli successivi.

Le piante di luppolo, alla maturità, tramite macchine specializzate, vengono tagliate sul campo, raccolte e separato i coni, la raccolta manuale ad alta intensità è oramai stata abbandonata (Haunold, 2010). Al fine di determinare il momento ottimale per la raccolta dei coni, si presta attenzione al

raggiungimento di un elevato contenuto di resina nei coni e di un livello di umidità intorno al 75–80%. Nelle infiorescenze fresche, l'umidità risulta così elevata da provocare un rischio di riscaldamento della massa dei coni raccolti, tanto da rendere le brattee di colore brunastro e causare da un lato una perdita di oli essenziali per volatilizzazione, dall'altro un rapido cambiamento della composizione chimica con successivo ammuffimento (Edwardson, 1952). Proprio per questo, gli strobili vengono fatti essiccare prontamente dopo la raccolta, fino ad un contenuto di umidità di circa 10% (Almaguer et al., 2014).

Il luppolo produce un vasto apparato radicale e delle radici profonde; le radici legnose perenni si sviluppano fino ad una profondità di 4 m o più e sono integrate da radici secondarie annuali che si allungano vicino alla superficie del suolo (Alfred, 2015). Per questa ragione, la pianta predilige terreni profondi e ben drenati (Edwardson, 1952). Durante l'inverno, le parti fuori terra della pianta muoiono, ma la corona se ben ricoperta da terra o neve può tollerare temperature di -25 °C o inferiori (Alfred, 2015).

Nella maggior parte delle aree di coltivazione del luppolo degli Stati Uniti, i suoli sono neutri o leggermente acidi (pH da 6 a 7), ma si sono ottenuti buoni risultati di coltivazione anche su suoli leggermente alcalini (Alfred, 2015).

3 Composizione chimica del luppolo

Le varietà di luppolo sono state tradizionalmente classificate in relazione alla loro composizione chimica, come luppoli amaricanti, sulla base del contenuto di α-acidi, e luppoli aromatici, in funzione della composizione dell'olio essenziale. Questa suddivisione è importante per il birraio, che può trarre vantaggio da un'adeguata selezione di particolari varietà di luppolo per raggiungere determinati sapori nelle birre. Tra le varietà di luppolo da amaro maggiormente commercializzate a livello mondiale si riconoscono 'Hallertauer Magnum', 'Hallertauer Taurus', 'Herkules', 'Galena', 'Nugget', 'Millennium' e 'CTZ' (Columbus, Tomahawk, Zeus). Invece, le varietà di luppolo aromatico più rappresentative sono 'Hallertauer Perle', 'Hallertauer Tradition', 'Splitter Select', 'Hallertauer Mittelfrüh', 'Hersbruck Hersbrucker', 'Tettnang Tettnanger', 'Saaz' e 'Cascade'. I luppoli aromatici più popolari negli Stati Uniti sono 'Cascade', 'Simcoe', 'Centennial' e 'Citra'. 'Galaxy', 'Ella' (precedentemente nota come Stella), 'Summer', 'Topaz' e 'Vic Secret' sono le varietà di luppolo aromatico coltivate in Australia, mentre 'Nelson Sauvin', 'Kazbek' e 'Aramis' vengono coltivate rispettivamente in Nuova Zelanda, Repubblica Ceca e Francia. Le ultime quattro selezioni di luppolo aromatico che sono state recentemente rilasciate per la coltivazione in Germania sono 'Polaris', 'Hallertauer Blanc', 'Mandarina Bavaria' e 'Hüll Melon' (Almaguer et al., 2014).

La varietà di luppolo, le condizioni ambientali, stagionali, il clima e l'ambiente locale sono caratteristiche tra loro correlate che influenzano la maturità delle infiorescenze, la composizione chimica e la concentrazione di resine e oli essenziali. Quindi, ogni cultivar di luppolo avrà un profilo qualitativo diverso, che è dato dall'interazione di queste variabili (Leles et al., 2023).

Gli strobili di luppolo intero fresco includono diversi componenti, come resine, oli essenziali, proteine, polifenoli, lipidi, cere, cellulosa e amminoacidi (Almaguer et al., 2014). I coni di luppolo essiccato contengono il 10% di umidità, dal 15 al 30% di resine totali, dallo 0,5 al 3% di olio essenziale, fino al 15% di proteine, il 2% di monosaccaridi, 4% di polifenoli (tannini), 2% di pectine, 0,1% di aminoacidi, da tracce al 25% di cere e steroidi, l'8% di ceneri infine il 43% di cellulosa etc. (Almaguer et al., 2014).

3.1 Resine totali

La luppolina è un materiale giallo e resinoso prodotto dalle ghiandole di luppolina delle infiorescenze femminili. È composta da: resine totali (acidi amari), olio essenziale e polifenoli (Rutnik et al., 2022) (Hieronymus, 2020).

In principio, Hayduck separò le resine del luppolo in frazioni α-, β- e γ- in base alla loro solubilità in diversi solventi e la loro capacità di formare un precipitato con acetato di piombo. Negli anni la

nomenclatura è cambiata di continuo e nel 1897, una di queste resine, la γ-resina, venne chiamata più comunemente resina dura. Nel 1957, la European Brewery Convention (EBC) e la Società americana dei chimici della birra (ASBC – American Society of Brewing Chemists) tramite proposte comuni chiarirono la situazione. Nel 1969 la terminologia è stata rivista dal sottocomitato per la nomenclatura dell'Hops Liaison e da quel momento non è più stata modificata.

La resina totale è espressa come la frazione solubile in etere dietilico e metanolo freddo, che deve essere a bassa temperatura per evitare di trattenere anche le cere del luppolo che così facendo cristallizzano e non si sciolgono o disperdono. Si suddivide in resine morbide e resine dure: le prime sono solubili in esano e costituiscono rispettivamente il 10-25% del luppolo essiccato; le seconde, insolubili all'esano e in idrocarburi paraffinici bassobollenti, rappresentano il 3-5% del peso totale del luppolo essiccato (Almaguer et al., 2014). Queste resine sono importanti perché i prodotti che si originano da esse durante la bollitura del mosto sono portatori del tipico amaro della birra e sono responsabili della stabilizzazione della schiuma (Krofta et al., 2019).

Le proprietà chimiche e fisiche delle due tipologie di resine differenziano l'una dall'altra. Le resine morbide riescono a produrre un fluido molto denso e viscoso di colore giallo, la cui consistenza è comparabile a quella del miele. Inoltre, in base alla varietà di luppolo e alla tipologia di prodotto, il colore degli estratti purificati può variare. Infatti, il colore dell'estratto ricco di resina rivela le caratteristiche varietali. Al contrario, la consistenza di questi estratti non è influenzata dalle stesse variabili. (Almaguer et al., 2014).

3.1.1 Resine morbide

Relativamente alla composizione chimica, le resine morbide comprendono α- e β-acidi e insieme all'olio essenziale sono tra i componenti di maggior valore per la produzione di birra, perché forniscono le componenti aromatiche ed amaricanti (Rutnik et al., 2022) (Almaguer et al., 2014).

Gli acidi amari sono costituiti da due serie correlate di omologhi, cioè α-acidi, o umuloni, e β-acidi, o lupuloni. I fondamentali omologhi degli α-acidi sono umulone, co-umulone, ad-umulone, mentre per i β-acidi sono lupulone, co-lupulone, ad-lupulone (Pistelli et al., 2018). Dalle resine morbide totali, gli α-acidi, che sono i costituenti più importanti, possono essere tranquillamente separati per la loro capacità di formare un sale di piombo insolubile con acetato di piombo (II) in metanolo. La loro composizione è caratteristica della varietà di luppolo e dipende inoltre dal tempo di raccolta (Almaguer et al., 2014).

a. α-acidi

Gli α-acidi vengono isomerizzati se sottoposti alle alte temperature, quindi prevalentemente nel mosto bollente. Con il calore, essi vengono convertiti nelle due forme *cis* e *trans*, risultando in sei

diverse forme (cis-iso-umulone, trans-iso-umolone, cis-iso-co-umulone, trans-iso-co-umulone, cis-iso-ad-umulone, trans-iso-ad-umulone). Dei sei, il composto più amaro è cis-iso-umulone e il meno amaro è trans-iso-co-umulone (Almaguer et al., 2014). Oltre l'85% dell'amaro piacevole percepito nella birra è fornito dagli iso-α-acidi; tuttavia, contribuiscono ad esso anche altre sostanze del luppolo come polifenoli e prodotti di ossidazione dei β-acidi (cioè gli hulupones) (Almaguer et al., 2014).

Gli α-acidi non sono propriamente amari e sono difficilmente solubili in soluzioni come la birra. Al contrario gli iso-α-acidi sono intensamente amari e notevolmente più solubili. Esiste una differenza tra le forme *cis* e *trans*: le prime possono essere percepite più amare, invece gli isomeri *trans* si deteriorano più velocemente. Proprio per quest'ultimo motivo, in Germania, alcuni ricercatori hanno determinato che il 75% dei trans-iso-α-acidi si degrada entro i primi 12 mesi in una birra conservata a 28°C, contenente solo il 15% di cis-iso-α-acidi (Hieronymus, 2020). In ulteriori studi sulla composizione della frazione α sono state trovate tracce di altri α-acidi quali pre-umulone e post-umulone.

b. Frazione β

La frazione β delle resine morbide totali è distinta in β-acidi e resine morbide non caratterizzate. I primi sono composti da lupulone e quattro congeneri: co-lupulone, ad-lupulone, pre-lupulone e post-lupulone. Le seconde rappresentano una frazione di luppolo non specifica e sono ulteriormente suddivise in resine α-morbide e resine β-morbide. I termini resine α-morbide e resine β-morbide sono assegnati per le sostanze che si identificano in seguito come originate rispettivamente dagli α-acidi o dai β-acidi. Sinora, i costituenti delle resine morbide non caratterizzate non sono stati definiti come alcun composto specifico, però si sono trovati componenti di olio essenziale e cera di luppolo. Il valore delle resine morbide non caratterizzate all'interno della birra rimane sconosciuto (Almaguer et al., 2014). I β-acidi sono presenti nel luppolo dal 3 al 10% in funzione della cultivar e sono sensibili alle reazioni di ossidazione inizializzate dall'aria. Diversamente dagli α-acidi, i β-acidi inseriti nel mosto caldo non subiscono l'isomerizzazione durante l'ebollizione del mosto e non conferiscono alcun sapore amaro alla birra, perché sono scarsamente solubili in essa. Tuttavia, una minima formazione di amaro può provenire dai prodotti di decomposizione ossidativa, che sono solubili in acqua, a causa della trascurabile concentrazione di ossigeno disciolto. Questo processo conferisce un sapore di amaro nalla birra che però non risulta sgradevole (Almaguer et al., 2014) (Krofta et al., 2019). Prima degli studi di Haseleu et al., si credeva che i β-acidi andassero persi nel processo di fermentazione della birra. Con queste sperimentazioni, invece, è stata identificata una serie di prodotti di trasformazione dei β-acidi dal sapore amaro che venivano generati durante l'ebollizione del mosto, dimostrando così che, oltre agli α-acidi anche i β-acidi sono potenziali precursori del gusto amaro

(Almaguer et al., 2014). In confronto agli α-acidi, i β-acidi sono stati oggetto di studi meno approfonditi.

3.2 Resine dure

È possibile affermare che le resine dure derivino dall'ossidazione della resina tenera, ma non è né ancora ben definito né provato in modo conclusivo quale sia la composizione di queste.

a. Resine dure α e β

Dato che le resine morbide sono inclini all'ossidazione, durante la conservazione pian piano che il luppolo invecchia, la percentuale di resina morbida diminuisce perché si ossidano gli alfa e beta acidi mentre quella della resina dura aumenta. Mentre gli acidi α e β diminuiscono continuamente durante lo stoccaggio, la quantità di resina morbida non caratterizzata aumenta inizialmente e poi si riduce costantemente man mano che la resina dura incrementa.

Burton e Stevens proposero due frazioni derivate dalla resina dura totale, la α-dura e la β-dura. La prima riesce a formare un sale di piombo insolubile quando è trattata con una soluzione di acetato di piombo e non implica che tutto il materiale è derivato dagli α-acidi ma, come gli alfa acidi, dà un sale di piombo insolubile. La resina β-dura, a differenza della resina α-dura, non riesce a dare un sale di piombo insolubile, con l'eccezione dello xantumolo, ed è la parte prevalente della resina dura totale (Almaguer et al., 2014).

Lo xantumolo è il componente principale nelle resine dure del luppolo; è l'unica resina di luppolo metilata presente in natura; ha una gamma di potenziali benefici per la salute e si trova in tracce nella birra perché viene perso nel processo di produzione della birra (Almaguer et al., 2014). Lo Xantumolo insieme alla quercetina e kaempferol, sono i principali responsabili delle proprietà antiossidanti del luppolo e tutti fanno parte dei flavonoidi del luppolo (Pereira et al., 2022). Nel processo di fermentazione avviene/si verifica l'isomerizzazione termica dello xantumolo che viene ciclizzato in isoxantumolo. Il componente principale dei prenilfavonoidi nel luppolo fresco è lo xantumolo (Almaguer et al., 2014).

b. Resina dura δ

Walker et al. ha trovato una porzione solubile in acqua della resina dura parte che dava anche un carattere di intenso amaro ma sapore gradevole e ha deciso di chiamarla la δ-resina della resina dura totale. Sempre Walker et al. determinò che la δ-resina è prodotta dall'ossidazione dei costituenti insolubili delle resine del luppolo. Per la stima del contenuto di resina δ nel luppolo, Abson et al. ha fatto degli esperimenti e ha sviluppato un metodo di stima e ha osservato che questa frazione si accumula durante lo stoccaggio di luppolo dall'altra parte però non sono riusciti a trovare alcuna relazione diretta tra la diminuzione percentuale della resina α-morbida (cioè gli α-acidi) e la quantità di δ-resina accumulata nello stesso periodo di tempo. Inoltre Jackson e Walker sono riusciti a separare

in sei frazioni non cristalline (δI–δVI) la δ-resina totale e le due frazioni principali della δ-resina grezza sono δII (66,3%) e δIII (22,5%). Per rendere chiara la situazione e poter distinguere le frazioni δII e δIII si è fatta un'ulteriore cromatografia e sulla base della sua solubilità in benzene e petrolio leggero, si ritiene che una parte significativa di δII sia residui della resina morbida invece la frazione δIII ha mostrato le stesse caratteristiche di solubilità come le resine dure.

In uno studio più recente sono state individuate 11 frazioni del totale di δ-resina le cui singole frazioni si contraddistinguono per le proprietà fisiche e la loro solubilità.

Nel corso dell'essicazione è stato visto che il contenuto di resina δ dei coni di luppolo è diminuito in modo notevole (Almaguer et al., 2014).

Gli hulupones sono prodotti di ossidazione dei beta acidi del luppolo; sono stati scoperti da Spetsig et al. alla fine degli anni '50 e consistono in una serie analoghi. Cohulupone, hulupone e adhulupone sono stati assegnati a singoli composti. Per la conversione da betacidi a hulupones è necessario un agente ossidante. Nel luppolo fresco non vi è la loro presenza, al contrario nelle resine dure. La maggior parte di hulupones viene trattenuta dal luppolo esaurito che rimane dopo l'ebollizione del mosto (Almaguer et al., 2014).

L'acido alupinico deriva da un ulteriore ossidazione degli hulupones, non è amaro ed è stato scoperto da Burton e Stevens nel 1964 perché riuscirono a isolare un prodotto cristallino della resina dura e suggerirono il nome di acido alupinico. La quantità di acido alupinico aumenta con l'età del luppolo. Dalle prove raccolte è emerso che durante il processo di ossidazione, la catena laterale acilica (cioè gruppo R) è rimossa ed eventualmente sostituita da un gruppo ossidrile. L'acido alupinico è classificato come componente della δ-resina nonostante sia stato isolato dalla resina α-dura per la sua solubilità in acqua e sia l'ultimo prodotto di ossidazione dei β-acidi (Almaguer et al., 2014).

c. Resina dura ε

Dallo studio di Almaguer et al., è emerso che dalla resina dura, c'era una porzione insolubile in acqua ma con carattere amaro e fu chiamata ε-resina. Questa costituisce l'80% della composizione della resina dura totale e dipende dalla varietà di luppolo.

Come l'δ-resina, anche dal frazionamento della ε-resina totale sono state riscontrate 11 frazioni che possono essere distinte in base alle loro proprietà fisiche e la loro solubilità. Quelle principali sono ε 10 (31,3%) e ε 11 (22,9%). Inoltre, dai dati raccolti dallo studio di Almaguer et al. è stato possibile classificare le 11 frazioni in base alla loro attività, di conseguenza, man mano che le frazioni diventano apolari, l'intensità amara e l'attività antimicrobica delle frazioni ε aumentano. Le frazioni ε 1 e ε 2 che sono altamente polari e non hanno dimostrato attività.

Infine oltre 100 frazioni sono state recuperate tramite ulteriore purificazione e frazionamento della resina (Almaguer et al., 2014).

3.3 Olio essenziale

Gli oli essenziali sono metaboliti secondari della pianta di luppolo prodotti dalle ghiandole di luppolina; per definizione, essi rappresentano la parte volatile dell' olio di luppolo e sono chiamati "essenziali" perché conferiscono al luppolo il suo caratteristico odore (Almaguer et al., 2014). La biosintesi dell'olio essenziale di luppolo si effettua nelle ghiandole della luppolina e si svolge più lentamente della biosintesi delle resine, perciò, l'olio essenziale si sviluppa interamente solo alla fine della fase di maturazione del luppolo. Durante la maturazione del luppolo, inizialmente si formano i composti ossigenati, poi i sesquiterpeni seguiti dai monoterpeni (Rutnik et al., 2022).

La quantità di olio inizia a diminuire dopo la raccolta. Inoltre, perdite più o meno significative di olio possono registrarsi durante la procedura di essicazione e in parte maggiore durante la lavorazione del pellet. Il tasso di diminuzione dipende principalmente dalle condizioni di conservazione; lo stoccaggio a basse temperature risulta ad oggi il metodo migliore per mantenere la qualità del materiale. Inoltre, durante lo stoccaggio, possono alterarsi sia la composizione sia la qualità dell'olio essenziale, in particolare: diminuisce la quantità di idrocarburi; il β-mircene subisce autossidazione e viene convertito in 40 composti diversi; i composti dell'ossigeno aumentano a scapito degli idrocarburi (Rutnik et al., 2022). "Il luppolo essiccato contiene lo 0,5–3,0% di olio essenziale"(Almaguer et al., 2014). Modificare frase: In termini quantitativi, le infiorescenze di luppolo essiccato contengono circa 0,5-3% di olio essenziale (Almaguer et al., 2014).

La composizione chimica dell'olio essenziale è influenzata non solo dalla varietà di luppolo, ma anche dalla regione geografica, dalle condizioni meteorologiche, dal tempo di raccolta, dalle condizioni di essiccazione, dalle condizioni di lavorazione e dalle condizioni di conservazione citare Rutnik. Il cosiddetto luppolo aromatico di solito contiene quantità maggiori di oli essenziali e la concentrazione dei singoli composti dipende fortemente dalla varietà (Rutnik et al., 2022).

La composizione dell'olio essenziale di luppolo è molto complessa, pertanto i composti presenti all'interno di esso possono essere suddivisi in gruppi in base alla loro struttura chimica o al tipo di aroma che conferiscono alla birra. Ad oggi sono stati scoperti più di 1000 composti (Rutnik et al., 2022). La componente volatile dell'olio di luppolo conferisce alla birra diversi sentori aromatici e gustativi che vengono descritti come note "floreali", "fruttate" (ad esempio determinate da alcoli, esteri, composti contenenti zolfo), "speziate", "legnose", "erbacee" (dovute a sesquiterpeni, sesquiterpenoidi ossigenati) e "verdi" (legate ad aldeidi). Il profilo sensoriale dipende dalle concentrazioni e dalle combinazioni dei componenti, ma anche dalle soglie di percezione di ciascuno di essi in diverse matrici (Dietz et al., 2020).

La composizione chimica degli oli essenziali di luppolo, dal 1980, è stata descritta per convenzione attraverso tre gruppi chimici principali: gli idrocarburi, i composti ossigenati e i componenti

contenenti zolfo (Almaguer et al., 2014). Seguendo un ordine crescente in termini di quantità nel totale dell'olio, i componenti contenenti zolfo si trovano in tracce, i composti ossigenati rappresentano circa il 30%, infine gli idrocarburi, la frazione maggiore, tra il 50 e l'80% (Rutnik et al., 2022). In generale, l'olio essenziale di luppolo si caratterizza per la presenza di alcuni composti, che si trovano in concentrazioni più abbondanti. Tra gli idrocarburi monoterpenici si riconosce il mircene, che risulta la componente principale dell'olio. Tra gli idrocarburi sesquiterpenici spiccano α-umulene, β-cariofillene e (E)-β-farnesene (Pistelli et al., 2018).

a. Idrocarburi

Gli idrocarburi, insieme ai composti ossigenati, compongono la maggior parte dell'olio essenziale di luppolo (Almaguer et al., 2014). Il gruppo degli idrocarburi si caratterizza per l'elevata volatilità dei composti. Di conseguenza, molte componenti durante l'ebollizione sono perse per evaporazione e infatti nella birra si trovano solo delle tracce. Inoltre, gli idrocarburi possono rapidamente ossidare e polimerizzare e la loro solubilità in acqua, mosto e birra è molto bassa (Almaguer et al., 2014).

Gli idrocarburi possono essere classificati in 3 gruppi: composti alifatici, monoterpeni e sesquiterpeni. I primi rappresentano una piccola frazione e si trovano solo in basse concentrazioni; i secondi con gli ultimi determinano la frazione più consistente (Rutnik et al., 2022).

I monoterpeni sono ulteriormente suddivisi in tipi aciclici, monociclici e biciclici. Essi sono costituiti da due unità isopreniche; sono molto volatili, si ossidano e polimerizzano facilmente; sono scarsamente solubili in acqua e, pertanto, il loro contributo al sapore e all'aroma della birra è basso ma non è trascurabile, soprattutto quando si utilizza il dry hopping (Rutnik et al., 2022). Il monoterpene più importante e abbondante è il β-mircene, che è il principale componente responsabile di conferire l'odore pungente al luppolo fresco. Nella frazione dell'olio di luppolo sono presenti altri monoterpeni in quantità notevolmente inferiori quali l'ocimene, il β-pinene, il limonene e il β-cimene (Almaguer et al., 2014).

I sesquiterpeni sono costituiti da tre unità di isoprene. Essi si trovano come forme acicliche, monocicliche, bicicliche e tricicliche. Rispetto ai monoterpeni, sono meno volatili, hanno punti di ebollizione più alti e un po' meno inclini all'ossidazione (Almaguer et al., 2014) (Rutnik et al., 2022).

I componenti principali del gruppo sesquiterpenico sono: l'α-umulene, che è il sesquiterpene più importante ed è stato uno dei primi composti ad essere identificato nell'olio di luppolo; il β-cariofillene, secondo sesquiterpene più importante, ed infine il β-farnesene, che si trova solo in alcune varietà di luppolo.

L'insieme di β-mircene, α-umulene e β-cariofillene costituisce l'80-90% dell'olio essenziale totale del luppolo (Almaguer et al., 2014).

b. Composti ossigenati

La frazione contenente ossigeno rappresenta fino al 30% dell'olio essenziale di luppolo (Rutnik et al., 2022). E' suddivisa in alcoli, aldeidi, acidi, chetoni, epossidi ed esteri e la maggior parte di questi è presente al di sotto delle concentrazioni di soglia dell'odore (Almaguer et al., 2014).

I composti ossigenati comprendono due porzioni chiamate "volatile" e "non volatile". La porzione "volatile" è composta da una serie di composti con punto di ebollizione inferiore a quello dell'α-umulene, invece la "non volatile" comprende composti caratterizzati da punto di ebollizione superiore a quello dell'α-umulene. Quest'ultima informazione, relativa alle sostanze ad alto punto di ebollizione, è importante perché potrebbero facilmente trovarsi nella birra finita, dal momento che molto probabilmente saranno trattenute nel mosto dopo l'ebollizione (Almaguer et al., 2014).

Complessivamente, l'impatto dei composti ossigenati sull'aroma della birra è maggiore dato che la frazione dell'ossigeno è più solubile in acqua rispetto agli idrocarburi (Rutnik et al., 2022). Inoltre, è stato osservato che durante l'invecchiamento del luppolo, l'olio di luppolo si arricchiva di composti ossigenati. Oltre a ciò, l'ossidazione, che porta ad una produzione di composti ossigenati non volatili con una concomitante perdita di alcuni di quelli volatili, va a scapito degli idrocarburi e, di conseguenza, causa una diminuzione della proporzione di β-mircene (Almaguer et al., 2014).

c. Alcoli

Il gruppo degli alcoli è costituito da alcoli monoterpenici, alcoli sesquiterpenici e alcoli alifatici, con 2-metil butanolo e linalolo come costituenti principali della frazione alcolica, seguiti da geraniolo, nerolo e α-terpineolo (Rutnik et al., 2022).

L'alcool terpenico più abbondante è il linalolo (Almaguer et al., 2014). In funzione della varietà, l'olio di luppolo contiene circa l'1% di linalolo in peso. È stato riscontrato che la concentrazione diminuisce rapidamente durante l'ebollizione del mosto e che il suo contributo nella birra è più percepibile quando si effettua un'aggiunta tardiva di luppolo (Almaguer et al., 2014) (Dietz et al., 2020).

Il linalolo è un prodotto di idratazione del β-mircene; è anche un composto chirale, quindi ci sono due stereoisomeri, (R)-(-)-linalool e (S)-(+)-linalool. È stato dimostrato che (R)-linalolo è più attivo sul gusto ed è solitamente presente nel luppolo tra il 92 e il 94% (Almaguer et al., 2014).

È stato scoperto ed è noto che gli alcoli monoterpenici come il linalolo, il geraniolo, il citronellolo e il nerolo contribuiscono a diverse dimensioni dell'aroma e del sapore di luppolo nella birra, aggiungendo note aromatiche fresche, fruttate, agrumate e floreali simili alla rosa. I composti della stessa classe chimica con caratteristiche aromatiche somiglianti possono manifestare un comportamento di tipo additivo o sinergico. È stato riscontrato, infatti, che il nerolo interagisce in modo additivo con il geraniolo, conferendo così alla birra maggiori aromi floreali e che il linalolo contribuisce in modo determinante ai caratteri floreali, che ricordano la lavanda, e agrumati. Il linalolo

sembra essere uno dei volatili sempre presente nella maggior parte delle varietà di luppolo e la sua quantità nell'olio di luppolo non varia tanto quanto nel caso di altri alcoli terpenici come il geraniolo. Il linalolo è considerato un composto marcatore responsabile delle caratteristiche di aroma e sapore nella maggior parte dei luppoli (Dietz et al., 2020).

d. Esteri

Gli esteri sono la frazione ossigenata più abbondante nell'olio di luppolo e hanno un ampio intervallo di ebollizione. Gli esteri chiave sono gli esteri di geranile, come geranil acetato, geranil propionato e geranil isobutirrato (Rutnik et al., 2022). Naya e Kotane hanno reso noto che le varietà ricche di β-mircene presentano un alto contenuto di esteri (Almaguer et al., 2014). Sia la lunghezza della catena che il grado di ramificazione sembrano avere un impatto sul profilo aromatico; di conseguenza, gli esteri a catena corta hanno soglie di sapore più elevate rispetto agli esteri a catena lunga e aggiungono note aromatiche alla birra come aromi di frutti di bosco, agrumi, pera, mela e frutta tropicale (Dietz et al., 2020).

e. Aldeidi

I sapori agrumati e fruttati sono caratteristici di aldeidi con lunghezze di catena più corte, mentre con l'aumentare della lunghezza della catena gli odori diventano sgradevoli, descritti come rancido, grasso, cartone e metallico (Dietz et al., 2020).

È stato dimostrato che le aldeidi quali l'1-esanale e lo (Z)-3-esenale sono responsabili di attribuire le note verdi ed erbacee alla birra (Almaguer et al., 2014).

f. Chetoni

I chetoni più rappresentati nell'olio di luppolo sono β-damascenone, β-ionone, 2-dodecanone e 2-undecanone; questi composti sono noti per conferire caratteri agrumati /fruttati e floreali alla birra.

Tra i chetoni presenti nel luppolo, spicca il composto noto come metil nonil chetone, che è stato scoperto alla fine degli anni '50 come il componente ossigenato più abbondante nella maggior parte degli oli di luppolo e attribuisce un sapore floreale alla birra (Almaguer et al., 2014).

I sesquiterpenoidi ossigenati del luppolo, specialmente l'umulene epossido II, sono stati associati al carattere speziato nel luppolo (Almaguer et al., 2014).

g. Composti di zolfo

Nel luppolo, i principali composti di zolfo presenti sono tioesteri, tiofeni, metilsolfuri, polisolfuri ed episolfuri. Sebbene i composti solforati si trovino solo in tracce nell'olio di luppolo, il loro impatto sull'aroma del luppolo e il sapore complessivo della birra è notevole (Rutnik et al., 2022). Nella produzione della birra sono sgraditi, in quanto, in generale, conferiscono sapori indesiderabili di zolfo, verdura cotta, muffa, cavolo, formaggio e simili. In particolare, sapori sgradevoli gommosi e simili all'aglio sono dovuti a 2,3,5-tritiaesano e dal 3,3-dimetilallil metil solfuro. Il responsabile

dell'aroma di tartufo è il tioestere S-metil-2-metil tiobutanoato; invece la nota di carne arrostita è impartita dal 2-metil-3-furanetiolo (Almaguer et al., 2014).

Nonostante questi composti solforati abbiano un effetto negativo nella maggior parte dei casi, talvolta possono avere effetti positivi sull'aroma (Krofta et al., 2021). Per esempio, il 4-mercapto-4-metilpentan-2-one (4MMP) è di particolare interesse per il birraio e il chimico della birra, perché conferisce l'intenso carattere moscato (cioè dell'uva) alla birra. Similmente, l'S-metiltioesanoato promuove note verdi e fruttate e odore di ananas (Almaguer et al., 2014). Gli esempi in cui sostanze solfuree del gruppo dei tioli polifunzionali caratterizzano piacevoli aromi sono numerosi. Il 4-sulfanil-4-metilpentan-2-one (4MMP) è stato identificato come responsabile dell'aroma fruttato estremamente forte del ribes nero nelle cultivar americane e australiane 'Cascade', 'Simcoe', 'Summit', 'Apollo' e ' Topaz' e l'aroma unico delle birre con il carattere di frutti esotici, pompelmi e vino bianco, che è stato luppolato con la cultivar neozelandese 'Nelson Sauvin'. E' associato ai tioli polifunzionali volatili 3-sulfanil-4-metilpentan-1-olo (3S4MP) e 3-sulfanil-4- metilpentilacetato (3S4MPA) (Krofta et al., 2021). Da quanto riscontrato ad oggi, il 4MMP non è presente nei luppoli europei, ma solo in quelli americani, australiani e neozelandesi e la sua presenza, insieme a quella del linalolo, geraniolo e β-citronellolo, tende a creare un carattere tropicale nella birra (Rutnik et al., 2022).

3.4 Polifenoli del luppolo

I polifenoli sono sostanze costituite da più unità fenoliche e condividono un elemento strutturale comune: un anello aromatico con almeno due gruppi idrossilici. Costituiscono fino al 4% del peso totale dei coni di luppolo essiccati. Essi si trovano principalmente nei petali del cono di luppolo e nell' asse a zig-zag dello strobilo, ad eccezione dei prenilfavonoidi (es. xantumolo), e non nelle ghiandole della luppolina. Come per la maggior parte dei costituenti del luppolo, la quantità varia in relazione alla varietà. Il luppolo invecchiato contiene livelli più elevati di polifenoli rispetto a quello fresco (Almaguer et al., 2014). La classificazione dei polifenoli presenti nel luppolo è stata strutturata come segue: flavonoli, flavan-3- oli, acidi carbossilici fenolici e altri composti polifenolici (Almaguer et al., 2014).

Dalla struttura del flavone derivano i flavonoli ed i flavan-3-oli. Ognuno di essi appartiene ai flavonoidi, un sottogruppo dei polifenoli. I flavonoidi del luppolo constano di catechine e i loro polimeri, protoantocianidine, quercetina e kaempferol. Nel luppolo, i due agliconi protonati, quercetina e kaempferol, non si trovano in forme libere, ma solo nelle forme legate glicosidicamente. La quercetina ha il più alto potenziale antiossidante (Almaguer et al., 2014) .

Nel mosto, solo circa il 20-30% dei polifenoli presenti proviene dal luppolo, la maggior parte derivano invece dal malto.

I polifenoli del luppolo possono essere: facilmente ossidati, a basso peso molecolare e ad alto peso molecolare. Quelli a basso peso molecolare operano come antiossidanti naturali; contribuiscono in gran parte al potere riducente del mosto, proteggendo così la birra dall'ossidazione e migliorando la stabilità del gusto. Invece, quelli ad alto peso molecolare contribuiscono al colore della birra e all' incremento di torbidità (Almaguer et al., 2014).

Callemien et al. hanno citato per la prima volta la presenza di tre stilbeni cardioprotettivi (una classe di composti fenolici) nel luppolo: trans-resveratrolo, trans-piceide e cis piceide. Il trans-resveratrolo è molto più idrofobo di altri polifenoli del luppolo e difficilmente si ritrova nella birra finita, ciononostante è stata confermata la sua presenza insieme a cis-resveratrolo, di trans-piceide e cis-piceide nella birra. Esso contribuisce al potenziale antiossidante e possiede anche proprietà antinfiammatorie e antitumorali (Almaguer et al., 2014).

4 Obiettivi

L’obiettivo del presente studio è stato quello di esaminare la variabilità aromatica del luppolo, sulla base della composizione chimica dell’olio essenziale, in relazione alla differenziazione genotipica e a diversi livelli di trasformazione. La sperimentazione ha mirato ad evidenziare similitudini e differenze tra sei diverse varietà di luppolo (Calicross, Cascade, Chinook, Comet, Target e Yeoman), nei tre diversi trattamenti delle infiorescenze (fresche, secche e in pellet), attraverso un’analisi della concentrazione dei composti chimici caratterizzanti. La valutazione delle modalità di trasferimento degli aromi tra questi diversi stadi di trasformazione delle infiorescenze si è rivelata di grande importanza all'interno della filiera brassicola, che sottolinea la convenienza economica e pratica dell'impiego di luppolo essiccato e confezionato in pellet.

5 Materiali e metodi

5.1 Sito sperimentale

Il materiale che è stato utilizzato per il presente progetto è stato ricavato presso il luppoleto presente nell'Azienda Agraria Sperimentale "L. Toniolo" dell'Università di Padova a Legnaro in provincia di Padova, realizzato nel 2021.

L'impianto è composto da una tendostruttura costituita da pali in calcestruzzo precompresso, collegati tra loro da cavi e fili di acciaio tenuti in tensione da appositi ancoraggi infissi nel terreno, in modo da garantire la durabilità e la resistenza dell'impianto. Le dimensioni dell'impianto sono 30.2 x 12 m, la distanza tra pali sulla fila è di 5.90 m, mentre l'interfila è di 3 m e inerbito.

Tutto l'impianto è stato ricoperto da una rete antigrandine e circondato da una rete bianca spessa per evitare danni di roditori. Lungo tutti i filari, è stato steso un telo pacciamante di larghezza 1 m, così da contenere la crescita di infestanti tra le piantine di luppolo.

Il luppoleto è dotato di un impianto di irrigazione costituito da 5 manichette, una per ogni filare, sono state posizionate ad 1 m da terra, le quali successivamente sono state suddivise in 2 gocciolatori, posti a lato di ogni pianta. Vedasi Figura 2 del luppoleto.

Presso la stessa Azienda Agricola Sperimentale "L.Toniolo" è situato l'essiccatoio (Figura 1), adibito all'essiccazione di piante officinali, tramite un meccanismo di deumidificazione e condizionamento dell'aria.

La lavorazione di pellettatura è stata, invece, affidata all'Azienda Agricola "Luppoleto della Valdalpone", situata a Vestenanova in provincia di Verona.

Figura 1. Essicatoio.

Figura 2. Luppoleto nell'Azienda Agraria Sperimentale "L. Toniolo" dell'Università di Padova a Legnaro in provincia di Padova.

5.2 Cultivar

Le cultivar che sono state impiegate nel presente esperimento sono le seguenti: Calicross, Cascade, Chinook, Comet, Yeoman e Target. Le varietà piantate sono state selezionate sulla base del profilo aromatico e dell'adattabilità alle condizioni pedoclimatiche del sito sperimentale. Le piante di luppolo sono state trapiantate ad una distanza tra loro di 0.98 m, per garantire la loro ottimale crescita e sviluppo, come da Figura 3. Ogni pianta è stata identificata con un codice, formato da una lettera e un numero. Per ogni cultivar esaminata si presenta di seguito una breve descrizione morfologica, corredata, ove disponibile, di informazioni su luogo di provenienza, originatore e probabile data di introduzione in commercio.

a. Calicross
b. Cascade
c. Chinook
d. Comet
e. Yeoman
f. Target

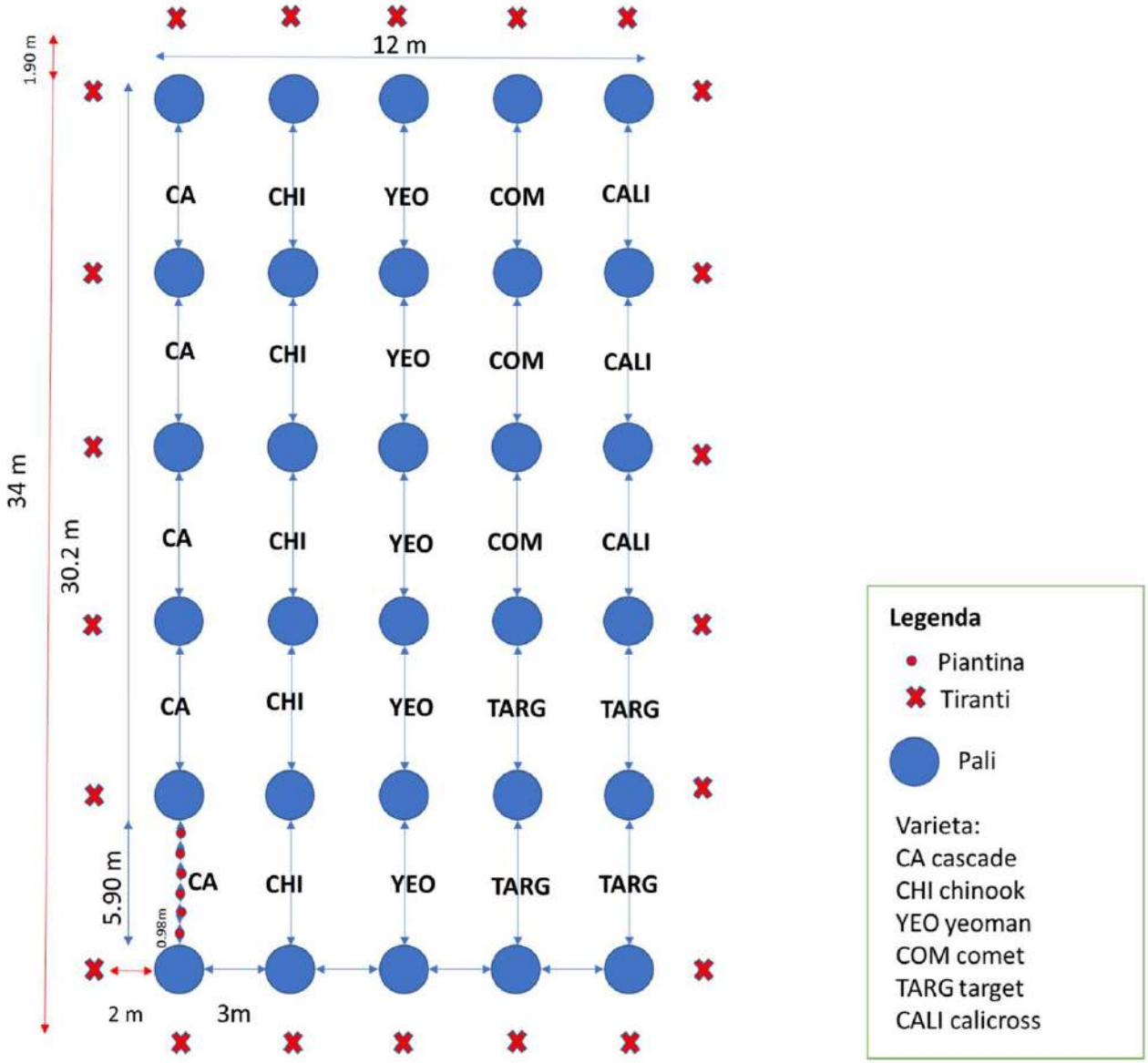


Figura 3. Mappa del luppoleto sperimentale all'interno dell'Azienda Agraria "L. Toniolo" dell'Università di Padova, situata a Legnaro (PD).

a. Calicross

Il luppolo Calicross è stato sviluppato dal Dipartimento di ricerca scientifica e industriale della Nuova Zelanda negli anni '60 ed è successivamente scomparso negli anni ’80 a causa del suo vigore limitato. Questa varietà neozelandese è stata creata da un incrocio tra Fuggle e Late Cluster, per l’urgenza di ottenere varietà resistenti alle malattie, in seguito all’attacco di *Phytophthora citricola,* alla fine degli anni ’40, che ha causato una decimazione del raccolto. Il Calicross è un luppolo a doppio uso, impiegato sia per l'aroma che per l'amaro; esibisce sapori terrosi e fruttati e aromi floreali che si avvicinano molto a quelli del luppolo Cluster. La composizione chimica e le quantità in percentuale dei costituenti principali dell’olio essenziale di Calicross sono presenti nella Tabella 1 (Healey, 2021).

Molecola	Concentrazione
Mircene	54% - 68%
Umulene	12% - 19%
Cariofillene	2% - 6%
Farnesene	0% - 1%

Tabella 1. Composizione chimica dell’olio essenziale di Humulus lupulus L. ‘Calicross’ (Healey, 2021).

b. Cascade

La varietà Cascade è stata sviluppata nel programma di allevamento dell'USDA presso la Oregon State University e creata da un incrocio tra Fuggle e il luppolo russo Serebrianka nel 1967. In seguito, nel 1972, è stata rilasciata al pubblico. All’origine il Cascade era conosciuto solo con la sua designazione numerica di USDA 56013. Sebbene sia conosciuto principalmente come varietà americana, rappresentando circa il 10% del raccolto di luppolo degli Stati Uniti, esistono anche varietà di Cascade neozelandesi, argentine e australiane. È un luppolo a doppio uso, impiegato per conferire amaro moderato, ma soprattutto aroma, tanto da definire lo stile American Pale Ale. Definito dal suo sapore di agrumi, e spesso più specificamente di pompelmo, possiede qualità floreali e speziate di agrumi di media intensità. La composizione chimica e le quantità delle sostanze rilevanti in percentuale dell’olio essenziale di *Humulus lupulus* L. ‘Cascade’ sono illustrate nella Tabella 2 (BeerMaverick, 2023a).

Molecola	Concentrazione
Mircene	45%-60%
Umulene	8%-20%
Cariofillene	3%-9%
Farnesene	3%-9%
Altri (compresi β-pinene, linalolo, geraniolo e selinene)	2-41%

Tabella 2. Composizione chimica dell’olio essenziale di Humulus lupulus L. ‘Cascade’ (BeerMaverick, 2023a).

c. Chinook

Il luppolo Chinook è un incrocio tra un Petham Golding e un maschio selezionato dall'USDA con alti α-acidi e buone proprietà di conservazione. È un luppolo a doppio uso e presenta un bouquet speziato. Può risultare leggermente piccante e presentare sentori affumicati e terrosi; ha un impressionante carattere di pino e resina, con note speziate e di pompelmo. Nel 2019, il Chinook è stato l'ottavo luppolo più raccolto negli Stati Uniti. La composizione chimica e le quantità in percentuale dei principali componenti dell'olio essenziale di *Humulus lupulus* L. 'Chinook' sono esposte nella Tabella 3 (BeerMaverick, 2023b).

Molecola	Concentrazione
Mircene	20%-30%
Umulene	18%-24%
Cariofillene	9%-11%
Farnesene	0%-1%
Altri (compresi β-pinene, linalolo, geraniolo e selinene)	34-53%

Tabella 3. Composizione chimica dell'olio essenziale di Humulus lupulus L. 'Chinook' (BeerMaverick, 2023b)

d. Comet

La varietà Comet è stata originariamente rilasciata come "high alpha" dall'USDA nel 1974; i suoi genitori sono l'inglese Sunshine e un luppolo nativo americano che esalta un sapore "selvaggio americano". È un luppolo a doppio uso, da amaro e aroma. Il profilo aromatico include descrittori come "erbaceo", "pompelmo", "americano", "selvatico" e "sottile". La composizione chimica e le quantità in percentuale dei principali elementi dell'olio essenziale di *Humulus lupulus* L.'Comet' si possono osservare nella Tabella 4 (BeerMaverick, 2023c).

Molecola	Concentrazione
Mircene	40%-65%
Umulene	1%-2%
Cariofillene	5%-15%
Farnesene	0%-1%
Altri (compresi β-pinene, linalolo, geraniolo e selinene)	17-54%

Tabella 4. Composizione chimica dell'olio essenziale di Humulus lupulus L. 'Comet' (BeerMaverick, 2023c).

e. Yeoman

Il luppolo Yeoman deriva da un incrocio realizzato al Wye College, in Inghilterra, negli anni '70; è un luppolo a doppio uso e ha un forte aroma di luppolo inglese con note di agrumi. La composizione e le quantità in percentuale delle sostanze principali presenti nell'olio essenziale di *Humulus lupulus* L. 'Yeoman' sono presenti nella Tabella 5 sottostante (BeerMaverick, 2023e).

Molecola	Concentrazione
Mircene	47%-49%
Umulene	19%-21%
Cariofillene	9%-10%
Farnesene	0%-1%
Altri (compresi β-pinene, linalolo, geraniolo e selinene)	19-25%

Tabella 5. Composizione chimica dell'olio essenziale di Humulus lupulus L. 'Yeoman' (BeerMaverick, 2023e).

f. Target

Il luppolo Target è stato rilasciato dal Wye College nel 1992; è cugino di Challenger e discendente di Northern Brewer e Eastwell Goldings. È comunemente usato come luppolo da amaro, dal momento che offre un'amarezza croccante e α-acidi moderati. I descrittori aromatici specifici del luppolo Target includono "salvia", "verde", "fresco", "speziato", "pepata"; presenta sentori di marmellata di agrumi. È stato osservato che le aggiunte nelle fasi di whirlpool o dry hopping esaltano il carattere speziato di questo luppolo. La composizione e le quantità in percentuale dei principali costituenti dell'olio essenziale di *Humulus lupulus* L. 'Target' sono riportati nella Tabella 6 (BeerMaverick, 2023d).

Molecola	Concentrazione
Mircene	45%-55%
Umulene	17%-23%
Cariofillene	8%-10%
Farnesene	0%-1%
Tutti gli altri compresi β-pinene, linalolo, geranoil e selinene	11-30%

Tabella 6. Composizione chimica dell'olio essenziale di Humulus lupulus L. 'Target' (BeerMaverick, 2023d).

5.3 Raccolta e lavorazione dei coni

La raccolta dei coni è stata svolta a maturazione ottimale, a mano, tra il 19 e il 29 settembre 2022.

Le infiorescenze fresche di ogni singola pianta sono state raccolte in contenitori rettangolari di ferro forati su tutta la superficie e pesate direttamente in campo (vedasi Figura 4). All'interno dello stesso contenitore i coni sono stati prontamente portati in essiccatoio, situato nel medesimo sito sperimentale.

L'essiccazione è stata effettuata ad una temperatura massima di 30°C attraverso un impianto di deumidificazione e condizionamento dell'aria fino al raggiungimento di un'umidità compresa tra l'8

e il 10%. Al termine dell'essicazione i singoli contenitori sono stati nuovamente pesati al fine di annotare il peso dei coni essiccati.

A questo punto i coni di ogni varietà sono stati raccolti in un unico sacco di juta e conservati in ambiente secco e buio fino al momento della pellettatura.

In data 12 ottobre 2022, il materiale è stato portato presso l'azienda agricola Luppoleto della Valdalpone, a Vestenanova (VR) dove è stata eseguita la trasformazione in pellet.

Le infiorescenze di luppolo secche sono state triturate e successivamente trasformate in pellet (Figura 5) attraverso un macchinario per la lavorazione del luppolo che rispetta una temperatura di massimo 30°C. Il procedimento è stato effettuato separatamente per ognuna delle varietà. Il pellet è stato dapprima riposto su appositi teli per facilitare il raffreddamento del materiale ed è stato successivamente raccolto in sacchetti sottovuoto.

Per ognuna delle fasi di raccolta e trasformazione è stato prelevato un campione di infiorescenze fresche, secche e pellettate per ognuna delle cultivar considerate. Ogni campione è stato conservato sottovuoto in congelatore a (-16°C) presso il laboratorio di chimica LaChi del Dipartimento DAFNAE, fino al momento delle analisi.

Figura 4.Coni di luppolo freschi.

Figura 5. Pellet di luppolo.

5.4 Analisi SPME-GC/MS

Per l'indagine del profilo aromatico e le concentrazioni delle sostanze volatili è stata usata la gascromatografia accoppiata a spettrometria di massa con tecnica di microestrazione in fase solida dello spazio di testa (HS-Head Space-SPME-Solid Phase Micro Extraction). Sono state determinate per ogni tesi 87 molecole; il nome di queste, per praticità e chiarezza grafica, sono state identificate con la lettera M ed un numero progressivo da 1 a 87.

La composizione chimica dei coni freschi, secchi e pellettati è stata analizzata tramite gas cromatografia mediante gascromatografo Agilent Technologies 7890A, accoppiato al rivelatore di massa selettivo 5977. L'analisi dei campioni è stata effettuata per ognuno dei 3 trattamenti subiti dai coni e per le 6 varietà.

Ciascun sacchetto contenente il campione di luppolo è stato scosso per favorire la disgregazione delle brattee dall'asse principale. Successivamente per ciascun campione sono stati pesati 150 mg di materiale fresco, secco o in pellet per mezzo di una bilancia analitica. Al termine della pesatura, ciascun campione è stato inserito all'interno di una vial di vetro da 20 ml, chiusa con un setto di gomma. Per la pre-estrazione, le vial sono state sottoposte a condizionamento a 60°C per 5 minuti. La fibra SPME (50/30 um DVB/CAR/PDMS, Stableflex, 2 cm, Supelco) è stata inserita nello spazio di testa del campione e i volatili sono stati estratti per 10 minuti con riscaldamento costante a 60◦C ed esposta per 10 minuti. Terminata l'esposizione, la fibra è stata inserita all'interno del gascromatografo. I componenti sono stati separati su una colonna capillare di silice, HP-5MS (5% difenile e 95% dimetilpolisilossano, 30 m lunghezza × 0,25 mm di diametro interno, spessore del film

0,25 µm; Agilent Technologies, Santa Clara, CA, USA). Come gas di trasporto è stato utilizzato l'elio, a una velocità di flusso di 1 mL/min. La temperatura del forno GC è stata mantenuta per 2 minuti a 40°C, aumentata a 160°C alla velocità di 3°C/min, successivamente aumentata ancora a 250°C con un incremento di 10°C/min e infine mantenuta a 250°C per 5 minuti. I componenti separati sono stati ulteriormente analizzati con un rilevatore a selezione di massa (MSD). Le temperature della linea di trasferimento, della sorgente ionica e dell'analizzatore di massa quadruplo sono state impostate rispettivamente a 280°C, 230°C e 150°C. La tensione di ionizzazione era di 70 eV e la selezione di massa è stata effettuata in modalità di scansione, con un intervallo di carica tra 30 e 500. L'elaborazione dei dati è stata eseguita con Mass Hunter in combinazione con il software NIST library (Agilent Technologies, Santa Clara, CA, USA).
Gli indici di Kovats sono stati calcolati e comparati con quanto riportato in letteratura, per avere una conferma aggiuntiva del riconoscimento di ogni componente. L'indice di ritenzione di Kovats si basa su un confronto dei tempi di ritenzione del composto con alcani lineari.

5.5 Analisi dei dati

Nella fase antecedente all'analisi statistica, si è elaborata e ordinata la raccolta dei dati attraverso una serie di tabelle in Microsoft Excel (Versione 2307).
Sono stati raccolti e riportati i valori delle aree dei picchi su una prima tabella. Successivamente, i valori delle aree dei singoli picchi sono stati rapportati all'area totale dei picchi di ciascun campione, al fine di ottenere le concentrazioni percentuali di ciascuna molecola.

5.6 Analisi statistica

L'analisi statistica è stata eseguita attraverso il software R studio. L'analisi della varianza (ANOVA), l'Analisi delle Componenti Principali (PCA) e l'applicazione dell'algoritmo K-Means hanno permesso di identificare associazioni tra le molecole rilevate dall'analisi gascromatografica e valutare somiglianze e differenze tra campioni di luppolo di diverse varietà e diversi stati.
La prima analisi statistica dei dati forniti dal laboratorio di chimica LaChi del Dipartimento DAFNAE è stata eseguita utilizzando il metodo di analisi della varianza (ANOVA). Questo test ha permesso di identificare differenze significative per ognuna delle molecole riconosciute dall'analisi gascromatografica, in funzione dei 3 stati delle infiorescenze e alle 6 varietà di luppolo.
Successivamente, l'Analisi delle Componenti Principali (PCA – Principal Component Analysis) è stata applicata per indagare similitudini e differenze tra i campioni in relazione alla composizione chimica e per evidenziare quali molecole contribuiscono maggiormente alla differenziazione dei

campioni. Questo metodo di statistica multivariata permette di esaminare e rappresentare le variazioni di un determinato set di dati.

Infine, l'algoritmo di analisi K-Means è stato applicato con l'obiettivo di raggruppare i campioni di luppolo in relazione alla relativa composizione chimica. Il K-Means è un algoritmo di clustering non supervisionato, basato su un sistema di intelligenza artificiale, che permette di suddividere un insieme di dati in *k* gruppi (i.e. cluster), sulla base di caratteristiche omogenee, in modo da ottenere il massimo grado di somiglianza all'interno di ciascun gruppo e il massimo grado di dissomiglianza tra elementi appartenenti a gruppi diversi (Team I.A. Italia, s.d.). La scelta del migliore del numero di cluster è stata fatta utilizzando il metodo "silhouette" (Naghizadeh & Metaxas, 2020).

6 Risultati

6.1 Resa

I risultati relativi alla resa ottenuta dalla raccolta delle infiorescenze sono stati riportati in Tabella 7. Per ogni varietà, si segnala la resa totale di coni freschi e secchi, la resa media per pianta, in relazione al numero di piante presenti nel luppoleto. Tali risultati sono stati confrontati con i dati disponibili in letteratura, relativamente alla produttività media in coni secchi e freschi.

Varieta'	N. piante	Fresco totale (g)	Secco totale (g)	Fresco per pianta (g)	Secco per pianta (g)	Produttività coni freschi (Kg/ha)	Produttività coni secchi (Kg/ha)
Calicross	17	5879,10	1502,70	345,83	88,39	1750,00	525,00
Cascade	30	14802,50	4413,60	493,42	147,12	2227,50	668,25
Chinook	29	10196,00	2672,40	351,59	92,15	1965,00	589,50
Comet	18	4150,90	1075,20	230,61	59,73	2070,00	621,00
Target	24	947,80	257,30	39,49	10,72	1575,00	472,50
Yeoman	28	2940,60	989,20	105,02	35,33	1645,00	493,50

Tabella 7. Rese in coni secchi, freschi e in pellet. Per ciascuna varietà si riporta: rispettivo numero di piante, resa totale in kg di infiorescenze fresche e secche, resa media per pianta in kg di infiorescenze secche e fresche, produttività (Kg/ha) dei coni freschi ed essiccati.

Da questa prima analisi comparativa, è possibile evidenziare che tutti i valori di peso secco e peso fresco, per ogni varietà, sono risultati inferiori alle rese medie. Questo può essere legato innanzitutto all'età delle piante, essendo il luppoleto sperimentale al terzo anno di produzione. Inoltre, è opportuno sottolineare che alcune varietà hanno dato risultati più soddisfacenti rispetto ad altre, in termini produttivi. Questo può suggerire una migliore risposta di queste cultivar alle condizioni del sito sperimentale.

6.2 Composizione chimica

Le concentrazioni in percentuale delle 87 molecole per le rispettive 18 tesi costituiscono la composizione chimica delle sei varietà di luppolo e sono state ordinate in ordine decrescente. Come è possibile evidenziare dalla Tabella 9, che riporta le concentrazioni medie di ogni componente, il composto principale risulta essere il monoterpene β-mircene, seguito da α-cariofillene / umulene, β-cariofillene, α-fellandrene, β-pinene, trans-β-ocimene, acido propionico e 2-methyl-, 2-methylpropyl ester. Le tabelle relative alla concentrazione delle molecole nei tre stati delle infiorescenze sono presenti nell'Appendice 1.

Composto	Concentrazione
β-Myrcene	63,586%
α-Caryophyllene / Humulene	12,308%
β-Caryophyllene	3,623%
α-Phellandrene	3,069%
β-Pinene	2,589%
trans-β-Ocimene	1,626%
Propanoic acid, 2-methyl-, 2-methylpropyl ester	1,067%
2-Isopropenyl-4a,8-dimethyl-1,2,3,4,4a,5,6,8a-octahydronaphthalene	0,854%
α-Selinene	0,803%
Nonanoic acid methyl ester	0,662%
β-Phellandrene	0,564%
Copaene	0,564%
Butanoic acid, 3-methyl-, 2-methylbutyl ester	0,561%
β-Selinene	0,551%
Benzyl Alcohol	0,546%
Linalool	0,546%
Calamenene	0,499%
2-Undecanone	0,431%
α-Pinene	0,386%
Naphthalene, 1,2,4a,5,6,8a-hexahydro-4,7-dimethyl-1-(1-methylethyl)-	0,370%
Acetic acid, heptyl ester	0,364%
4,11-selinadiene	0,348%
Propanoic acid, 2-methyl-, 3,7-dimethyl-2,6-octadienyl ester, (E)-	0,281%
2,6-Octadien-1-ol, 3,7-dimethyl-, (E)-	0,206%
2-Nonanone	0,189%
2,6-Octadien-1-ol, 3,7-dimethyl-, propanoate, (E)-	0,164%
Propanoic acid, 2-methyl-, 1-(1,1-dimethylethyl)-2-methyl-1,3-propanediyl ester	0,148%
Ylangene	0,144%
Acetone	0,137%
Acetic acid	0,136%
1-Butanol, 2-methyl-	0,130%
2,3-Butanedione	0,124%
(E)-2-Hexenal	0,119%
1-Butanol, 2-methyl-, acetate	0,112%
Propanoic acid, 2-methyl-, 2-methylbutyl ester	0,111%
1-Hexanol	0,110%
S-Methyl 3-methylbutanethioate	0,107%
α-Farnesene	0,107%
3-Buten-2-ol, 2-methyl-	0,102%
α-Calacorene	0,102%
1,3,8-p-Menthatriene	0,099%
cis-β-Ocimene	0,093%
2,6-Octadienal, 3,7-dimethyl-, (E)-	0,085%
2-Butenal, 3-methyl-	0,083%

Clovene	0,082%
Benzene, 1-ethyl-4-methoxy-	0,069%
Propanoic acid, 2-methyl-, heptyl ester	0,064%
2-Butanone, 3-hydroxy-	0,060%
allo-Ocimene	0,058%
Propanoic acid, 2-methyl-, hexyl ester	0,055%
2-Butenal	0,054%
Ethylbenzene	0,052%
Benzene, 1,3-dimethyl-	0,052%
Hexanal	0,047%
Propanoic acid, 2-methyl-, pentyl ester	0,044%
Propanoic acid, ethyl ester	0,044%
2-Decanol	0,043%
Heptanoic acid, ethyl ester	0,041%
Benzaldehyde	0,038%
Propanoic acid, 2-methyl-, butyl ester	0,034%
Heptanal	0,029%
Propanoic acid, 2-methyl-, octyl ester	0,022%
Octanoic acid, ethyl ester	0,022%
Nonanoic acid, ethyl ester	0,021%
Disulfide, dimethyl	0,019%
Hexanoic acid, 2-methylbutyl ester	0,018%
τ-Cadinol	0,018%
Propanoic acid, hexyl ester	0,018%
Camphene hydrate	0,017%
2-Undecanol	0,017%
Decanoic acid, ethyl ester	0,017%
Benzene, 1-methyl-4-(1-methylethyl)-	0,015%
Benzeneacetic acid, methyl ester	0,014%
2,3-Butanediol	0,013%
2,6-Octadien-1-ol, 3,7-dimethyl-, (Z)-	0,013%
Propanoic acid, 2-methyl-, ethyl ester	0,012%
n-Propyl acetate	0,011%
α-Humulene epoxide II	0,010%
α-Terpineol	0,009%
Nerolidol 2	0,007%
Butanoic acid, 2-methyl-, methyl ester	0,007%
α-Cadinol	0,006%
Methanthiol	0,006%
1-Propanol	0,004%
Butanoic acid	0,004%
Humulane-1,6-dien-3-ol	0,002%
Eudesm-7(11)-en-4-ol	0,002%

Tabella 8. Concentrazione media percentuale degli 88 composti rilevati nei campioni di luppolo fresco, secco e pellet.

6.3 Analisi della varianza (ANOVA)

Lo scopo del test di ANOVA è stato quello di determinare se ci fossero differenze significative per ogni molecola nei 3 stati dei coni (freschi, essiccati e in pellet) e tra le 6 varietà.

Per mostrare i risultati dell'ANOVA ci si è serviti di una tabella che include:

- Origine (Source): le origini della varianza, i fattori in esame (varietà e stato), i residui, chiamati anche errori e il totale (corretto);
- Devianza (Sum of Squares);
- Gradi di libertà (Df), che indicano il numero delle variabili indipendenti usate per calcolare ogni somma dei quadrati;
- Media quadratica/Varianza (Mean Square**)**, che si utilizza per ottenere un rapporto F rapportando la varianza tra gruppi sulla varianza entro gruppi;
- F- Ratio, che è il rapporto delle varianze;
- P-Value, che è la probabilità di sbagliare dicendo che esiste differenza tra le varietà o dicendo che c'è differenza fra i gruppi. Un valore P significativo (P<0,05) suggerisce che almeno una media di gruppo è significativamente diversa dalle altre invece superiore al 5% quindi non è significativo. Quando il P-Value è significativo, in tabella è evidenziato di colore rosso.

La significatività si riferisce alla concentrazione di ciascuna delle molecole in funzione dello stato del luppolo (fresco, secco, pellettato) e delle varietà.

Una volta che l'analisi della varianza evidenzia che si dimostra almeno una differenza significativa nei 3 stati o nelle 6 varietà, in relazione alla molecola considerata, si fa un test aggiuntivo, il test di separazione delle medie, che permette di discriminare le medie. Quello che si è utilizzato in questa analisi è stato il test di Tukey HSD (Honestly Significant Difference) con P≤0.05. Si osservano delle X sulla colonna "gruppi omogenei" ("homogeoeous groups"), le quali evidenziano se i trattamenti del luppolo contengono una quantità della molecola in questione similare o diversa. Per esempio se le X sono incolonnate insieme vuol dire che appartengono allo stesso gruppo. Un esempio è la molecola Acetone in cui si nota nella colonna dei gruppi omogenei che per lo stato fresco e in pellet le X sono allineate verticalmente invece per lo stato secco la X è discostata leggermente a destra (Tab.10 (a)). Questo significa che il secco è diverso da tutti gli altri due stati; ciò è confermato nella Tabella 10(b), che denota i valori della differenza significativa sono colorati in rosso.

Dalla diversità dei coni secchi si può dedurre che, durante la fase di essicazione, possono realizzarsi vari fenomeni che predispongono la molecola a modificarsi o evaporare. I fenomeni possono essere: un aumento della concentrazione delle molecole dovuta alla perdita di acqua, la degradazione o la perdita di molecole che evaporano. Solitamente si volatilizzano più velocemente quelle leggere e rimangono costanti quelle più pesanti, come i sesquiterpeni. Anche la conformazione dello strobilo

può interferire con l'essicazione, in quanto le brattee possono essere più avvolgenti o più aperte e di conseguenza la luppolina all'interno può essere perse in maniera non omogenea.

(a)

STATO	Count	LS Mean	LS Sigma	Homogeneous Groups
F	6	385978.	54821.7	X
P	6	464530.	54821.7	X
S	6	883276.	54821.7	X

(b)

Contrast	Sig.	Difference	+/- Limits
F - P		-78551.5	212762.
F - S	*	-497297.	212762.
P - S	*	-418746.	212762.

Tabella 9. Test di intervallo multiplo per M2 da STATO. Metodo: 95.0 percent Tukey HSD

Le molecole significative per stato e per varietà sono state indicate nella Tabella 11 con un asterisco, inoltre vi è riportata la concentrazione di ogni molecola in percentuale.

Le molecole totali significative per stato sono 23: Acetone(M2); 1-Propanol(M3); 2,3-Butanedione(M4); Acetic acid(M5); 3-Buten-2-ol, 2-methyl-(M6); n-Propyl acetate(M10); 1-Butanol, 2-methyl-(M11); Hexanal(M18); (E)-2-Hexenal(M19); 1-Hexanol(M22); Benzaldehyde(M29); β-Myrcene(M31); Propanoic acid, 2-methyl-, 2-methylbutyl ester(M33); Benzene, 1-ethyl-4-methoxy-(M42); 2-Nonanone(M43); 2-Undecanone(M61); Propanoic acid, 2-methyl-, octyl ester(M64); β-Caryophyllene(M69); α-Caryophyllene / Humulene(M70); 4,11-selinadiene(M72); β-Selinene(M74); Propanoic acid, 2-methyl-, 1-(1,1-dimethylethyl)-2-methyl-1,3-propanediyl ester(M82); Humulane-1,6-dien-3-ol(M84).

Mentre, in totale, quelle significative per varietà sono 44: 3-Buten-2-ol, 2-methyl-(M6); n-Propyl acetate(M10); 1-Butanol, 2-methyl-(M11); Hexanal(M18); 1-Hexanol(M22); 1-Butanol, 2-methyl-, acetate(M23); Propanoic acid, 2-methyl-, 2-methylpropyl ester(M25); S-Methyl 3-methylbutanethioate(M27); Propanoic acid, 2-methyl-, butyl ester(M28); β-Myrcene(31); Propanoic acid, 2-methyl-, 2-methylbutyl ester(M33); trans-β-Ocimene(M37); Propanoic acid, hexyl ester(M40); Benzene, 1-methyl-4-(1-methylethyl)-(M41); 2-Nonanone(M43); Linalool(M44); Butanoic acid, 3-methyl-, 2-methylbutyl ester(M45); Camphene hydrate(M46); Acetic acid, heptyl

ester(M47); 1,3,8-p-Menthatriene(M48); allo-Ocimene(M49); Propanoic acid, 2-methyl-, hexyl ester(M50); α-Terpineol(M52); 2,6-Octadien-1-ol, 3,7-dimethyl-, (Z)-(M56); Hexanoic acid, 2-methylbutyl ester(M58); 2,6-Octadien-1-ol, 3,7-dimethyl-, (E)-(M59); 2-Undecanone(M61); 2-Undecanol(M63); Propanoic acid, 2-methyl-, octyl ester(M64); Clovene(M65); Ylangene(M66); Copaene(M67); β-Caryophyllene(M69); α-Caryophyllene / Humulene(M70); 2,6-Octadien-1-ol, 3,7-dimethyl-, propanoate, (E)-(M71); 4,11-selinadiene(M72); β-Selinene(M74); α-Selinene(M75); 2-Isopropenyl-4a,8-dimethyl-1,2,3,4,4a,5,6,8a-octahydronaphthalene(M76); Propanoic acid, 2-methyl-,3,7-dimethyl-2,6-octadienyl ester, (E)-(M78); Calamenene(M79); α-Calacorene(M80); τ-Cadinol(M85); α-Cadinol(M86).

Invece, in totale, le molecole con significatività in entrambi i fattori sono 14: 3-Buten-2-ol, 2-methyl-(M6); n-Propyl acetate(M10); 1-Butanol, 2-methyl-(M11); Hexanal(M18); 1-Hexanol(M22); β-Myrcene(M31); Propanoic acid, 2-methyl-, 2-methylbutyl ester(M33); 2-Nonanone(M43); 2-Undecanone(M61); Propanoic acid, 2-methyl-, octyl ester(M64); β-Caryophyllene(M69); α-Caryophyllene / Humulene(M70); 4,11-selinadiene(M72); β-Selinene(M74).

L'assenza di significatività nella molecola in entrambi i fattori significa che la molecola è qualcosa di abbastanza stabile all'interno di tutte le tesi valutate e nella tabella è rappresentata da uno spazio vuoto.

I risultati relativi all'ANOVA di tutte le 87 molecole sono presenti in Allegato 1.

	Composto	Varietà	Stato	Varietà + Stato	Concentrazione
M1	Methanthiol				0,0067%
M2	Acetone		*	*	0,1251%
M3	1-Propanol		*	*	0,0039%
M4	2,3-Butanedione		*	*	0,1135%
M5	Acetic acid		*	*	0,1197%
M6	3-Buten-2-ol, 2-methyl-	*	*	**	0,0797%
M7	2-Butenal				0,0483%
M8	2-Butanone, 3-hydroxy-				0,0545%
M9	Propanoic acid, ethyl ester				0,0404%
M10	n-Propyl acetate	*	*	**	0,0092%
M11	1-Butanol, 2-methyl-	*	*	**	0,1267%
M12	Disulfide, dimethyl				0,0177%
M13	Propanoic acid, 2-methyl-, ethyl ester				0,0110%
M14	Butanoic acid, 2-methyl-, methyl ester				0,0078%
M15	2,3-Butanediol				0,0120%
M16	2-Butenal, 3-methyl-				0,0750%
M17	Butanoic acid				0,0056%
M18	Hexanal	*	*	**	0,0384%
M19	(E)-2-Hexenal		*	*	0,1231%
M20	Ethylbenzene				0,0357%

M21	Benzene, 1,3-dimethyl-				0,0387%
M22	1-Hexanol	*	*	**	0,1020%
M23	1-Butanol, 2-methyl-, acetate	*		*	0,1193%
M24	Heptanal				0,0255%
M25	Propanoic acid, 2-methyl-, 2-methylpropyl ester	*		*	0,9627%
M26	α-Pinene				0,4030%
M27	S-Methyl 3-methylbutanethioate	*		*	0,1086%
M28	Propanoic acid, 2-methyl-, butyl ester	*		*	0,0272%
M29	Benzaldehyde		*	*	0,0413%
M30	β-Pinene				2,7112%
M31	β-Myrcene	*	*	**	62,7396%
M32	α-Phellandrene				3,3956%
M33	Propanoic acid, 2-methyl-, 2-methylbutyl ester	*	*	**	0,1144%
M34	Benzyl Alcohol				0,5690%
M35	β-Phellandrene				0,5939%
M36	cis-β-Ocimene				0,0946%
M37	trans-β-Ocimene	*		*	1,7775%
M38	Propanoic acid, 2-methyl-, pentyl ester				0,0339%
M39	Heptanoic acid, ethyl ester				0,0432%
M40	Propanoic acid, hexyl ester	*		*	0,0177%
M41	Benzene, 1-methyl-4-(1-methylethyl)-	*		*	0,0161%
M42	Benzene, 1-ethyl-4-methoxy-		*	*	0,0705%
M43	2-Nonanone	*	*	**	0,1826%
M44	Linalool	*		*	0,5672%
M45	Butanoic acid, 3-methyl-, 2-methylbutyl ester	*		*	0,5463%
M46	Camphene hydrate	*		*	0,0160%
M47	Acetic acid, heptyl ester	*		*	0,3888%
M48	1,3,8-p-Menthatriene	*		*	0,1040%
M49	allo-Ocimene	*		*	0,0614%
M50	Propanoic acid, 2-methyl-, hexyl ester	*		*	0,0496%
M51	Benzeneacetic acid, methyl ester				0,0139%
M52	α-Terpineol	*		*	0,0072%
M53	2-Decanol				0,0305%
M54	Octanoic acid, ethyl ester				0,0272%
M55	Nonanoic acid methyl ester				0,6850%
M56	2,6-Octadien-1-ol, 3,7-dimethyl-, (Z)-	*		*	0,0155%
M57	Propanoic acid, 2-methyl-, heptyl ester				0,0516%
M58	Hexanoic acid, 2-methylbutyl ester	*		*	0,0174%
M59	2,6-Octadien-1-ol, 3,7-dimethyl-, (E)-	*		*	0,2412%
M60	2,6-Octadienal, 3,7-dimethyl-, (E)-				0,1017%
M61	2-Undecanone	*	*	**	0,3850%
M62	Nonanoic acid, ethyl ester				0,0268%
M63	2-Undecanol	*		*	0,0121%
M64	Propanoic acid, 2-methyl-, octyl ester	*	*	**	0,0208%

M65	Clovene	*		*	0,0881%
M66	Ylangene	*		*	0,1530%
M67	Copaene	*		*	0,6036%
M68	Decanoic acid, ethyl ester				0,0196%
M69	β-Caryophyllene	*	*	**	3,8015%
M70	α-Caryophyllene / Humulene	*	*	**	12,0907%
M71	2,6-Octadien-1-ol, 3,7-dimethyl-, propanoate, (E)-	*		*	0,1853%
M72	4,11-selinadiene	*	*	**	0,3885%
M73	Naphthalene, 1,2,4a,5,6,8a-hexahydro-4,7-dimethyl-1-(1-methylethyl)-				0,4137%
M74	β-Selinene	*	*	**	0,5937%
M75	α-Selinene	*		*	0,8299%
M76	2-Isopropenyl-4a,8-dimethyl-1,2,3,4,4a,5,6,8a-octahydronaphthalene	*		*	0,9562%
M77	α-Farnesene				0,1133%
M78	Propanoic acid, 2-methyl-, 3,7-dimethyl-2,6-octadienyl ester, (E)-	*		*	0,3164%
M79	Calamenene	*		*	0,5277%
M80	α-Calacorene	*		*	0,1096%
M81	Nerolidol 2				0,0096%
M82	Propanoic acid, 2-methyl-, 1-(1,1-dimethylethyl)-2-methyl-1,3-propanediyl ester		*	*	0,1461%
M83	α-Humulene epoxide II				0,0093%
M84	Humulane-1,6-dien-3-ol		*	*	0,0033%
M85	τ-Cadinol	*		*	0,0205%
M86	α-Cadinol	*		*	0,0072%
M87	Eudesm-7(11)-en-4-ol				0,0016%

Tabella 10. Tabella della significatività delle 87 molecole, con concentrazione percentuale media di ciascuna molecola.

6.4 Analisi delle Componenti Principali (PCA)

Per esplorare ulteriormente le differenze apprezzabili nei profili aromatici dei sei luppoli in questo studio, le concentrazioni delle molecole sono state analizzate mediante PCA. La PCA ci ha permesso di individuare similitudini o differenze tra le tesi a confronto e quali molecole hanno differenziato e caratterizzato le tesi. Tramite le prime due componenti principali, che spiegano la più grande variabilità, (varianza dei dati) è stato possibile rappresentare in dei grafici i risultati dell'analisi delle componenti principali. I dati utilizzati sono standardizzati. Questa standardizzazione è stata effettuata per evitare che le molecole presenti in concentrazioni maggiori venissero considerate come più importanti, così da poter vedere le differenze tra molecole confrontarle alla pari.

Nella Figura 6 è rappresentata l'analisi delle correlazioni delle concentrazioni delle 87 molecole ed a lato del grafico. A sinistra, vi è la legenda che riporta il valore R, che indica il tipo di correlazione:

positiva, negativa o nulla. Ad ogni livello di correlazione, come rappresentato dalla legenda, corrisponde una sfumatura di colore tra rosso e blu. Una correlazione è di tipo positivo quando il valore di R è compreso tra 0 e 1; la concentrazione di due molecole aumenta o diminuisce, questo può essere legato ad una via biosintetica in cui, a partire da un metabolita, in base a determinati stimoli, avviene un incremento o una diminuzione della produzione di due o più molecole. Un esempio sono le molecole M3 e M5. Invece, una correlazione è di tipo negativo quando il valore di R è compreso tra 0 e -1; quando aumenta la concentrazione di una molecola diminuisce l'altra. Questo meccanismo può essere legato ad una via biosintetica in cui, in base a determinati stimoli, a partire da un metabolita di partenza ne viene prodotto uno piuttosto che un altro. Un esempio sono le molecole M1 e M10. R è uguale a 1 o -1 quando vi è la massima correlazione rispettivamente positiva e negativa.

Lo scopo di questo grafico è trovare ed evidenziare la correlazione di due molecole al fine di evitare nelle analisi successive di fornire informazioni simili o ridondanti. Ridurre la ridondanza, dal punto di vista statistico, è importante perché può diminuire la complessità del modello statistico utilizzato e rendere più semplice l'interpretazione dei risultati. Si può notare, infatti, che nel grafico ci sono molte correlazioni sia positive che negative. Questo da un lato indica che le molecole sono fra di loro legate perché appartengono a vie metaboliche che possono essere comuni, dall'altro implica che molte delle informazioni presenti sono ridondanti.

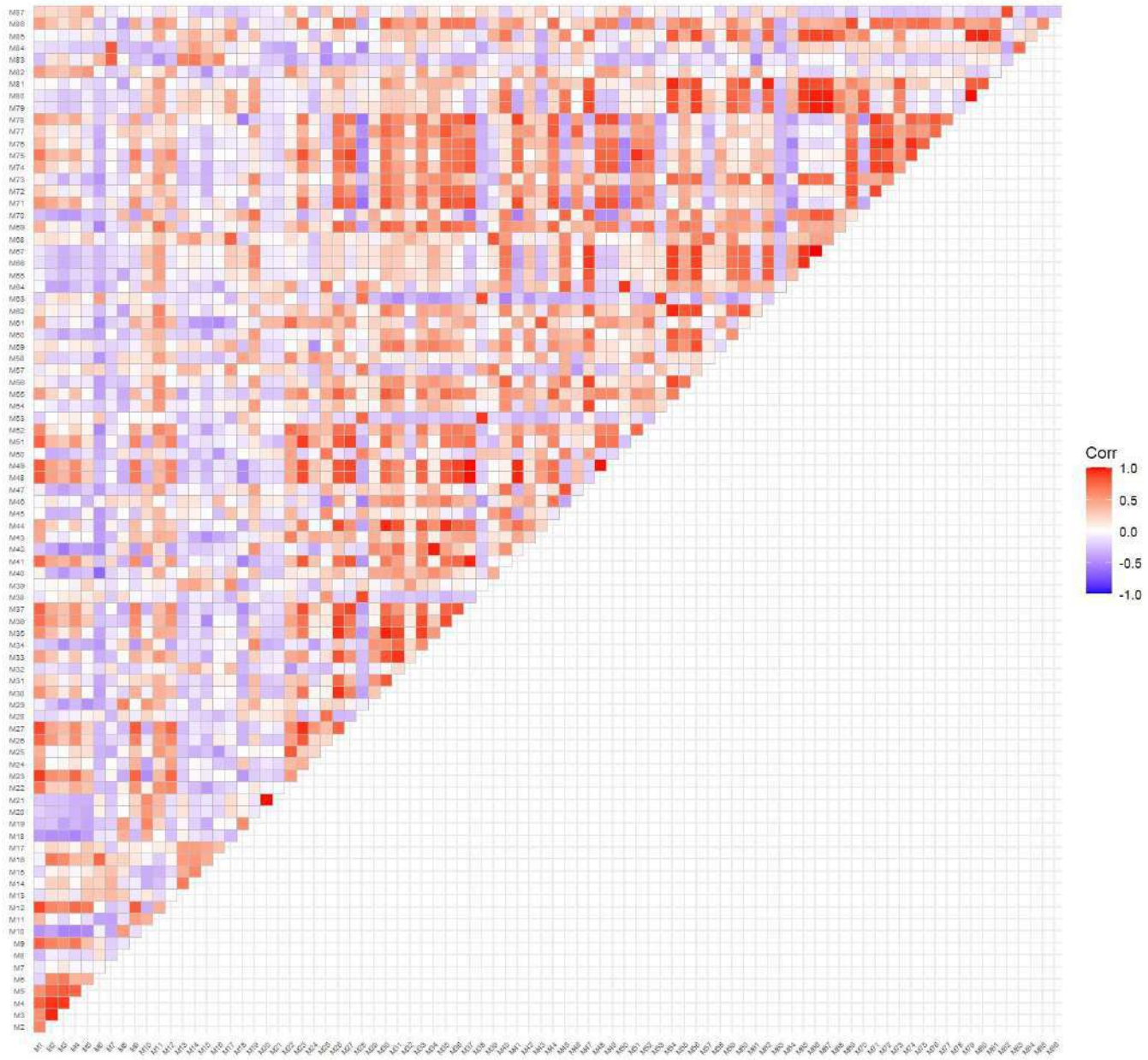


Figura 6. Matrice delle correlazioni tra le 87 molecole

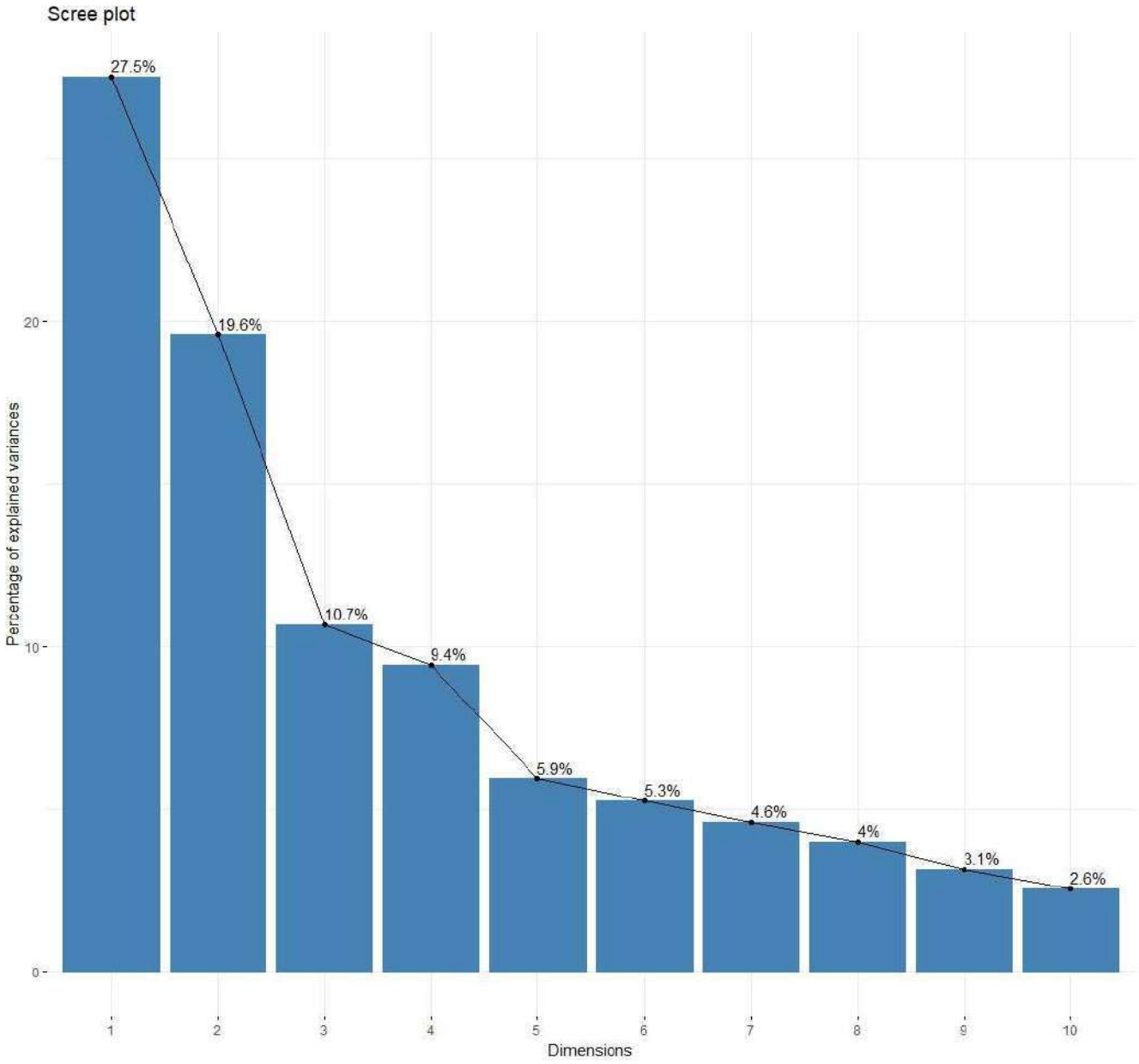


Figura 7. Scree plot

L'analisi PCA (Principal Component Analysis) ha potuto definire una serie di componenti, ciascuna delle quali capace di ridurre le 1566 variabili in questione (87molecole × 18tesi) in un riassunto complessivo delle informazioni fondamentali, caratterizzanti e discriminanti.

Il grafico Scree Plot (Fig. 7) è un istogramma che mostra la varianza spiegata da ciascuna componente principale in ordine decrescente. Il valore della varianza si trova sull'asse delle ordinate e il numero di componenti principali sull'asse delle ascisse. Questa rappresentazione è utile per determinare il numero ottimale di componenti principali da conservare nella PCA, sulla base della "regola del gomito". La regola del gomito si basa sull'analisi visiva e quindi risulta di natura "empirica", in

quanto il numero di componenti da estrarre è quello che coincide con il cambio di pendenza, ovvero con il gomito della curva, dopo il quale in genere la spezzata tende ad appiattirsi. La varianza spiegata diminuisce man mano che si procede verso le componenti principali successive, che si trovano sulla destra del grafico. È poi possibile, combinando le singole componenti ottenute, ritornare ai dati iniziali.

L' istogramma in Figura 7 conferma quanto affermato precedentemente. La prima dimensione (Dim1) è riuscita a riassumere il 27,5%, un quantitativo molto importante della variabilità dei dati; la seconda componente (Dim2) ha spiegato un ulteriore 19,6% della variabilità, la Dim3 ha riassunto il 10,7%, la Dim4 il 9,4%, la Dim5 il 5,9% (e dalla loro somma si ottiene quindi il 73,1% della variabilità), la Dim6 un'altra percentuale del 5,3%, la Dim7 il 4,6%, la Dim8 un'altra percentuale piccola (4%), la Dim9 il 3,1% e la Dim10 un'altra percentuale più piccola ancora, il 2,6%; infine, la Dim17 ha permesso di raggiungere il 100% della variabilità. Si è creata dunque una riduzione, contenente solamente le informazioni importanti e non ridondanti, in 17 variabili invece di 87. Pertanto, dal momento che il gomito che delinea il cambiamento di pendenza nel grafico si trova in corrispondenza della Dim5, è alla quinta componente che ci si può fermare per spiegare la gran parte della variabilità. Di conseguenza, è possibile trascurare le successive componenti, dove la variabilità spiegata diventa sempre meno significativa. Poiché le prime due componenti principali assieme permettono di spiegare circa il 47,1% delle informazioni, sono le componenti più importanti. Quindi, da questo grafico in avanti, tutte le rappresentazioni faranno riferimento soltanto alle prime due componenti per questioni di rappresentatività e di semplificazione grafica.

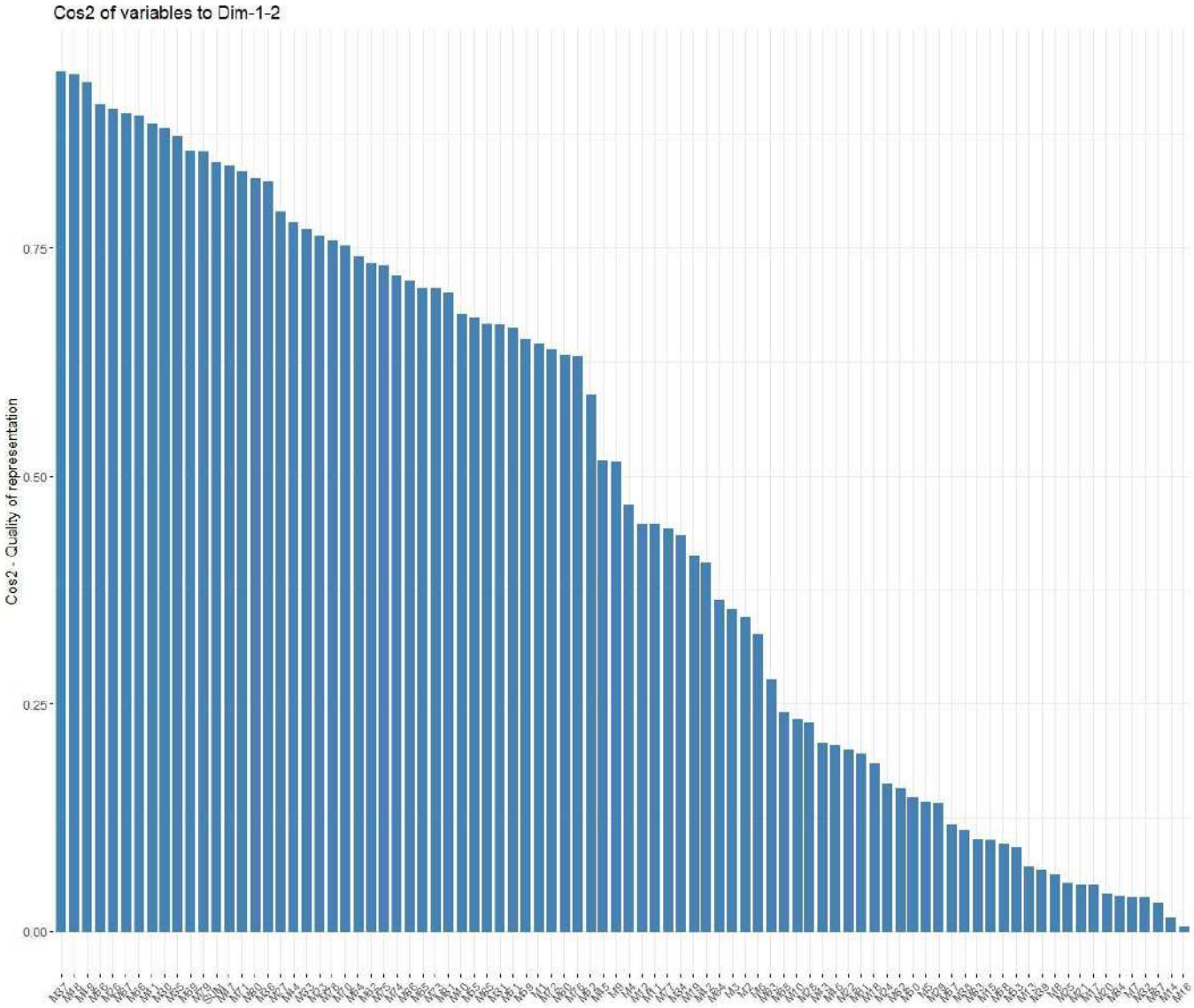


Figura 8. Coseno della variabilità della dimensione 1 e 2 delle 87 molecole.

Il grafico in Figura 8 raffigura il coseno della variabilità della dimensione 1 e della dimensione 2 insieme. Permette, dunque, di osservare quali sono le molecole che contribuiscono a determinare maggiormente le due componenti e che sono in grado di differenziare meglio le 18 tesi, ovvero le diverse varietà nei diversi stati.

Le prime molecole sono identificate con barre più alte e si posizionano sulla sinistra vicino all'origine, perché permettono di differenziare meglio le tesi. Procedendo verso destra, le barre corrispondenti alle molecole successive differenziano sempre meno i campioni a confronto.

Le molecole più diverse fra le varietà e gli stati e che risultano significative nell'analisi della varianza, quindi quelle che discriminano maggiormente le tesi, sono: trans-β-ocimene (M37), 1,3,8-p-menthatriene (M48) e 2,4,6-octatriene, 2,6-dimethyl-, (E,Z)- (M49).

Le molecole che, invece, permettono la minor spiegazione delle componenti, perché non sono significative, e che quindi si possono definire ubiquitarie perché non variano molto fra le varietà e i tre stati, sono: butanoic acid, 2-methyl-, methyl ester (M14) e 2-butenal, 3-methyl- (M16). Per lo scopo del presente studio, è opportuno sottolineare che l'importanza delle molecole non corrisponde alla concentrazione più elevata all'interno dei campioni, ma al loro ruolo nella differenziazione delle tesi.

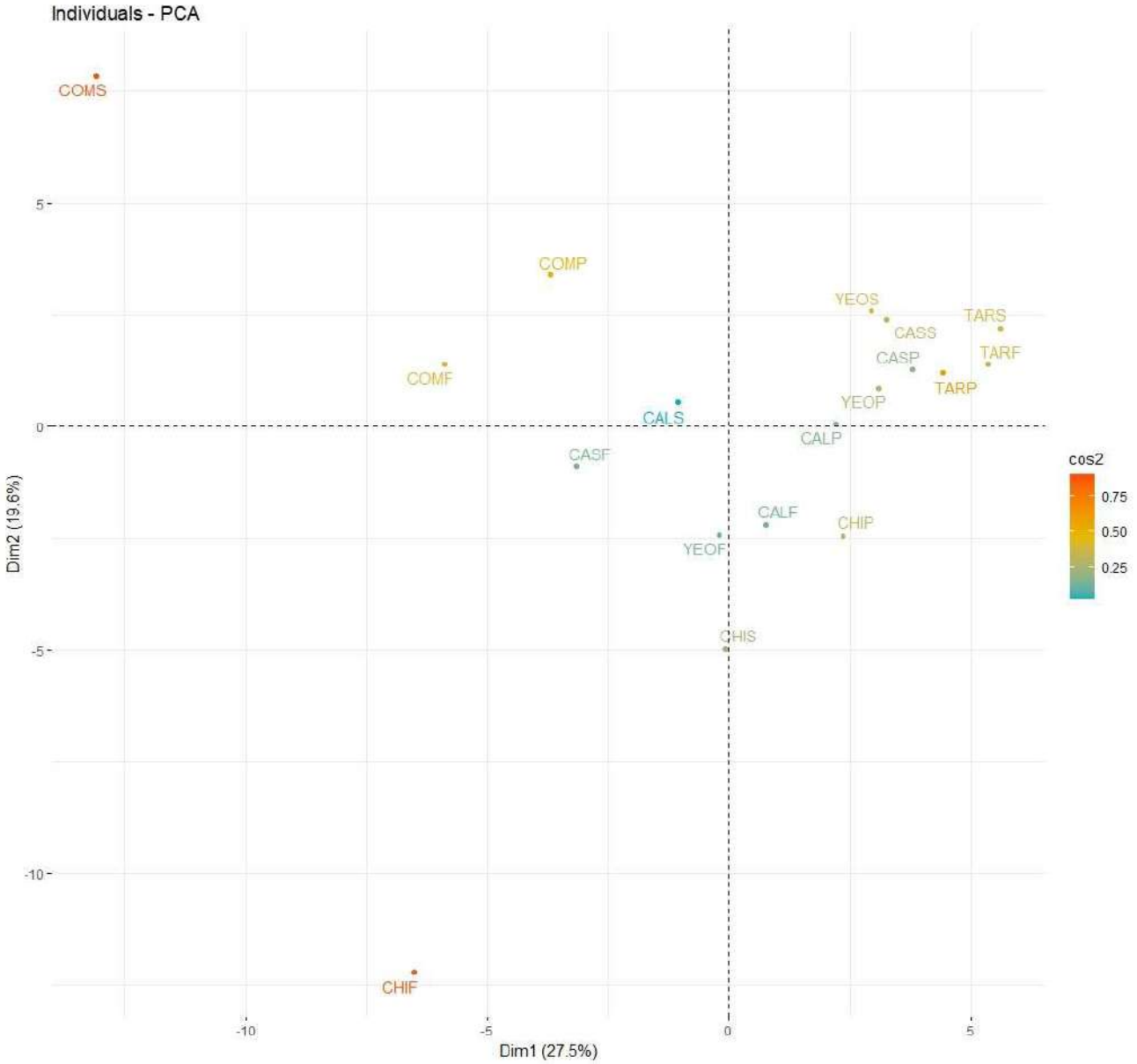


Figura 9. Individual-PCA; rappresentazione delle 18 tesi nell'analisi PCA nei primi due assi Dim1 e Dim2.

I risultati dell'analisi delle componenti principali sono stati rappresentati attraverso tre forme grafiche: due component plot relativi a individui (18 tesi) e variabili (87 molecole) e un biplot che riunisce i risultati di entrambi i precedenti.

In primo luogo, è stato scelto un grafico di dispersione bidimensionale (Figura 9) che individua tutti i campioni, cioè le 18 tesi come punti sul piano cartesiano, con raggruppamenti più o meno grandi in funzione delle due dimensioni (prime due componenti principali). Questo grafico rappresenta le differenze e le similitudini che esistono tra le 18 tesi e mostra quanto distanti sono in base alle concentrazioni delle molecole. Più i punti sono lontani fra loro, più indicano che le tesi sono differenti. I risultati sono in termini di concentrazione relativa, dal momento che dati sono stati standardizzati. Inoltre, sono nuovamente rappresentati in rosso i soggetti più lontani rispetto agli altri, in blu i campioni più vicini e simili tra loro. Due punti situati vicino all'asse delle ascisse distanti tra loro indicano tesi molto differenti, perché sull'asse considerato viene spiegato il 27,5% della variabilità, mentre due punti situati vicino all'asse delle ordinate ma distanti tra loro indicano tesi meno differenti tra loro, perché l'asse spiega solo il 19,6% della variabilità. Si può osservare come il Comet secco nel secondo quadrante e il Chinook fresco nel terzo quadrante si trovano molto distanti rispetto a un gruppo più grande che si nota vicino agli assi. Nel secondo quadrante sono localizzate tutte e tre le forme di Comet, fresco, secco e in pellet, sebbene si evidenzi che in funzione dello stato in cui si trova il rapporto fra le singole molecole è molto diverso. I vari trattamenti del Comet fanno variare di molto il rapporto fra le molecole e siccome nella fase di produzione della birra si preferisce utilizzare il pellet piuttosto che il secco, il risultato potrebbe essere molto diverso in quanto in relazione alle componenti aromatiche i campioni sono molto distanti. Infatti, dal punto di vista produttivo, in fase di birrificazione si adoperano i coni freschi solo una volta all'anno, mentre solitamente si usa il secco o in particolare il pellet perché più conveniente e pratico.

Una situazione opposta è quella del Target, perché una sua qualsiasi trasformazione fa rimanere invariato o quanto meno simile il rapporto tra le molecole, il suo corredo aromatico. Dato che le tesi sono molto vicine, dal punto di vista di concentrazione delle molecole sono somiglianti. In aggiunta, è possibile evidenziare il caso del Chinook fresco che si differenzia molto da tutte le altre tesi, però quando viene essiccato e pellettato si posiziona vicino a tutte le altre tesi. Quindi la fase di lavorazione di questo luppolo lo rende più simile alle altre varietà. Inoltre, si evidenzia che sia sul primo sia sul quarto quadrante si nota un gruppo di varietà formato da Yeoman, Target e Cascade che, trattate anche in maniera diversa, dal punto di vista pratico in realtà danno sempre un risultato aromatico simile, ovvero mantengono un profilo aromatico simile in termini di molecole. Diversamente succede per Comet e Chinook, ove il rapporto tra le singole molecole è molto diverso nei tre stati. Qualora il risultato in termini di concentrazione relativa delle molecole risulti abbastanza similare, significa che

si potrebbe adoperare una qualsiasi forma e varietà per dare un risultato analogo in termini di aroma della birra.

In secondo luogo, una volta analizzata la differenziazione delle tesi, è interessante capire da cosa è dovuta. Per approfondire ciò si impiega il grafico relativo alle variabili (Figura 10), in cui sono state plottate le molecole.

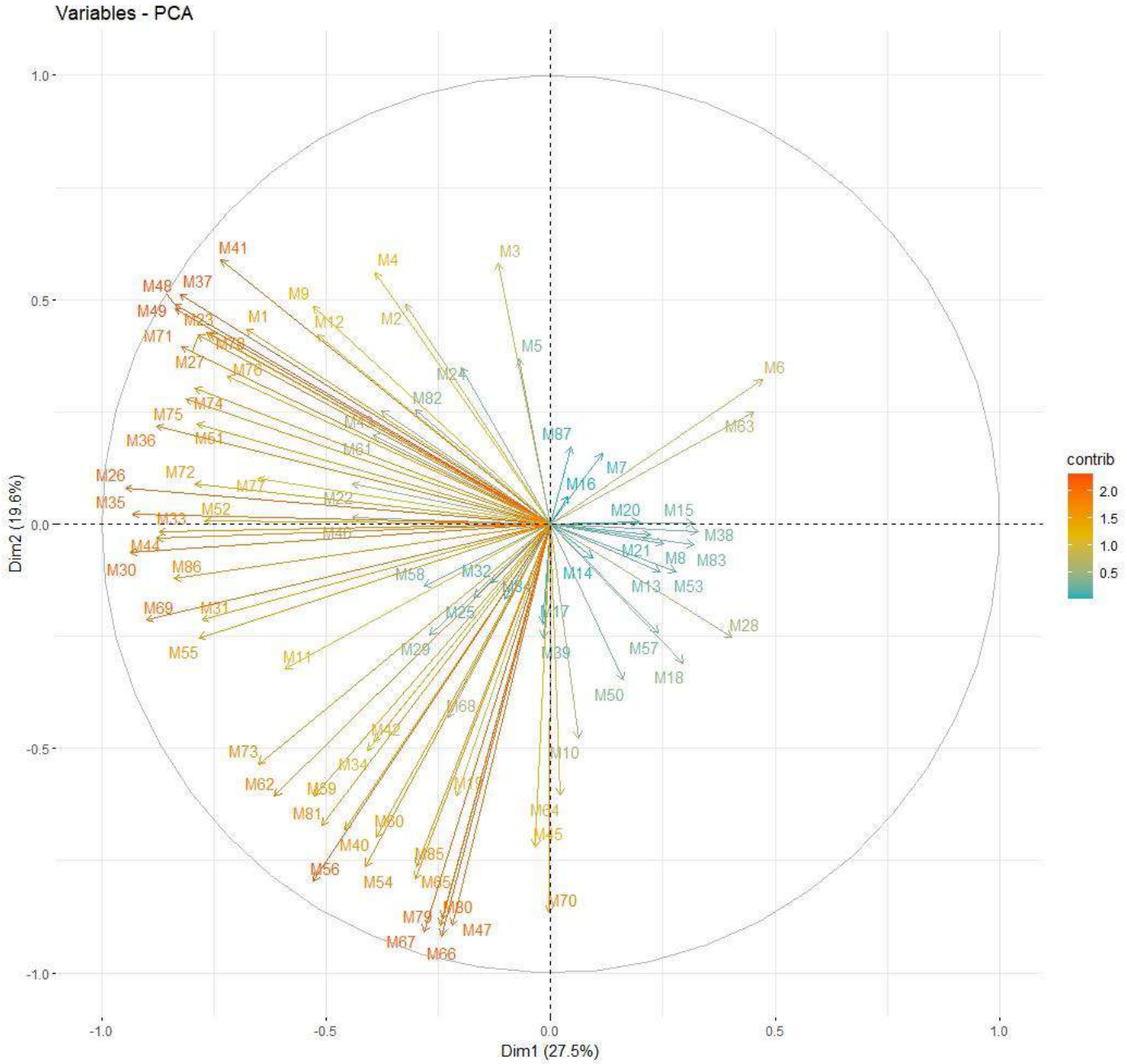


Figura 10. Variables PCA; rappresentazione dei vettori relativi a ciascuna molecola nell'analisi PCA nei primi due assi Dim1 e Dim2.

Questo grafico permette di affermare quali sono le molecole che contribuiscono di più alla differenziazione. Le 87 molecole sono rappresentate ognuna con un vettore di diversa lunghezza e colore che prende origine dall'intersezione degli assi e ha un verso uscente, diretto verso la circonferenza esterna. La differente lunghezza e il colore del vettore permettono di contribuire alla spiegazione della componente considerata. Infatti, vettori lunghi e di colore arancione-rosso, a lambire il limite critico 1 sono quelli che rappresentano le molecole che sono maggiormente in grado di discriminare le tesi. Invece, accade l'opposto per i vettori corti e di colore azzurro, che contribuiscono di meno alla discriminazione. Inoltre, i vettori colorati con sfumature arancioni/rosse concorrono in maniera positiva alla comprensione delle dimensioni mentre quelli colorati con sfumature azzurre e azzurri in maniera negativa.
All'asse delle ascisse e delle ordinate si è attribuito un valore 0, invece nei punti di intersezione dei due assi con la circonferenza sono assegnati i valori 1 e -1, in base alla posizione nei quadranti.
Questi valori indicano la quantità con cui le molecole sono in grado di contribuire a spiegare le rispettive componenti; pertanto, il valore di 1 e -1 indica la massima contribuzione alla differenziazione mentre i valori intermedi indicano contributi poco rilevanti. Le molecole che nel grafico precedente (Fig. 4) si trovavano sulla sinistra e sono rappresentate da barre alte sono le stesse che in questo grafico sono figurate da vettori arancioni-rossi lunghi che giungono vicino alla circonferenza nel I e nel II quadrante del piano. Sono infatti le molecole che meglio effettuano la discriminazione. Di conseguenza, le più importanti sono trans-β-ocimene (M37), 1,3,8-p-menthatriene (M48), 2,4,6-octatriene, 2,6-dimethyl-, (E,Z)- (M49) e 2,6-Octadien-1-ol, 3,7-dimethyl-, (Z)- (M56). In contrapposizione, le molecole che permettono di differenziare meno le tesi sono butanoic acid, 2-methyl-, methyl ester (M14) e 2-Butenal, 3-methyl- (M16).

Infine, tramite il grafico sottostante (Figura 11) è possibile evidenziare quali sono le molecole per cui alcune tesi si differenziano rispetto alle altre.

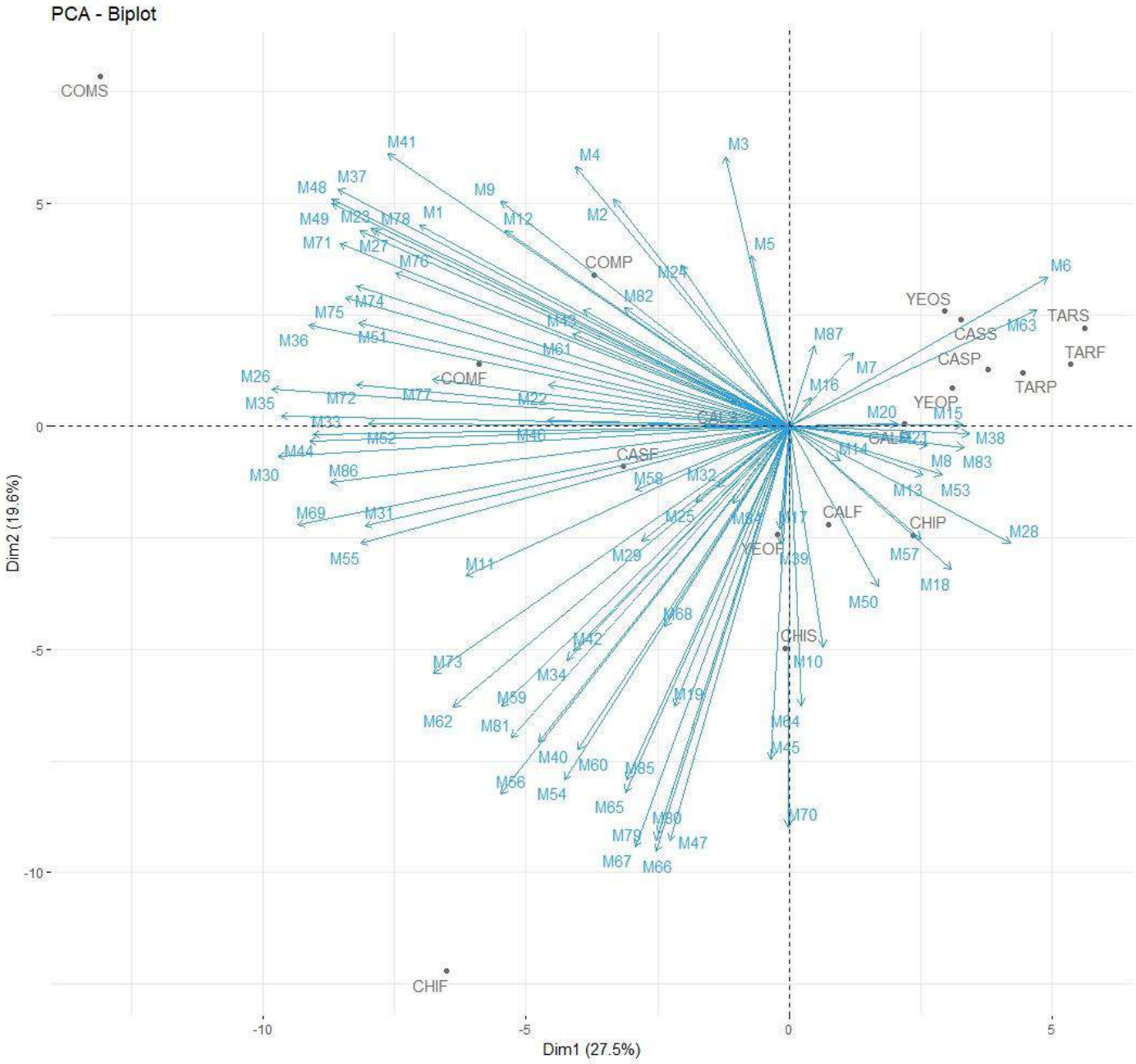


Figura 11. PCA-biplot; rappresentazione delle 18 tesi e dei vettori relativi a ciascuna molecola nell'analisi PCA nei primi due assi Dim1 e Dim2.

Questo grafico biplot è un grafico bidimensionale in cui vi sono i punti che rappresentano le 18 tesi e i vettori le 87 molecole. Ogni molecola è collegata all'origine da un segmento, la cui direzione e lunghezza sono indicatrici dell'influenza di ciascuna molecola sulla discriminazione del campione. Come spiegato precedentemente, più lungo è il segmento, più forte è l'influenza della molecola sulla distinzione del campione. La maggior parte delle tesi sono nel primo quadrante dove vi sono poche molecole, solo 5, che permettono di differenziarle, quelle che sono nel quadrante 2 (Comet fresco, secco e in pellet e Calicross secco) e nel quadrante 3 (Cascade fresco, Yeoman fresco e Chinook fresco) si differenziano molto perché le molecole permettono una grande differenziazione, soprattutto

per il Comet secco e Chinook fresco. Comet secco è differenziato da trans-β-Ocimene (M37), 1,3,8-p-menthatriene (M48) e 2,4,6-octatriene, 2,6-dimethyl-, (E,Z)- (M49); invece il Chinook fresco da octanoic acid, ethyl ester (M54), 2,6-octadien-1-ol, 3,7-dimethyl-, (Z)- (M56). È interessante evidenziare che il Cascade fresco è caratterizzato da determinate molecole invece Cascade secco e pellet sono caratterizzati da altre tipologie di molecole. Questo significa che c'è stato uno squilibrio fra le singole molecole che può essere dovuto alla trasformazione dei coni in secco e pellettato. Il Calicross secco è molto vicino all'origine degli assi, pertanto risulta poco discriminato rispetto a tutte le altre tesi a confronto, mentre il Calicross pellet ha una sola molecola, Ethylbenzene (M20), che lo discrimina dagli altri campioni.

Yeoman fresco e Chinook secco sono discriminati in modo simile, però il Chinook secco presenta una maggiore differenza rispetto Yeoman fresco. Il Yeoman fresco risente meno della componente di queste molecole.

6.5 Analisi K-Means

I risultati della PCA-biplot sono stati aggregati tramite l'algoritmo K-Means che raggruppa per caratteristiche omogenee le tesi.

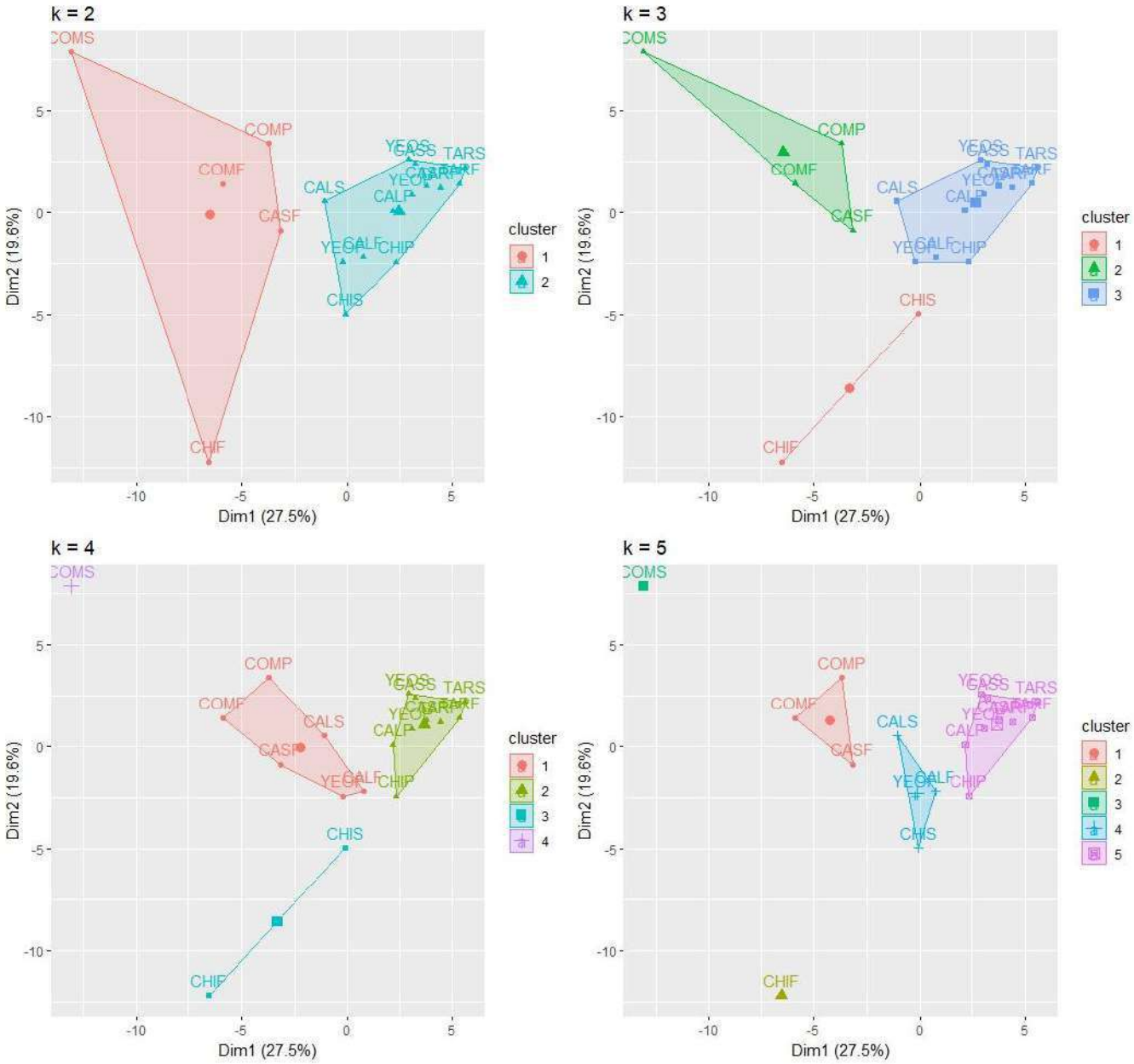


Figura 12. K-Means numero di gruppi.

L'obiettivo di questa analisi è stato quello di raggruppare per caratteristiche omogenee le 18 tesi. Tramite la funzione "silhouette" è stato selezionato il numero (k) corretto di raggruppamenti che permette di differenziare di più i singoli gruppi, nel punto in cui la significatività è più alta.

Nella Figura 12 vi sono quattro grafici, rappresentati ognuno dalla prime due dimensioni Dim1 e Dim2, sebbene l'analisi consideri tutte le dimensioni. Sulla base di questa analisi è possibile sottolineare alcune differenze rispetto alle somiglianze evidenziate nel grafico PCA relativo agli

individui. Infatti, quando si analizzano i tre gruppi, K-Means crea un unico gruppo di Comet secco, fresco e pelletato con Cascade fresco, invece nel grafico Individuals-PCA vi è il Calicross secco al posto del Cascade fresco.

Il risultato del K-Means è la formazione di gruppi per radunare i dati simili. Questo, dal punto di vista chimico, in termini di produzione di birra, indica che, di uno stesso gruppo, si può impiegare qualsiasi tipo di luppolo sia fresco, secco o pellettato, per ottenere la stessa varietà di molecole o molecole molto simili.

Il numero ottimale di gruppi omogenei che si considerano distinti lo si nota nel grafico in Figura 13.

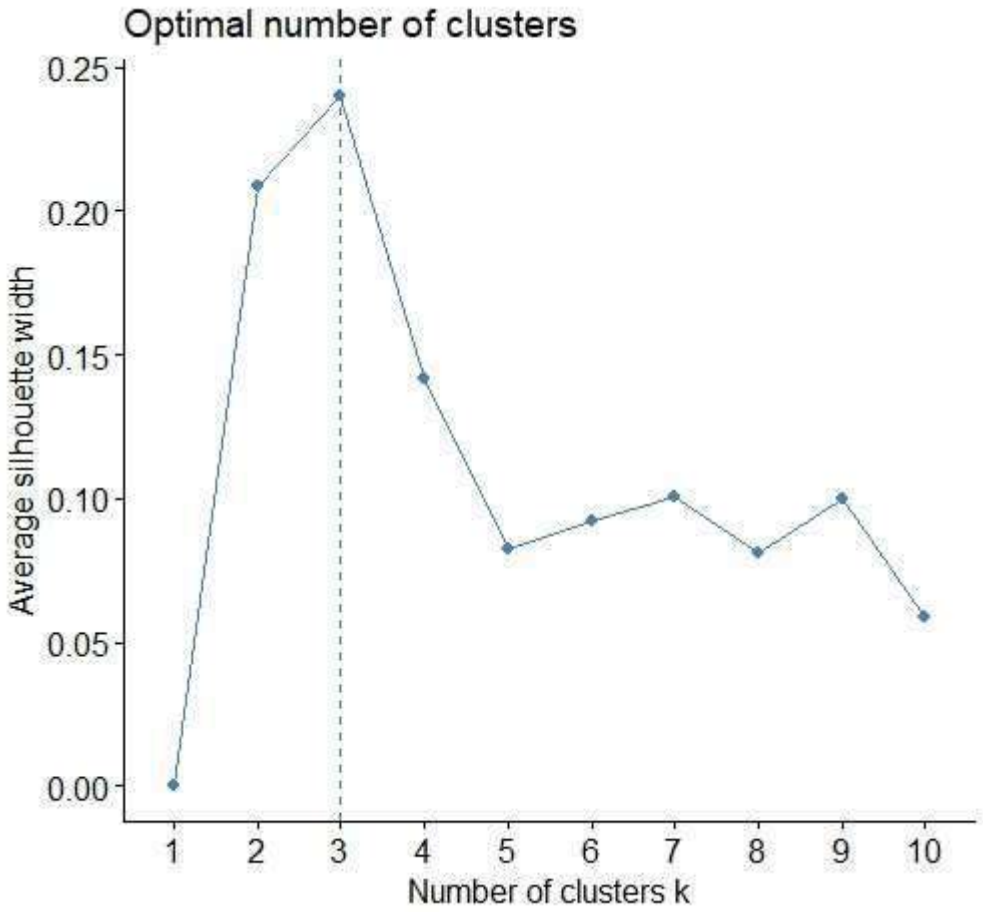


Figura 13. Silhouette.

Questo grafico è composto da un'ascissa in cui vi sono il numero di cluster (k) e un'ordinata che riporta l'Average Silhouette Width (ASW). Tale indice di validazione dei cluster si impiega per stimare il numero di cluster da utilizzare (Batool & Hennig, 2021); si tratta cioè di un indice di variabilità che quando diminuisce indica che l'incremento di numero di gruppi non si associa a un incremento di diversità fra i gruppi. Infatti, la diversità dopo un certo punto diminuisce e i gruppi

risultano sempre più simili tra loro. È conveniente fermarsi ad un numero di cluster che corrisponde al punto in cui l'incremento del numero di gruppi non fa incrementare la significatività dei miei dati. Pertanto, si nota che il numero ottimale di cluster, che permette la maggior discriminazione tra gruppi, è 3. Come nel caso dell'analisi delle componenti principali, si sceglie il numero ottimale di gruppi in funzione dell'indice silhouette, che calcola la distanza relativa fra i differenti gruppi; soltanto quando questa distanza è massima vi è una suddivisione ottimale ed i gruppi sono ben distinti.

7 Conclusioni

Gli esiti conseguiti dalle analisi indicano che nei coni delle sei varietà (Calicross, Cascade, Chinook, Comet,Yeoman e Target), nei tre diversi trattamenti delle infiorescenze (fresche, secche e in pellet), sono stati riconosciuti 87 composti di cui il principale risulta essere il monoterpene β-mircene, seguito da α-cariofillene, β-cariofillene, α-fellandrene, β-pinene, trans-β-ocimene ed acido propanoico. Le tecniche statistiche utilizzate ANOVA, PCA e K-Means hanno permesso di evidenziare differenze significative e dunque di discriminare alcuni campioni in relazione alla varietà ed al tipo di lavorazione. Nell'ottica decisionale di utilizzazione di una tipologia di luppolo, è quindi necessario porre attenzione alla varietà selezionata così come il tipo di lavorazione che subisce, poiché in grado di influenzare le caratteristiche organolettiche finali della birra.

Il solo metodo di trasformazione è in grado, come nel caso del Cascade secco e pellettato, di creare uno squilibrio nel contenuto finale delle molecole con possibili ripercussioni sul profilo sensoriale del prodotto finale. Questo si rivela un valido punto di partenza per ulteriori sperimentazioni focalizzate sul controllo del processo di trasformazione. In particolare, ottimizzare le operazioni di essiccazione e pellettatura può favorire l'efficienza della trasformazione e di conseguenza risultare in una migliore qualità e standardizzazione del prodotto finale.

In aggiunta, in funzione della varietà di appartenenza e della tipologia di lavorazione subita, la presenza di diverse molecole consente di differenziare notevolmente e di caratterizzare chimicamente ogni luppolo. Infatti, è stato evidenziato che il Comet secco si differenzia dal Chinook fresco per il contenuto di molecole come il trans-β-ocimene della varietà Comet e l'etil ottanoato del Chinook fresco.

Questo studio supporta il miglioramento e l'efficientamento dell'utilizzo del luppolo all'interno della filiera brassicola.

8 Referenze

Alfred, H. (2015). Hop. In W. R. Fehr & H. H. Hadley (A c. Di), *Hybridization of Crop Plants* (pp. 393–406). American Society of Agronomy, Crop Science Society of America. https://doi.org/10.2135/1980.hybridizationofcrops.c27

Almaguer, C., Schönberger, C., Gastl, M., Arendt, E. K., & Becker, T. (2014). *Humulus lupulus* - a story that begs to be told. A review: *Humulus lupulus* - a story that begs to be told. *Journal of the Institute of Brewing*, n/a-n/a. https://doi.org/10.1002/jib.160

AssoBirra. (2022). *Annual report 2022*.

Batool, F., & Hennig, C. (2021). Clustering with the Average Silhouette Width. *Computational Statistics & Data Analysis*, *158*, 107190. https://doi.org/10.1016/j.csda.2021.107190

BeerMaverick. (2023a). *Cascade Hop*. Beer Maverick. https://beermaverick.com/hop/cascade/

BeerMaverick. (2023b). *Chinook Hop*. Beer Maverick. https://beermaverick.com/hop/chinook/

BeerMaverick. (2023c). *Comet Hop*. Beer Maverick. https://beermaverick.com/hop/comet/

BeerMaverick. (2023d). *Target Hop*. Beer Maverick. https://beermaverick.com/hop/target/

BeerMaverick. (2023e). *Yeoman Hop*. Beer Maverick. https://beermaverick.com/hop/yeoman/

Dietz, C., Cook, D., Huismann, M., Wilson, C., & Ford, R. (2020). The multisensory perception of hop essential oil: A review. *J. Inst. Brew.*

Direzione generale dell'Agricoltura e dello sviluppo rurale. (s.d.). *Luppolo*. Commissione europea. Recuperato 13 settembre 2023, da https://agriculture.ec.europa.eu/farming/crop-productions-and-plant-based-products/hops_it

Duarte, L. M., Amorim, T. L., Grazul, R. M., & de Oliveira, M. A. L. (2020). Differentiation of aromatic, bittering and dual-purpose commercial hops from their terpenic profiles: An approach involving batch extraction, GC–MS and multivariate analysis. *Food Research International*, *138*, 109768. https://doi.org/10.1016/j.foodres.2020.109768

Edwardson, J. R. (1952). *Hops—Their Botany, History, Production and Utilization*. *6(2)*, 160–175.

Haunold, A. (2010). Encyclopedia of Life Support Systems (EOLSS). In *Soils, plant, growth and crop production: Vol. II* (pp. 192–207). Willy H. Verheye.

Healey, J. (2021). *Calicross*. Hopslist. https://www.hopslist.com/hops/dual-purpose-hops/calicross/

Hieronymus, S. (2020). *Gli ingredienti della birra-Il luppolo| La guida pratica all'aroma, all'amaro e alla coltivazione dei luppoli* (F. Sangiorgio, Trad.; I). Edizioni Lswr.

Krofta, K., Hervert, J., Mikyška, A., & Dušek, M. (2019). Hop beta acids – from cones to beer. *Acta Horticulturae*, *1236*, 15–22. https://doi.org/10.17660/ActaHortic.2019.1236.3

Krofta, K., Patzak, J., & Vondráčková, P. (2021). Sulfur substances of hop oils – another tool for identification of hop cultivars. *Acta Horticulturae*, *1328*, 153–161. https://doi.org/10.17660/ActaHortic.2021.1328.21

Leles, N. R., Sato, A. J., Rufato, L., Jastrombek, J. M., Marques, V. V., Missio, R. F., Fernandes, N. L. M., & Roberto, S. R. (2023). Performance of Hop Cultivars Grown with Artificial Lighting under Subtropical Conditions. *Plants*, *12*(10), 1971. https://doi.org/10.3390/plants12101971

Naghizadeh, A., & Metaxas, D. N. (2020). Procedia Computer Science. *Condensed Silhouette: An Optimized Filtering Process for Cluster Selection in K-Means*, *176*, 205–214.

Perbellini, A., Spinsanti, E., Carazzolo, G., Bruna, M., Fusaro, C., & Bona, S. (2023). Fitoalimurgia del luppolo *Contributo a cura di GRiPO, Gruppo di Ricerca*.

Pereira, O. R., Santos, G., & Sousa, M. J. (2022). Hop By-Products: Pharmacological Activities and Potential Application as Cosmetics. *Cosmetics*, *9*(6), 139. https://doi.org/10.3390/cosmetics9060139

Pistelli, L., Ferri, B., Cioni, P. L., Koziara, M., Agacka, M., & Skomra, U. (2018). Aroma profile and bitter acid characterization of hop cones (Humulus lupulus L.) of five healthy and infected Polish cultivars. *Industrial Crops and Products*, *124*, 653–662. https://doi.org/10.1016/j.indcrop.2018.08.009

Prandi, M. (2015, giugno 29). *Piccola guida al mondo del luppolo*. Giornale della birra. https://www.giornaledellabirra.it/approfondimenti/piccola-guida-al-mondo-del-luppolo/

Rossini, F., Virga, G., Loreti, P., Iacuzzi, N., Ruggeri, R., & Provenzano, M. E. (2021). Hops (Humulus lupulus L.) as a Novel Multipurpose Crop for the Mediterranean Region of Europe: Challenges and Opportunities of Their Cultivation. *Agriculture*, *11*(6), 484. https://doi.org/10.3390/agriculture11060484

Rutnik, K., Knez Hrnčič, M., & Jože Košir, I. (2022). Hop Essential Oil: Chemical Composition, Extraction, Analysis, and Applications. *Food Reviews International*, *38*(sup1), 529–551. https://doi.org/10.1080/87559129.2021.1874413

scienceaq. (s.d.). *Come calcolare l'indice di Kovats*. scienceaq. Recuperato 7 settembre 2023, da https://it.scienceaq.com/Chemistry/100218311.html

Team I.A. Italia. (s.d.). *K-means Cluster analysis: Teoria e codice in Python*. intelligenzaartificialeitalia. Recuperato 7 settembre 2023, da https://www.intelligenzaartificialeitalia.net/post/k-means-cluster-analysis-teoria-e-codice-in-python

Veneto Agricoltura. (2021). *La produzione artigianale di birra in Veneto* (p. 78).

Vidmar, M., Abram, V., Čeh, B., Demšar, L., & Poklar-Ulrih, N. (2019). White Hop Shoot Production in Slovenia: Total Phenolic, Microelement and Pesticide Residue Content in Five Commercial Cultivars. *Food Technology and Biotechnology*, *57*(4), 525–534. https://doi.org/10.17113/ftb.57.04.19.6269

Appendice 1

Composizione chimica dei 18 campioni di luppolo, per le sei varietà Chinook (CHI), Cascade (CAS), Comet (COM), Calicross (CAL), Yeoman (YEO), Target (TAR), nei tre trattamenti fresco (F), secco (S) e pellet (P).

STATO FRESCO	YEO-F	COM-F	TAR-F	CHI-F	CAL-F	CAS-F
β-Myrcene	58,550 %	59,830 %	70,960 %	54,880 %	65,560 %	62,080 %
α-Caryophyllene / Humulene	18,640 %	1,190%	10,910 %	19,160 %	17,590 %	13,390 %
β-Caryophyllene	4,940%	5,610%	3,100%	4,880%	3,070%	3,590%
α-Phellandrene	0,980%	12,760 %	0,640%	0,110%	0,130%	2,730%
β-Pinene	1,860%	2,490%	1,520%	3,360%	2,050%	3,500%
trans-β-Ocimene	0,520%	3,780%	0,870%	0,480%	0,990%	1,350%
Propanoic acid, 2-methyl-, 2-methylpropyl ester	1,350%	0,350%	1,560%	0,830%	1,380%	0,150%
2-Isopropenyl-4a,8-dimethyl-1,2,3,4,4a,5,6,8a-octahydronaphthalene	1,400%	2,530%	0,040%	0,180%	0,070%	2,260%
α-Selinene	1,400%	0,890%	0,630%	0,750%	0,100%	0,750%
Nonanoic acid methyl ester	0,420%	0,680%	0,130%	1,180%	0,710%	0,350%
β-Phellandrene	0,470%	0,600%	0,410%	0,610%	0,590%	0,810%
Copaene	0,810%	0,180%	0,370%	1,850%	0,510%	0,440%
Butanoic acid, 3-methyl-, 2-methylbutyl ester	0,910%	0,140%	0,580%	0,720%	0,720%	0,110%
β-Selinene	0,850%	1,530%	0,450%	0,440%	0,060%	0,750%
Benzyl Alcohol	0,550%	0,650%	0,040%	0,680%	0,670%	0,890%
Linalool	0,290%	0,600%	0,450%	0,600%	0,560%	0,760%
Calamenene	0,620%	0,170%	0,360%	1,330%	0,480%	0,420%
2-Undecanone	0,420%	0,360%	1,120%	0,260%	0,440%	0,190%
α-Pinene	0,300%	0,340%	0,240%	0,470%	0,300%	0,480%
Naphthalene, 1,2,4a,5,6,8a-hexahydro-4,7-dimethyl-1-(1-methylethyl)-	0,510%	0,510%	0,050%	1,070%	0,220%	0,580%
Acetic acid, heptyl ester	0,600%	0,100%	0,370%	1,240%	0,470%	0,010%
4,11-selinadiene	0,490%	0,910%	0,220%	0,380%	0,070%	0,850%
Propanoic acid, 2-methyl-, 3,7-dimethyl-2,6-octadienyl ester, (E)-	0,010%	0,670%	0,070%	0,020%	0,200%	0,460%
2,6-Octadien-1-ol, 3,7-dimethyl-, (E)-	0,040%	0,210%	0,030%	0,520%	0,120%	0,360%
2-Nonanone	0,270%	0,290%	0,390%	0,040%	0,320%	0,090%
2,6-Octadien-1-ol, 3,7-dimethyl-, propanoate, (E)-	0,090%	0,340%	0,050%	0,100%	0,040%	0,360%

Propanoic acid, 2-methyl-, 1-(1,1-dimethylethyl)-2-methyl-1,3-propanediyl ester	0,030%	0,240%	0,040%	0,070%	0,030%	0,010%
Ylangene	0,220%	0,030%	0,100%	0,490%	0,130%	0,110%
Acetone	0,060%	0,060%	0,140%	0,060%	0,070%	0,070%
Acetic acid	0,030%	0,030%	0,060%	0,030%	0,030%	0,040%
1-Butanol, 2-methyl-	0,170%	0,140%	0,390%	0,190%	0,180%	0,040%
2,3-Butanedione	0,020%	0,020%	0,040%	0,040%	0,040%	0,050%
(E)-2-Hexenal	0,330%	0,030%	0,090%	0,260%	0,100%	0,290%
1-Butanol, 2-methyl-, acetate	0,050%	0,050%	0,020%	0,080%	0,040%	0,040%
Propanoic acid, 2-methyl-, 2-methylbutyl ester	0,100%	0,150%	0,120%	0,110%	0,130%	0,130%
1-Hexanol	0,160%	0,040%	0,160%	0,080%	0,120%	0,030%
S-Methyl 3-methylbutanethioate	0,120%	0,120%	0,130%	0,060%	0,100%	0,020%
α-Farnesene	0,070%	0,120%	0,090%	0,090%	0,110%	0,310%
3-Buten-2-ol, 2-methyl-	0,020%	0,020%	0,230%	0,020%	0,040%	0,030%
α-Calacorene	0,100%	0,030%	0,050%	0,300%	0,080%	0,080%
1,3,8-p-Menthatriene	0,050%	0,170%	0,080%	0,050%	0,060%	0,070%
cis-β-Ocimene	0,090%	0,120%	0,090%	0,080%	0,020%	0,100%
2,6-Octadienal, 3,7-dimethyl-, (E)-	0,040%	0,130%	0,020%	0,470%	0,040%	0,130%
2-Butenal, 3-methyl-	0,040%	0,040%	0,100%	0,050%	0,070%	0,060%
Clovene	0,050%	0,060%	0,030%	0,360%	0,030%	0,030%
Benzene, 1-ethyl-4-methoxy-	0,070%	0,090%	0,050%	0,080%	0,090%	0,100%
Propanoic acid, 2-methyl-, heptyl ester	0,090%	0,010%	0,210%	0,020%	0,020%	0,000%
2-Butanone, 3-hydroxy-	0,110%	0,010%	0,080%	0,000%	0,120%	0,100%
allo-Ocimene	0,030%	0,110%	0,050%	0,030%	0,040%	0,040%
Propanoic acid, 2-methyl-, hexyl ester	0,060%	0,010%	0,110%	0,040%	0,100%	0,020%
2-Butenal	0,000%	0,010%	0,000%	0,010%	0,000%	0,000%
Ethylbenzene	0,030%	0,030%	0,620%	0,020%	0,050%	0,020%
Benzene, 1,3-dimethyl-	0,030%	0,040%	0,460%	0,020%	0,060%	0,020%
Hexanal	0,060%	0,020%	0,090%	0,040%	0,040%	0,040%
Propanoic acid, 2-methyl-, pentyl ester	0,040%	0,000%	0,010%	0,020%	0,040%	0,000%
Propanoic acid, ethyl ester	0,030%	0,020%	0,190%	0,010%	0,030%	0,010%
2-Decanol	0,020%	0,000%	0,070%	0,050%	0,010%	0,000%
Heptanoic acid, ethyl ester	0,010%	0,080%	0,020%	0,000%	0,080%	0,000%
Benzaldehyde	0,060%	0,040%	0,040%	0,040%	0,170%	0,080%
Propanoic acid, 2-methyl-, butyl ester	0,040%	0,000%	0,070%	0,020%	0,030%	0,000%
Heptanal	0,030%	0,010%	0,040%	0,010%	0,030%	0,010%
Propanoic acid, 2-methyl-, octyl ester	0,020%	0,010%	0,050%	0,030%	0,040%	0,000%
Octanoic acid, ethyl ester	0,020%	0,010%	0,010%	0,160%	0,010%	0,000%
Nonanoic acid, ethyl ester	0,000%	0,030%	0,000%	0,120%	0,020%	0,010%
Disulfide, dimethyl	0,010%	0,010%	0,010%	0,010%	0,010%	0,000%

Hexanoic acid, 2-methylbutyl ester	0,060%	0,010%	0,010%	0,020%	0,020%	0,000%
τ-Cadinol	0,010%	0,010%	0,010%	0,050%	0,010%	0,010%
Propanoic acid, hexyl ester	0,020%	0,020%	0,000%	0,020%	0,030%	0,010%
Camphene hydrate	0,010%	0,020%	0,040%	0,010%	0,020%	0,030%
2-Undecanol	0,010%	0,000%	0,060%	0,000%	0,000%	0,000%
Decanoic acid, ethyl ester	0,040%	0,020%	0,010%	0,020%	0,010%	0,010%
Benzene, 1-methyl-4-(1-methylethyl)-	0,010%	0,020%	0,010%	0,000%	0,010%	0,010%
Benzeneacetic acid, methyl ester	0,020%	0,010%	0,000%	0,010%	0,010%	0,010%
2,3-Butanediol	0,000%	0,000%	0,010%	0,000%	0,020%	0,010%
2,6-Octadien-1-ol, 3,7-dimethyl-, (Z)-	0,020%	0,010%	0,000%	0,040%	0,010%	0,010%
Propanoic acid, 2-methyl-, ethyl ester	0,000%	0,000%	0,040%	0,000%	0,010%	0,010%
n-Propyl acetate	0,010%	0,010%	0,040%	0,010%	0,010%	0,010%
α-Humulene epoxide II	0,000%	0,000%	0,000%	0,010%	0,000%	0,000%
α-Terpineol	0,010%	0,010%	0,010%	0,010%	0,010%	0,010%
Nerolidol 2	0,000%	0,010%	0,000%	0,050%	0,000%	0,000%
Butanoic acid, 2-methyl-, methyl ester	0,000%	0,000%	0,000%	0,000%	0,000%	0,000%
α-Cadinol	0,000%	0,010%	0,000%	0,010%	0,000%	0,010%
Methanthiol	0,000%	0,000%	0,000%	0,000%	0,000%	0,000%
1-Propanol	0,000%	0,000%	0,000%	0,000%	0,000%	0,000%
Butanoic acid	0,000%	0,000%	0,010%	0,000%	0,000%	0,000%
Humulane-1,6-dien-3-ol	0,000%	0,000%	0,000%	0,000%	0,000%	0,000%
Eudesm-7(11)-en-4-ol	0,000%	0,000%	0,000%	0,000%	0,000%	0,000%

STATO SECCO	CAL-S	COM-S	YEO-S	CAS-S	TAR-S	CHI-S
β-Myrcene	70,59%	62,75%	60,04%	77,88%	73,09%	54,91%
α-Caryophyllene / Humulene	11,37%	1,28%	18,15%	9,50%	6,94%	15,68%
β-Caryophyllene	1,91%	5,64%	4,10%	2,04%	1,78%	3,49%
α-Phellandrene	0,15%	0,53%	0,59%	0,06%	0,63%	10,32%
β-Pinene	2,69%	4,46%	1,75%	2,45%	2,32%	1,97%
trans-β-Ocimene	2,12%	6,05%	0,68%	0,76%	1,17%	0,43%
Propanoic acid, 2-methyl-, 2-methylpropyl ester	1,23%	1,04%	1,46%	0,16%	3,25%	0,90%
2-Isopropenyl-4a,8-dimethyl-1,2,3,4,4a,5,6,8a-octahydronaphthalene	0,03%	2,31%	1,13%	0,03%	0,03%	0,16%
α-Selinene	0,08%	2,31%	1,14%	0,33%	0,03%	0,49%
Nonanoic acid methyl ester	0,75%	1,15%	0,26%	0,23%	1,51%	0,55%
β-Phellandrene	0,61%	1,03%	0,39%	0,58%	0,40%	0,41%
Copaene	0,25%	0,18%	0,53%	0,23%	0,26%	1,18%
Butanoic acid, 3-methyl-, 2-methylbutyl ester	0,87%	0,12%	0,72%	0,13%	0,40%	1,07%
β-Selinene	0,05%	1,46%	0,76%	0,24%	0,11%	0,03%

Benzyl Alcohol	0,70%	0,13%	0,48%	0,65%	0,50%	0,47%
Linalool	0,55%	0,87%	0,21%	0,38%	0,58%	0,47%
Calamenene	0,24%	0,17%	0,53%	0,28%	0,25%	1,35%
2-Undecanone	0,45%	0,41%	0,71%	0,13%	0,55%	0,20%
α-Pinene	0,42%	0,87%	0,37%	0,36%	0,41%	0,35%
Naphthalene, 1,2,4a,5,6,8a-hexahydro-4,7-dimethyl-1-(1-methylethyl)-	0,12%	0,48%	0,39%	0,21%	0,03%	0,06%
Acetic acid, heptyl ester	0,57%	0,00%	0,07%	0,05%	0,08%	0,69%
4,11-selinadiene	0,04%	0,75%	0,37%	0,13%	0,07%	0,27%
Propanoic acid, 2-methyl-, 3,7-dimethyl-2,6-octadienyl ester, (E)-	0,20%	0,80%	0,03%	0,31%	0,05%	0,35%
2,6-Octadien-1-ol, 3,7-dimethyl-, (E)-	0,40%	0,21%	0,08%	0,34%	0,06%	0,55%
2-Nonanone	0,35%	0,28%	0,36%	0,03%	0,09%	0,03%
2,6-Octadien-1-ol, 3,7-dimethyl-, propanoate, (E)-	0,03%	0,56%	0,07%	0,18%	0,03%	0,07%
Propanoic acid, 2-methyl-, 1-(1,1-dimethylethyl)-2-methyl-1,3-propanediyl ester	0,77%	0,28%	0,66%	0,04%	0,42%	0,02%
Ylangene	0,06%	0,03%	0,14%	0,06%	0,07%	0,30%
Acetone	0,12%	0,20%	0,27%	0,24%	0,28%	0,15%
Acetic acid	0,17%	0,17%	0,43%	0,15%	0,29%	0,20%
1-Butanol, 2-methyl-	0,07%	0,18%	0,21%	0,03%	0,14%	0,12%
2,3-Butanedione	0,14%	0,27%	0,27%	0,22%	0,35%	0,11%
(E)-2-Hexenal	0,06%	0,02%	0,18%	0,11%	0,20%	0,07%
1-Butanol, 2-methyl-, acetate	0,12%	0,50%	0,12%	0,04%	0,06%	0,09%
Propanoic acid, 2-methyl-, 2-methylbutyl ester	0,15%	0,16%	0,11%	0,13%	0,12%	0,10%
1-Hexanol	0,15%	0,15%	0,21%	0,05%	0,22%	0,08%
S-Methyl 3-methylbutanethioate	0,05%	0,37%	0,13%	0,01%	0,09%	0,06%
α-Farnesene	0,07%	0,19%	0,11%	0,05%	0,07%	0,04%
3-Buten-2-ol, 2-methyl-	0,04%	0,06%	0,22%	0,25%	0,29%	0,09%
α-Calacorene	0,04%	0,03%	0,09%	0,04%	0,04%	0,29%
1,3,8-p-Menthatriene	0,15%	0,29%	0,08%	0,07%	0,10%	0,05%
cis-β-Ocimene	0,14%	0,18%	0,10%	0,09%	0,11%	0,09%
2,6-Octadienal, 3,7-dimethyl-, (E)-	0,02%	0,03%	0,01%	0,03%	0,01%	0,06%
2-Butenal, 3-methyl-	0,04%	0,07%	0,15%	0,16%	0,12%	0,10%
Clovene	0,02%	0,04%	0,03%	0,01%	0,05%	0,14%
Benzene, 1-ethyl-4-methoxy-	0,09%	0,01%	0,06%	0,07%	0,06%	0,06%
Propanoic acid, 2-methyl-, heptyl ester	0,02%	0,01%	0,05%	0,00%	0,34%	0,24%
2-Butanone, 3-hydroxy-	0,03%	0,01%	0,13%	0,08%	0,14%	0,04%
allo-Ocimene	0,09%	0,18%	0,05%	0,04%	0,06%	0,03%
Propanoic acid, 2-methyl-, hexyl ester	0,11%	0,01%	0,03%	0,01%	0,12%	0,04%
2-Butenal	0,00%	0,01%	0,02%	0,02%	0,02%	0,01%
Ethylbenzene	0,00%	0,01%	0,02%	0,01%	0,02%	0,03%
Benzene, 1,3-dimethyl-	0,02%	0,01%	0,05%	0,02%	0,05%	0,04%
Hexanal	0,01%	0,01%	0,08%	0,02%	0,09%	0,02%

Propanoic acid, 2-methyl-, pentyl ester	0,03%	0,01%	0,03%	0,00%	0,35%	0,02%
Propanoic acid, ethyl ester	0,01%	0,19%	0,07%	0,04%	0,10%	0,02%
2-Decanol	0,00%	0,01%	0,04%	0,01%	0,34%	0,00%
Heptanoic acid, ethyl ester	0,08%	0,00%	0,01%	0,00%	0,08%	0,23%
Benzaldehyde	0,03%	0,03%	0,02%	0,03%	0,01%	0,01%
Propanoic acid, 2-methyl-, butyl ester	0,04%	0,00%	0,03%	0,01%	0,18%	0,03%
Heptanal	0,01%	0,04%	0,04%	0,01%	0,03%	0,01%
Propanoic acid, 2-methyl-, octyl ester	0,04%	0,01%	0,02%	0,00%	0,04%	0,02%
Octanoic acid, ethyl ester	0,01%	0,01%	0,01%	0,01%	0,01%	0,06%
Nonanoic acid, ethyl ester	0,01%	0,04%	0,00%	0,00%	0,02%	0,04%
Disulfide, dimethyl	0,02%	0,06%	0,08%	0,00%	0,03%	0,02%
Hexanoic acid, 2-methylbutyl ester	0,01%	0,02%	0,04%	0,00%	0,01%	0,01%
τ-Cadinol	0,01%	0,01%	0,02%	0,01%	0,01%	0,06%
Propanoic acid, hexyl ester	0,02%	0,01%	0,01%	0,00%	0,01%	0,03%
Camphene hydrate	0,01%	0,02%	0,01%	0,02%	0,01%	0,01%
2-Undecanol	0,00%	0,01%	0,02%	0,01%	0,13%	0,00%
Decanoic acid, ethyl ester	0,01%	0,02%	0,01%	0,01%	0,01%	0,12%
Benzene, 1-methyl-4-(1-methylethyl)-	0,02%	0,04%	0,01%	0,01%	0,01%	0,01%
Benzeneacetic acid, methyl ester	0,01%	0,04%	0,02%	0,00%	0,01%	0,01%
2,3-Butanediol	0,00%	0,00%	0,01%	0,02%	0,01%	0,02%
2,6-Octadien-1-ol, 3,7-dimethyl-, (Z)-	0,02%	0,01%	0,00%	0,01%	0,01%	0,03%
Propanoic acid, 2-methyl-, ethyl ester	0,01%	0,00%	0,04%	0,00%	0,00%	0,03%
n-Propyl acetate	0,01%	0,00%	0,02%	0,01%	0,02%	0,01%
α-Humulene epoxide II	0,00%	0,00%	0,02%	0,02%	0,01%	0,01%
α-Terpineol	0,01%	0,01%	0,01%	0,00%	0,01%	0,01%
Nerolidol 2	0,00%	0,01%	0,00%	0,01%	0,00%	0,01%
Butanoic acid, 2-methyl-, methyl ester	0,00%	0,01%	0,00%	0,00%	0,00%	0,03%
α-Cadinol	0,00%	0,02%	0,01%	0,00%	0,00%	0,01%
Methanthiol	0,01%	0,02%	0,01%	0,00%	0,01%	0,01%
1-Propanol	0,00%	0,01%	0,01%	0,01%	0,01%	0,01%
Butanoic acid	0,00%	0,00%	0,01%	0,01%	0,00%	0,01%
Humulane-1,6-dien-3-ol	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
Eudesm-7(11)-en-4-ol	0,01%	0,00%	0,01%	0,00%	0,01%	0,00%

STATO PELLET	TAR-P	YEO-P	CAL-P	COM-P	CAS-P	CHI-P
β-Myrcene	72,38%	57,08%	66,49%	64,35%	57,82%	55,31%
α-Caryophyllene / Humulene	11,76%	18,61%	14,02%	2,51%	15,89%	14,96%
β-Caryophyllene	2,51%	4,53%	2,29%	5,09%	3,21%	3,44%
α-Phellandrene	0,06%	0,64%	2,32%	0,13%	10,63%	11,84%
β-Pinene	2,90%	1,99%	2,50%	4,64%	2,03%	2,13%
trans-β-Ocimene	0,85%	1,50%	1,79%	4,91%	0,53%	0,49%
Propanoic acid, 2-methyl-, 2-methylpropyl ester	0,60%	1,42%	1,33%	0,97%	0,12%	1,11%

2-Isopropenyl-4a,8-dimethyl-1,2,3,4,4a,5,6,8a-octahydronaphthalene	0,04%	1,45%	0,05%	2,27%	0,82%	0,57%
α-Selinene	0,47%	1,45%	0,08%	2,28%	0,82%	0,45%
Nonanoic acid methyl ester	0,88%	0,46%	0,83%	1,00%	0,36%	0,47%
β-Phellandrene	0,61%	0,44%	0,54%	0,77%	0,47%	0,42%
Copaene	0,38%	0,75%	0,34%	0,27%	0,43%	1,19%
Butanoic acid, 3-methyl-, 2-methylbutyl ester	0,32%	1,08%	0,85%	0,29%	0,19%	0,87%
β-Selinene	0,20%	0,85%	0,05%	1,33%	0,51%	0,25%
Benzyl Alcohol	0,65%	0,49%	0,57%	0,78%	0,49%	0,44%
Linalool	0,66%	0,28%	0,66%	0,92%	0,60%	0,39%
Calamenene	0,39%	0,56%	0,26%	0,18%	0,47%	0,93%
2-Undecanone	0,40%	0,70%	0,54%	0,52%	0,20%	0,15%
α-Pinene	0,34%	0,37%	0,31%	0,57%	0,21%	0,23%
Naphthalene, 1,2,4a,5,6,8a-hexahydro-4,7-dimethyl-1-(1-methylethyl)-	0,19%	0,47%	0,16%	0,47%	0,40%	0,74%
Acetic acid, heptyl ester	0,21%	0,69%	0,55%	0,19%	0,12%	0,55%
4,11-selinadiene	0,18%	0,47%	0,05%	0,73%	0,26%	0,03%
Propanoic acid, 2-methyl-, 3,7-dimethyl-2,6-octadienyl ester, (E)-	0,18%	0,02%	0,27%	0,83%	0,35%	0,24%
2,6-Octadien-1-ol, 3,7-dimethyl-, (E)-	0,07%	0,03%	0,02%	0,17%	0,17%	0,33%
2-Nonanone	0,08%	0,36%	0,34%	0,02%	0,03%	0,03%
2,6-Octadien-1-ol, 3,7-dimethyl-, propanoate, (E)-	0,12%	0,08%	0,05%	0,49%	0,25%	0,05%
Propanoic acid, 2-methyl-, 1-(1,1-dimethylethyl)-2-methyl-1,3-propanediyl ester	0,01%	0,01%	0,01%	0,02%	0,01%	0,00%
Ylangene	0,10%	0,20%	0,09%	0,05%	0,11%	0,31%
Acetone	0,17%	0,13%	0,08%	0,13%	0,17%	0,07%
Acetic acid	0,13%	0,19%	0,12%	0,12%	0,13%	0,13%
1-Butanol, 2-methyl-	0,03%	0,12%	0,06%	0,11%	0,02%	0,14%
2,3-Butanedione	0,13%	0,10%	0,08%	0,18%	0,10%	0,08%
(E)-2-Hexenal	0,10%	0,10%	0,05%	0,03%	0,09%	0,04%
1-Butanol, 2-methyl-, acetate	0,05%	0,13%	0,10%	0,43%	0,03%	0,07%
Propanoic acid, 2-methyl-, 2-methylbutyl ester	0,07%	0,09%	0,08%	0,13%	0,06%	0,06%
1-Hexanol	0,08%	0,14%	0,13%	0,10%	0,04%	0,04%
S-Methyl 3-methylbutanethioate	0,03%	0,18%	0,07%	0,30%	0,01%	0,07%
α-Farnesene	0,06%	0,07%	0,13%	0,16%	0,14%	0,04%
3-Buten-2-ol, 2-methyl-	0,17%	0,09%	0,03%	0,03%	0,16%	0,04%
α-Calacorene	0,08%	0,12%	0,06%	0,05%	0,11%	0,24%
1,3,8-p-Menthatriene	0,06%	0,09%	0,09%	0,24%	0,06%	0,03%
cis-β-Ocimene	0,07%	0,10%	0,09%	0,11%	0,05%	0,04%
2,6-Octadienal, 3,7-dimethyl-, (E)-	0,02%	0,01%	0,42%	0,03%	0,02%	0,04%
2-Butenal, 3-methyl-	0,13%	0,09%	0,04%	0,05%	0,16%	0,03%
Clovene	0,04%	0,15%	0,03%	0,03%	0,06%	0,31%
Benzene, 1-ethyl-4-methoxy-	0,07%	0,07%	0,08%	0,09%	0,05%	0,05%

Propanoic acid, 2-methyl-, heptyl ester	0,00%	0,08%	0,02%	0,01%	0,01%	0,03%
2-Butanone, 3-hydroxy-	0,07%	0,04%	0,02%	0,02%	0,06%	0,02%
allo-Ocimene	0,03%	0,05%	0,06%	0,13%	0,02%	0,01%
Propanoic acid, 2-methyl-, hexyl ester	0,06%	0,05%	0,13%	0,02%	0,02%	0,05%
2-Butenal	0,01%	0,01%	0,18%	0,22%	0,46%	0,00%
Ethylbenzene	0,03%	0,00%	0,01%	0,01%	0,00%	0,02%
Benzene, 1,3-dimethyl-	0,04%	0,01%	0,02%	0,01%	0,01%	0,02%
Hexanal	0,06%	0,13%	0,03%	0,03%	0,05%	0,02%
Propanoic acid, 2-methyl-, pentyl ester	0,10%	0,05%	0,03%	0,01%	0,01%	0,04%
Propanoic acid, ethyl ester	0,01%	0,02%	0,00%	0,02%	0,01%	0,01%
2-Decanol	0,12%	0,04%	0,01%	0,01%	0,01%	0,03%
Heptanoic acid, ethyl ester	0,03%	0,01%	0,09%	0,00%	0,01%	0,01%
Benzaldehyde	0,03%	0,02%	0,02%	0,02%	0,02%	0,01%
Propanoic acid, 2-methyl-, butyl ester	0,03%	0,04%	0,04%	0,01%	0,01%	0,03%
Heptanal	0,04%	0,11%	0,04%	0,02%	0,03%	0,02%
Propanoic acid, 2-methyl-, octyl ester	0,02%	0,02%	0,05%	0,01%	0,00%	0,02%
Octanoic acid, ethyl ester	0,00%	0,01%	0,00%	0,05%	0,00%	0,01%
Nonanoic acid, ethyl ester	0,01%	0,00%	0,02%	0,05%	0,01%	0,00%
Disulfide, dimethyl	0,00%	0,04%	0,01%	0,01%	0,00%	0,02%
Hexanoic acid, 2-methylbutyl ester	0,01%	0,07%	0,01%	0,02%	0,00%	0,01%
τ-Cadinol	0,01%	0,02%	0,01%	0,01%	0,02%	0,04%
Propanoic acid, hexyl ester	0,03%	0,04%	0,02%	0,02%	0,01%	0,02%
Camphene hydrate	0,03%	0,01%	0,02%	0,01%	0,03%	0,00%
2-Undecanol	0,04%	0,01%	0,00%	0,01%	0,01%	0,00%
Decanoic acid, ethyl ester	0,00%	0,00%	0,01%	0,00%	0,00%	0,01%
Benzene, 1-methyl-4-(1-methylethyl)-	0,01%	0,01%	0,02%	0,04%	0,02%	0,01%
Benzeneacetic acid, methyl ester	0,01%	0,03%	0,01%	0,04%	0,01%	0,01%
2,3-Butanediol	0,04%	0,02%	0,01%	0,02%	0,03%	0,02%
2,6-Octadien-1-ol, 3,7-dimethyl-, (Z)-	0,01%	0,01%	0,01%	0,01%	0,01%	0,02%
Propanoic acid, 2-methyl-, ethyl ester	0,00%	0,02%	0,00%	0,00%	0,05%	0,00%
n-Propyl acetate	0,01%	0,01%	0,01%	0,00%	0,01%	0,00%
α-Humulene epoxide II	0,02%	0,01%	0,01%	0,00%	0,06%	0,01%
α-Terpineol	0,01%	0,01%	0,01%	0,01%	0,01%	0,00%
Nerolidol 2	0,01%	0,00%	0,00%	0,01%	0,01%	0,01%
Butanoic acid, 2-methyl-, methyl ester	0,03%	0,02%	0,00%	0,00%	0,04%	0,00%
α-Cadinol	0,00%	0,01%	0,00%	0,02%	0,00%	0,01%
Methanthiol	0,00%	0,01%	0,01%	0,01%	0,00%	0,01%
1-Propanol	0,01%	0,00%	0,00%	0,00%	0,01%	0,00%
Butanoic acid	0,01%	0,01%	0,00%	0,00%	0,00%	0,01%
Humulane-1,6-dien-3-ol	0,01%	0,01%	0,00%	0,00%	0,01%	0,00%
Eudesm-7(11)-en-4-ol	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%

Allegato 1

Allegato 1: ANOVA varietà-stato

Analysis of Variance for M1 - Type III Sums of Squares

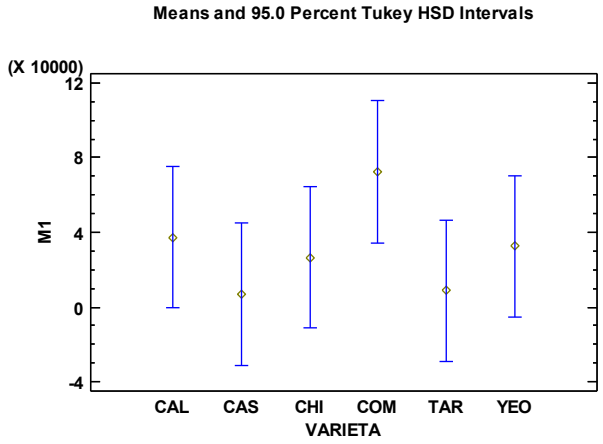
Source	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
MAIN EFFECTS					
A:VARIETA	8.55292E9	5	1.71058E9	2.39	0.1131
B:STATO	4.3326E9	2	2.1663E9	3.02	0.0939
RESIDUAL	7.16294E9	10	7.16294E8		
TOTAL (CORRECTED)	2.00485E10	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor

The ANOVA table decomposes the variability of M1 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M1 at the 95.0% confidence level.

Means Plot



This plot shows the mean M1 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M1 with 95.0% Confidence Intervals

Level	Count	Mean	Stnd. Error	Lower Limit	Upper Limit
GRAND MEAN	18	30787.9			
VARIETA					
CAL	3	37442.6	15452.0	3013.32	71872.0
CAS	3	6864.85	15452.0	-27564.5	41294.2
CHI	3	26660.0	15452.0	-7769.3	61089.3
COM	3	72341.3	15452.0	37911.9	106771.
TAR	3	8719.74	15452.0	-25709.6	43149.1
YEO	3	32699.2	15452.0	-1730.14	67128.5
STATO					
F	6	15258.3	10926.2	-9086.9	39603.5
P	6	25129.9	10926.2	784.726	49475.1
S	6	51975.6	10926.2	27630.4	76320.8

The StatAdvisor

This table shows the mean M1 for each level of the factors. It also shows the standard error of each mean, which is a

measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M1 by STATO

Method: 95.0 percent Tukey HSD

STATO	Count	LS Mean	LS Sigma	Homogeneous Groups
F	6	15258.3	10926.2	X
P	6	25129.9	10926.2	X
S	6	51975.6	10926.2	X

Contrast	Sig.	Difference	+/- Limits
F - P		-9871.63	42404.5
F - S		-36717.3	42404.5
P - S		-26845.7	42404.5

* denotes a statistically significant difference.

The StatAdvisor

This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M2 - Type III Sums of Squares

Source	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
MAIN EFFECTS					
A:VARIETA	2.41574E11	5	4.83149E10	2.68	0.0867
B:STATO	8.57646E11	2	4.28823E11	23.78	0.0002
RESIDUAL	1.80325E11	10	1.80325E10		
TOTAL (CORRECTED)	1.27955E12	17			

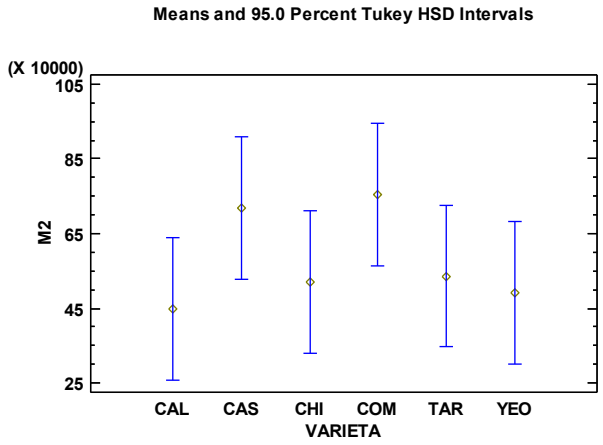
All F-ratios are based on the residual mean square error.

The StatAdvisor

The ANOVA table decomposes the variability of M2 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M2 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M2 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M2 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	577928.			
VARIETA					
CAL	3	447860.	77529.7	275113.	620607.
CAS	3	718152.	77529.7	545404.	890899.
CHI	3	519984.	77529.7	347237.	692731.
COM	3	754686.	77529.7	581938.	927433.
TAR	3	536107.	77529.7	363360.	708854.
YEO	3	490780.	77529.7	318033.	663527.
STATO					
F	6	385978.	54821.7	263828.	508129.
P	6	464530.	54821.7	342379.	586681.
S	6	883276.	54821.7	761125.	1.00543E6

The StatAdvisor
This table shows the mean M2 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M2 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
F	6	385978.	54821.7	X
P	6	464530.	54821.7	X
S	6	883276.	54821.7	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		-78551.5	212762.
F - S	*	-497297.	212762.
P - S	*	-418746.	212762.

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 2 pairs, indicating that these pairs show statistically significant differences at the 95.0% confidence level. At the top of the page, 2 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

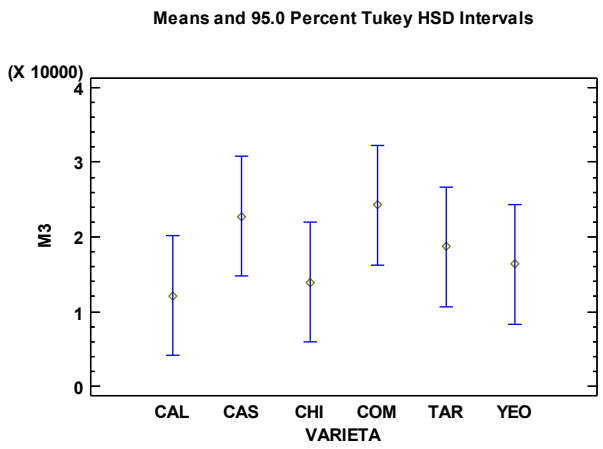
Analysis of Variance for M3 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	3.47618E8	5	6.95236E7	2.17	0.1395
B:STATO	2.1499E9	2	1.07495E9	33.51	0.0000
RESIDUAL	3.20793E8	10	3.20793E7		
TOTAL (CORRECTED)	2.81831E9	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M3 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M3 at the 95.0% confidence level.

Means Plot



This plot shows the mean M3 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M3 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	18019.6			
VARIETA					
CAL	3	12167.7	3270.03	4881.58	19453.8
CAS	3	22758.0	3270.03	15471.9	30044.2

Allegato 1: ANOVA varietà-stato

CHI	3	13901.3	3270.03	6615.19	21187.4
COM	3	24250.2	3270.03	16964.1	31536.3
TAR	3	18723.4	3270.03	11437.3	26009.5
YEO	3	16317.0	3270.03	9030.88	23603.1
STATO					
F	6	5857.86	2312.26	705.809	11009.9
P	6	15840.5	2312.26	10688.4	20992.5
S	6	32360.5	2312.26	27208.4	37512.5

The StatAdvisor
This table shows the mean M3 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M3 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
F	6	5857.86	2312.26	X
P	6	15840.5	2312.26	X
S	6	32360.5	2312.26	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P	*	-9982.62	8973.86
F - S	*	-26502.6	8973.86
P - S	*	-16520.0	8973.86

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 3 pairs, indicating that these pairs show statistically significant differences at the 95.0% confidence level. At the top of the page, 3 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M4 - Type III Sums of Squares

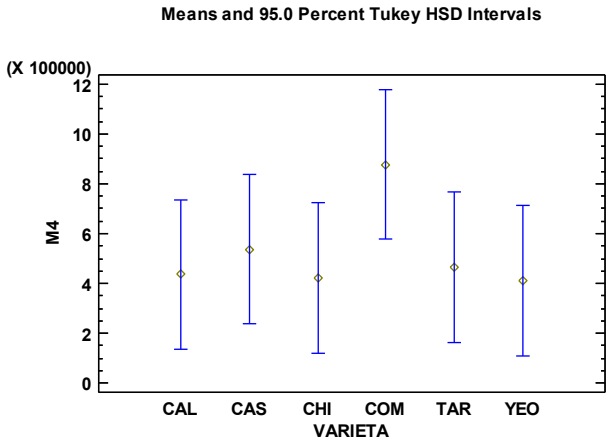
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	4.79447E11	5	9.58894E10	2.12	0.1459
B:STATO	1.84639E12	2	9.23195E11	20.42	0.0003
RESIDUAL	4.52188E11	10	4.52188E10		
TOTAL (CORRECTED)	2.77802E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M4 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M4 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M4 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M4 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	524673.			
VARIETA					
CAL	3	436156.	122772.	162602.	709709.
CAS	3	537181.	122772.	263627.	810734.
CHI	3	422565.	122772.	149011.	696118.
COM	3	877660.	122772.	604107.	1.15121E6
TAR	3	464696.	122772.	191142.	738249.
YEO	3	409778.	122772.	136225.	683332.
STATO					
F	6	194264.	86812.8	832.555	387696.
P	6	421570.	86812.8	228139.	615002.
S	6	958183.	86812.8	764752.	1.15161E6

The StatAdvisor
This table shows the mean M4 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M4 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
F	6	194264.	86812.8	X
P	6	421570.	86812.8	X
S	6	958183.	86812.8	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		-227306.	336919.
F - S	*	-763919.	336919.
P - S	*	-536613.	336919.

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 2 pairs, indicating that these pairs show statistically significant differences at the 95.0% confidence level. At the top of the page, 2 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

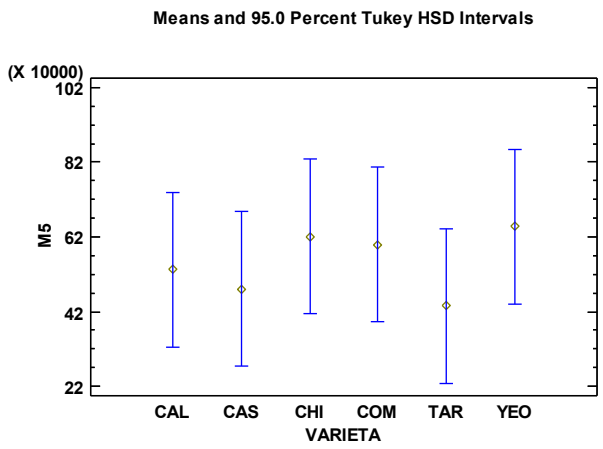
Analysis of Variance for M5 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.06636E11	5	2.13272E10	0.99	0.4682
B:STATO	1.84953E12	2	9.24763E11	43.09	0.0000
RESIDUAL	2.14619E11	10	2.14619E10		
TOTAL (CORRECTED)	2.17078E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M5 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M5 at the 95.0% confidence level.

Means Plot



This plot shows the mean M5 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M5 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	552895.			
VARIETA					
CAL	3	533023.	84581.2	344564.	721482.
CAS	3	480001.	84581.2	291542.	668460.

Allegato 1: ANOVA varietà-stato

CHI	3	621239.	84581.2	432780.	809698.
COM	3	599620.	84581.2	411161.	788079.
TAR	3	435126.	84581.2	246667.	623585.
YEO	3	648359.	84581.2	459900.	836818.
STATO					
F	6	188796.	59807.9	55535.5	322057.
P	6	501061.	59807.9	367800.	634321.
S	6	968827.	59807.9	835566.	1.10209E6

The StatAdvisor
This table shows the mean M5 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M5 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
F	6	188796.	59807.9	X
P	6	501061.	59807.9	X
S	6	968827.	59807.9	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P	*	-312264.	232114.
F - S	*	-780031.	232114.
P - S	*	-467766.	232114.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 3 pairs, indicating that these pairs show statistically significant differences at the 95.0% confidence level. At the top of the page, 3 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M6 - Type III Sums of Squares

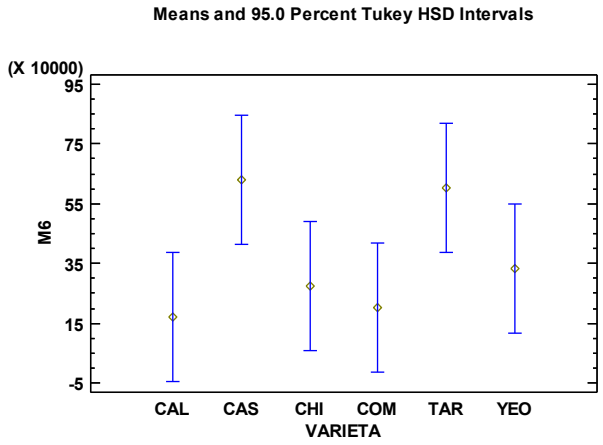
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	6.01112E11	5	1.20222E11	5.16	0.0134
B:STATO	4.50592E11	2	2.25296E11	9.67	0.0046
RESIDUAL	2.33012E11	10	2.33012E10		
TOTAL (CORRECTED)	1.28472E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M6 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since 2 P-values are less than 0.05, these factors have a statistically significant effect on M6 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M6 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M6 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	368467.			
VARIETA					
CAL	3	172651.	88130.9	-23717.2	369020.
CAS	3	629148.	88130.9	432780.	825516.
CHI	3	272583.	88130.9	76214.6	468951.
COM	3	201341.	88130.9	4972.67	397709.
TAR	3	604135.	88130.9	407767.	800504.
YEO	3	330945.	88130.9	134576.	527313.
STATO					
F	6	217733.	62318.0	78879.9	356587.
P	6	300625.	62318.0	161772.	439479.
S	6	587043.	62318.0	448190.	725896.

The StatAdvisor
This table shows the mean M6 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M6 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
F	6	217733.	62318.0	X
P	6	300625.	62318.0	X
S	6	587043.	62318.0	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		-82892.1	241855.
F - S	*	-369310.	241855.
P - S	*	-286418.	241855.

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 2 pairs, indicating that these pairs show statistically significant differences at the 95.0% confidence level. At the top of the page, 2 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

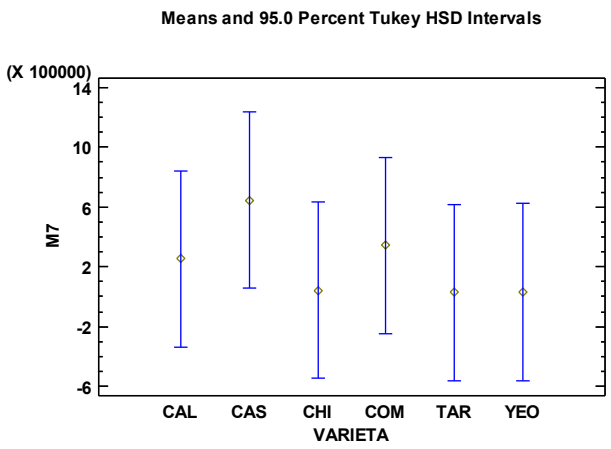
Analysis of Variance for M7 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	9.04595E11	5	1.80919E11	1.04	0.4475
B:STATO	1.18096E12	2	5.90481E11	3.38	0.0755
RESIDUAL	1.746E12	10	1.746E11		
TOTAL (CORRECTED)	3.83155E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M7 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M7 at the 95.0% confidence level.

Means Plot



This plot shows the mean M7 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M7 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	223232.			
VARIETA					
CAL	3	252015.	241247.	-285517.	789548.
CAS	3	645108.	241247.	107576.	1.18264E6

Allegato 1: ANOVA varietà-stato

CHI	3	43538.0	241247.	-493994.	581070.
COM	3	342602.	241247.	-194930.	880135.
TAR	3	26540.4	241247.	-510992.	564073.
YEO	3	29590.7	241247.	-507942.	567123.
STATO					
F	6	31718.2	170587.	-348375.	411811.
P	6	585270.	170587.	205177.	965363.
S	6	52709.4	170587.	-327383.	432802.

The StatAdvisor
This table shows the mean M7 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M7 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
F	6	31718.2	170587.	X
S	6	52709.4	170587.	X
P	6	585270.	170587.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		-553552.	662047.
F - S		-20991.2	662047.
P - S		532560.	662047.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M8 - Type III Sums of Squares

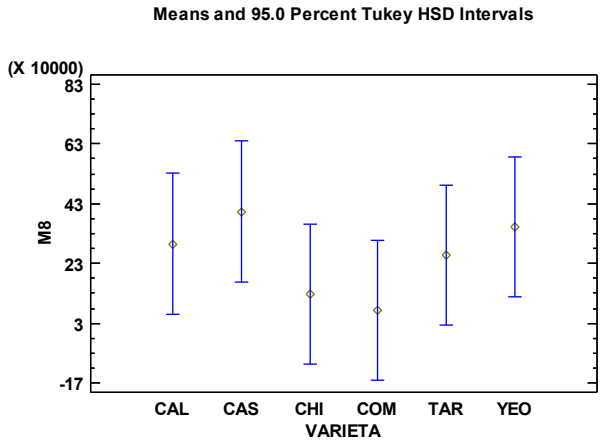
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	2.47567E11	5	4.95135E10	1.80	0.2001
B:STATO	1.30223E11	2	6.51116E10	2.37	0.1437
RESIDUAL	2.74727E11	10	2.74727E10		
TOTAL (CORRECTED)	6.52518E11	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M8 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M8 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M8 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M8 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	251888.			
VARIETA					
CAL	3	296153.	95695.2	82930.4	509376.
CAS	3	404103.	95695.2	190880.	617326.
CHI	3	128372.	95695.2	-84850.8	341595.
COM	3	72660.4	95695.2	-140562.	285883.
TAR	3	258283.	95695.2	45060.5	471506.
YEO	3	351758.	95695.2	138535.	564980.
STATO					
F	6	351164.	67666.7	200393.	501935.
P	6	143427.	67666.7	-7344.21	294198.
S	6	261074.	67666.7	110303.	411845.

The StatAdvisor
This table shows the mean M8 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M8 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	143427.	67666.7	X
S	6	261074.	67666.7	X
F	6	351164.	67666.7	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		207737.	262614.
F - S		90090.1	262614.
P - S		-117647.	262614.

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

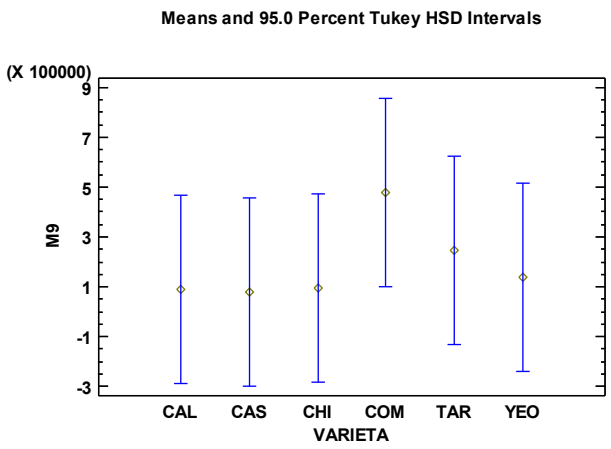
Analysis of Variance for M9 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	3.59059E11	5	7.18118E10	1.01	0.4623
B:STATO	2.64101E11	2	1.3205E11	1.85	0.2073
RESIDUAL	7.1397E11	10	7.1397E10		
TOTAL (CORRECTED)	1.33713E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M9 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M9 at the 95.0% confidence level.

Means Plot



This plot shows the mean M9 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M9 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	186619.			
VARIETA					
CAL	3	88131.6	154269.	-255602.	431866.
CAS	3	78374.3	154269.	-265360.	422108.

Allegato 1: ANOVA varietà-stato

CHI	3	93601.4	154269.	-250133.	437335.
COM	3	476371.	154269.	132637.	820105.
TAR	3	244585.	154269.	-99149.4	588319.
YEO	3	138650.	154269.	-205084.	482384.
STATO					
F	6	175429.	109085.	-67628.0	418485.
P	6	44178.6	109085.	-198878.	287235.
S	6	340249.	109085.	97192.8	583306.

The StatAdvisor
This table shows the mean M9 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M9 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	44178.6	109085.	X
F	6	175429.	109085.	X
S	6	340249.	109085.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		131250.	423357.
F - S		-164821.	423357.
P - S		-296071.	423357.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M10 - Type III Sums of Squares

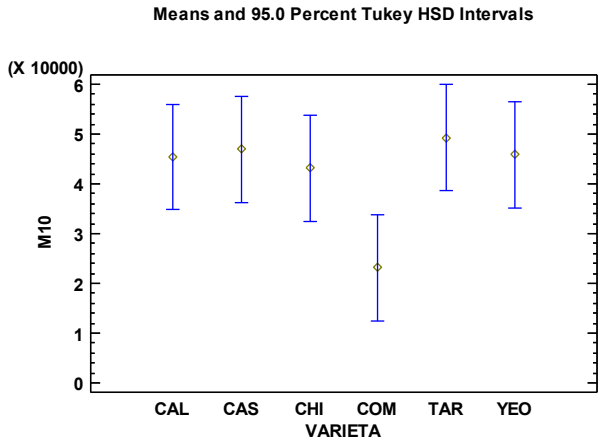
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.37302E9	5	2.74603E8	4.87	0.0162
B:STATO	9.27604E9	2	4.63802E9	82.23	0.0000
RESIDUAL	5.64004E8	10	5.64004E7		
TOTAL (CORRECTED)	1.12131E10	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M10 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since 2 P-values are less than 0.05, these factors have a statistically significant effect on M10 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M10 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M10 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	42290.5			
VARIETA					
CAL	3	45381.8	4335.91	35720.8	55042.8
CAS	3	46922.1	4335.91	37261.1	56583.2
CHI	3	43118.3	4335.91	33457.3	52779.4
COM	3	23200.6	4335.91	13539.6	32861.7
TAR	3	49294.8	4335.91	39633.8	58955.8
YEO	3	45825.3	4335.91	36164.2	55486.3
STATO					
F	6	72634.2	3065.95	65802.8	79465.6
P	6	18038.5	3065.95	11207.2	24869.9
S	6	36198.7	3065.95	29367.4	43030.1

The StatAdvisor
This table shows the mean M10 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M10 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	18038.5	3065.95	X
S	6	36198.7	3065.95	X
F	6	72634.2	3065.95	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P	*	54595.7	11898.9
F - S	*	36435.5	11898.9
P - S	*	-18160.2	11898.9

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 3 pairs, indicating that these pairs show statistically significant differences at the 95.0% confidence level. At the top of the page, 3 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

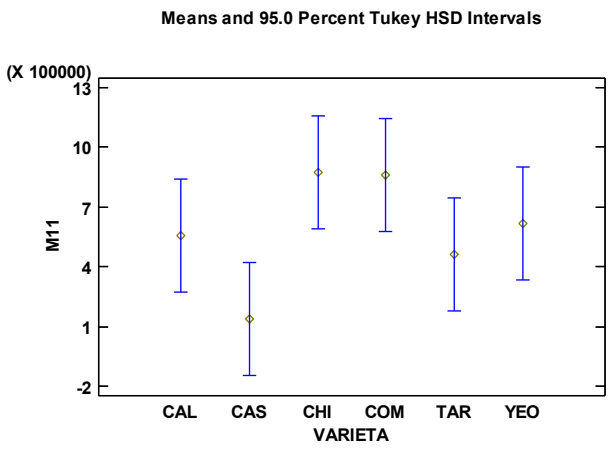
Analysis of Variance for M11 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.11865E12	5	2.23731E11	5.60	0.0102
B:STATO	9.87811E11	2	4.93905E11	12.37	0.0020
RESIDUAL	3.99387E11	10	3.99387E10		
TOTAL (CORRECTED)	2.50585E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M11 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since 2 P-values are less than 0.05, these factors have a statistically significant effect on M11 at the 95.0% confidence level.

Means Plot



This plot shows the mean M11 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M11 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	585278.			
VARIETA					
CAL	3	555598.	115382.	298511.	812685.
CAS	3	140624.	115382.	-116462.	397711.

Allegato 1: ANOVA varietà-stato

CHI	3	872562.	115382.	615476.	1.12965E6
COM	3	860973.	115382.	603887.	1.11806E6
TAR	3	464087.	115382.	207000.	721174.
YEO	3	617821.	115382.	360735.	874908.
STATO					
F	6	883893.	81587.1	702105.	1.06568E6
P	6	311715.	81587.1	129928.	493503.
S	6	560225.	81587.1	378437.	742012.

The StatAdvisor
This table shows the mean M11 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M11 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	311715.	81587.1	X
S	6	560225.	81587.1	X
F	6	883893.	81587.1	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P	*	572178.	316638.
F - S	*	323668.	316638.
P - S		-248509.	316638.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 2 pairs, indicating that these pairs show statistically significant differences at the 95.0% confidence level. At the top of the page, 2 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M12 - Type III Sums of Squares

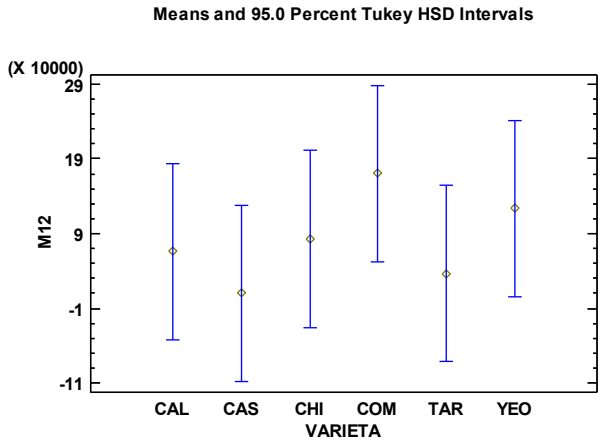
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	5.10878E10	5	1.02176E10	1.47	0.2817
B:STATO	4.43746E10	2	2.21873E10	3.19	0.0846
RESIDUAL	6.94597E10	10	6.94597E9		
TOTAL (CORRECTED)	1.64922E11	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M12 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M12 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M12 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M12 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	81622.9			
VARIETA					
CAL	3	66177.9	48117.8	-41035.5	173391.
CAS	3	10422.7	48117.8	-96790.7	117636.
CHI	3	82721.3	48117.8	-24492.1	189935.
COM	3	170227.	48117.8	63013.5	277440.
TAR	3	36135.8	48117.8	-71077.6	143349.
YEO	3	124053.	48117.8	16839.4	231266.
STATO					
F	6	41686.0	34024.4	-34125.3	117497.
P	6	51574.7	34024.4	-24236.6	127386.
S	6	151608.	34024.4	75796.7	227419.

The StatAdvisor
This table shows the mean M12 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M12 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
F	6	41686.0	34024.4	X
P	6	51574.7	34024.4	X
S	6	151608.	34024.4	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		-9888.75	132048.
F - S		-109922.	132048.
P - S		-100033.	132048.

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

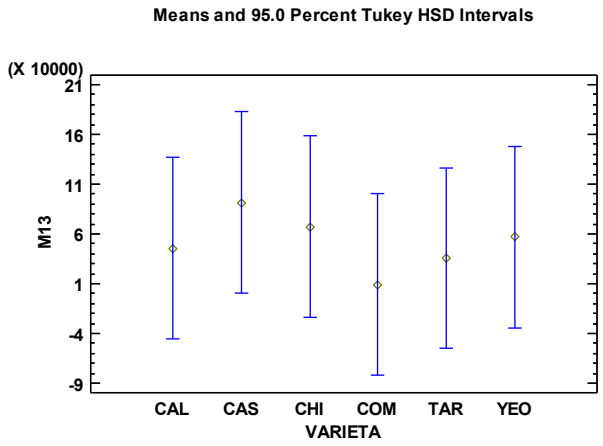
Analysis of Variance for M13 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.18483E10	5	2.36966E9	0.58	0.7180
B:STATO	1.23708E9	2	6.18539E8	0.15	0.8623
RESIDUAL	4.11467E10	10	4.11467E9		
TOTAL (CORRECTED)	5.4232E10	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M13 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M13 at the 95.0% confidence level.

Means Plot



This plot shows the mean M13 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M13 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	51025.1			
VARIETA					
CAL	3	45793.5	37034.5	-36724.7	128312.
CAS	3	91386.3	37034.5	8868.11	173905.

Allegato 1: ANOVA varietà-stato

CHI	3	67298.9	37034.5	-15219.4	149817.
COM	3	9125.33	37034.5	-73392.9	91643.6
TAR	3	35609.1	37034.5	-46909.1	118127.
YEO	3	56937.2	37034.5	-25581.0	139455.
STATO					
F	6	45396.7	26187.4	-12952.5	103746.
P	6	44932.5	26187.4	-13416.7	103282.
S	6	62746.0	26187.4	4396.84	121095.

The StatAdvisor
This table shows the mean M13 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M13 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	44932.5	26187.4	X
F	6	45396.7	26187.4	X
S	6	62746.0	26187.4	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		464.234	101633.
F - S		-17349.3	101633.
P - S		-17813.6	101633.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M14 - Type III Sums of Squares

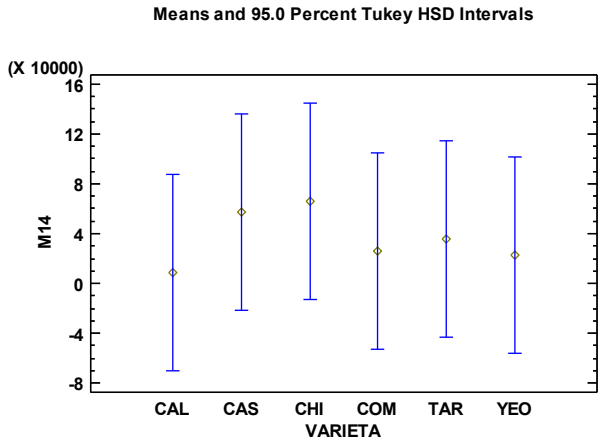
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	7.05575E9	5	1.41115E9	0.45	0.8018
B:STATO	6.05045E9	2	3.02523E9	0.97	0.4112
RESIDUAL	3.11053E10	10	3.11053E9		
TOTAL (CORRECTED)	4.42115E10	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M14 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M14 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M14 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M14 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	36106.8			
VARIETA					
CAL	3	8947.76	32200.0	-62798.6	80694.1
CAS	3	57604.3	32200.0	-14142.0	129351.
CHI	3	65497.8	32200.0	-6248.55	137244.
COM	3	26204.2	32200.0	-45542.1	97950.6
TAR	3	36073.8	32200.0	-35672.6	107820.
YEO	3	22312.9	32200.0	-49433.4	94059.2
STATO					
F	6	11837.7	22768.9	-38894.6	62570.0
P	6	56144.7	22768.9	5412.35	106877.
S	6	40338.0	22768.9	-10394.3	91070.3

The StatAdvisor
This table shows the mean M14 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M14 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
F	6	11837.7	22768.9	X
S	6	40338.0	22768.9	X
P	6	56144.7	22768.9	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		-44307.0	88365.7
F - S		-28500.3	88365.7
P - S		15806.7	88365.7

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

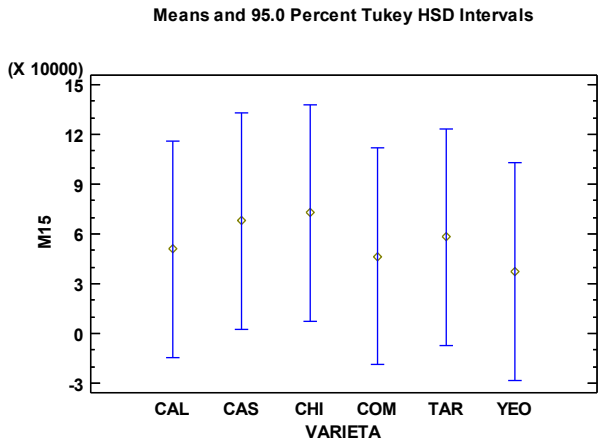
Analysis of Variance for M15 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	2.65121E9	5	5.30241E8	0.25	0.9308
B:STATO	6.61294E9	2	3.30647E9	1.55	0.2584
RESIDUAL	2.12791E10	10	2.12791E9		
TOTAL (CORRECTED)	3.05432E10	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M15 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M15 at the 95.0% confidence level.

Means Plot



This plot shows the mean M15 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M15 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	55507.4			
VARIETA					
CAL	3	50947.5	26632.7	-8394.05	110289.
CAS	3	67739.4	26632.7	8397.87	127081.

Allegato 1: ANOVA varietà-stato

CHI	3	72589.2	26632.7	13247.6	131931.
COM	3	46494.7	26632.7	-12846.8	105836.
TAR	3	58038.7	26632.7	-1302.84	117380.
YEO	3	37234.6	26632.7	-22107.0	96576.1
STATO					
F	6	35784.8	18832.2	-6176.03	77745.6
P	6	81472.8	18832.2	39512.0	123434.
S	6	49264.5	18832.2	7303.68	91225.3

The StatAdvisor
This table shows the mean M15 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M15 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
F	6	35784.8	18832.2	X
S	6	49264.5	18832.2	X
P	6	81472.8	18832.2	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		-45688.0	73087.5
F - S		-13479.7	73087.5
P - S		32208.3	73087.5

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M16 - Type III Sums of Squares

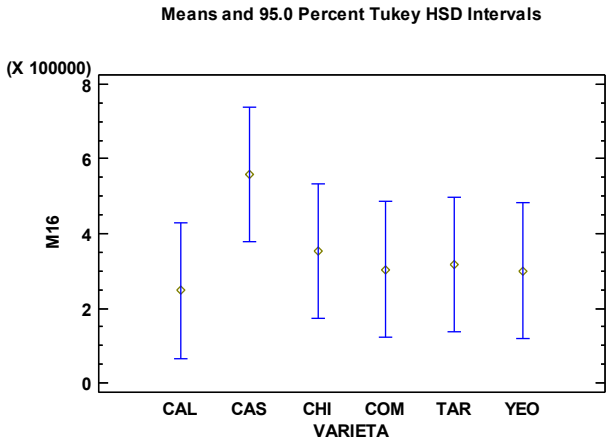
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.7854E11	5	3.57081E10	2.18	0.1383
B:STATO	7.1827E10	2	3.59135E10	2.19	0.1628
RESIDUAL	1.64099E11	10	1.64099E10		
TOTAL (CORRECTED)	4.14467E11	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M16 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M16 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M16 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M16 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	346680.			
VARIETA					
CAL	3	247740.	73959.3	82948.0	412532.
CAS	3	558230.	73959.3	393438.	723022.
CHI	3	353540.	73959.3	188748.	518332.
COM	3	303511.	73959.3	138719.	468303.
TAR	3	317183.	73959.3	152391.	481975.
YEO	3	299877.	73959.3	135085.	464669.
STATO					
F	6	300500.	52297.1	183975.	417026.
P	6	303542.	52297.1	187017.	420068.
S	6	435998.	52297.1	319473.	552524.

The StatAdvisor
This table shows the mean M16 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M16 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
F	6	300500.	52297.1	X
P	6	303542.	52297.1	X
S	6	435998.	52297.1	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		-3042.22	202964.
F - S		-135498.	202964.
P - S		-132456.	202964.

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

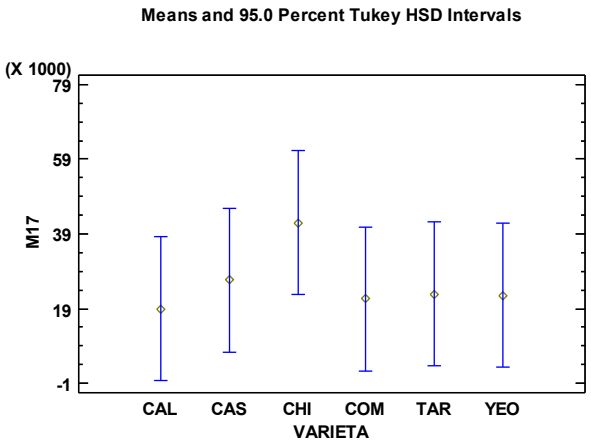
Analysis of Variance for M17 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.03996E9	5	2.07992E8	1.13	0.4068
B:STATO	1.72753E8	2	8.63764E7	0.47	0.6397
RESIDUAL	1.84823E9	10	1.84823E8		
TOTAL (CORRECTED)	3.06094E9	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M17 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M17 at the 95.0% confidence level.

Means Plot



This plot shows the mean M17 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M17 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	25761.8			
VARIETA					
CAL	3	18860.1	7849.05	1371.23	36348.9
CAS	3	26607.9	7849.05	9119.04	44096.7

Allegato 1: ANOVA varietà-stato

CHI	3	41977.2	7849.05	24488.4	59466.1
COM	3	21607.4	7849.05	4118.54	39096.2
TAR	3	22950.5	7849.05	5461.7	40439.3
YEO	3	22568.0	7849.05	5079.2	40056.8
STATO					
F	6	24441.9	5550.12	12075.5	36808.4
P	6	22803.9	5550.12	10437.4	35170.3
S	6	30039.7	5550.12	17673.3	42406.2

The StatAdvisor
This table shows the mean M17 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M17 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	22803.9	5550.12	X
F	6	24441.9	5550.12	X
S	6	30039.7	5550.12	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		1638.04	21539.9
F - S		-5597.82	21539.9
P - S		-7235.86	21539.9

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M18 - Type III Sums of Squares

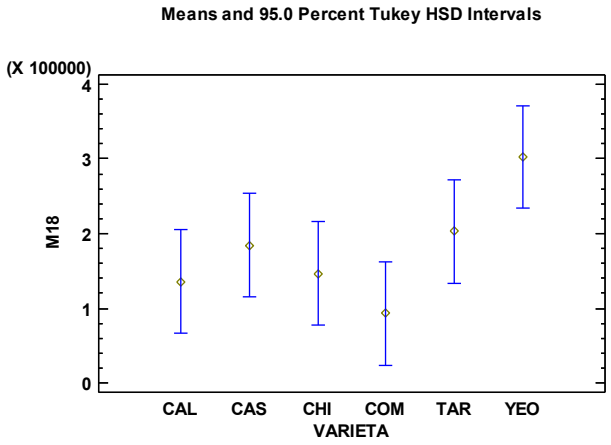
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	7.87261E10	5	1.57452E10	6.63	0.0057
B:STATO	3.12825E10	2	1.56413E10	6.59	0.0149
RESIDUAL	2.37321E10	10	2.37321E9		
TOTAL (CORRECTED)	1.33741E11	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M18 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since 2 P-values are less than 0.05, these factors have a statistically significant effect on M18 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M18 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M18 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	177540.			
VARIETA					
CAL	3	135665.	28126.0	72996.6	198334.
CAS	3	184509.	28126.0	121840.	247178.
CHI	3	146566.	28126.0	83897.7	209235.
COM	3	92934.8	28126.0	30266.1	155603.
TAR	3	202784.	28126.0	140116.	265453.
YEO	3	302781.	28126.0	240112.	365450.
STATO					
F	6	227875.	19888.1	183562.	272189.
P	6	178955.	19888.1	134642.	223269.
S	6	125790.	19888.1	81476.3	170103.

The StatAdvisor
This table shows the mean M18 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M18 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
S	6	125790.	19888.1	X
P	6	178955.	19888.1	XX
F	6	227875.	19888.1	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		48920.4	77185.3
F - S	*	102086.	77185.3
P - S		53165.4	77185.3

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 1 pair, indicating that this pair shows a statistically significant difference at the 95.0% confidence level. At the top of the page, 2 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

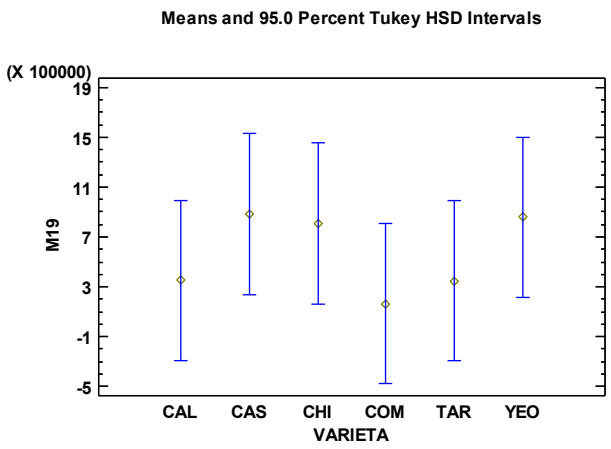
Analysis of Variance for M19 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.501E12	5	3.002E11	1.44	0.2905
B:STATO	2.27583E12	2	1.13792E12	5.47	0.0249
RESIDUAL	2.08218E12	10	2.08218E11		
TOTAL (CORRECTED)	5.85902E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M19 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M19 at the 95.0% confidence level.

Means Plot



This plot shows the mean M19 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M19 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	569016.			
VARIETA					
CAL	3	350650.	263450.	-236356.	937655.
CAS	3	884839.	263450.	297833.	1.47184E6

Allegato 1: ANOVA varietà-stato

CHI	3	808583.	263450.	221577.	1.39559E6
COM	3	164572.	263450.	-422434.	751577.
TAR	3	348104.	263450.	-238901.	935110.
YEO	3	857349.	263450.	270343.	1.44435E6
STATO					
F	6	1.06545E6	186288.	650374.	1.48052E6
P	6	251385.	186288.	-163690.	666461.
S	6	390214.	186288.	-24861.8	805289.

The StatAdvisor
This table shows the mean M19 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M19 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	251385.	186288.	X
S	6	390214.	186288.	XX
F	6	1.06545E6	186288.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P	*	814064.	722980.
F - S		675235.	722980.
P - S		-138829.	722980.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 1 pair, indicating that this pair shows a statistically significant difference at the 95.0% confidence level. At the top of the page, 2 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M20 - Type III Sums of Squares

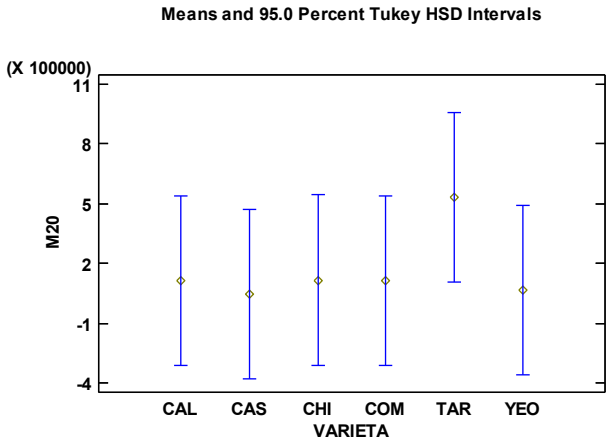
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	5.03107E11	5	1.00621E11	1.11	0.4133
B:STATO	4.37659E11	2	2.1883E11	2.42	0.1394
RESIDUAL	9.06073E11	10	9.06073E10		
TOTAL (CORRECTED)	1.84684E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M20 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M20 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M20 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M20 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	164756.			
VARIETA					
CAL	3	113527.	173788.	-273699.	500753.
CAS	3	45518.8	173788.	-341707.	432745.
CHI	3	116291.	173788.	-270935.	503517.
COM	3	114031.	173788.	-273195.	501257.
TAR	3	533658.	173788.	146432.	920883.
YEO	3	65508.4	173788.	-321717.	452734.
STATO					
F	6	384921.	122887.	111111.	658731.
P	6	43856.2	122887.	-229954.	317666.
S	6	65489.7	122887.	-208320.	339300.

The StatAdvisor
This table shows the mean M20 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M20 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	43856.2	122887.	X
S	6	65489.7	122887.	X
F	6	384921.	122887.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		341065.	476923.
F - S		319431.	476923.
P - S		-21633.5	476923.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

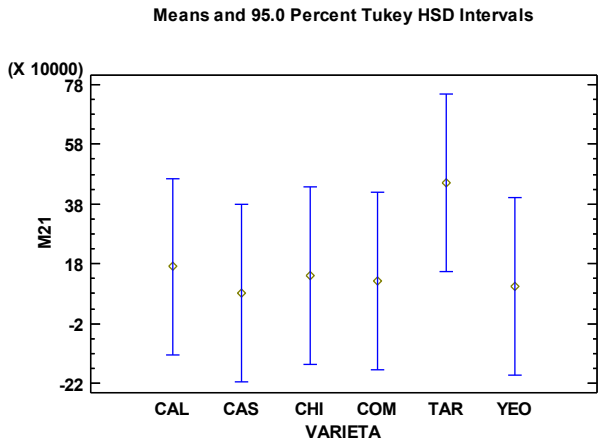
Analysis of Variance for M21 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	2.82251E11	5	5.64501E10	1.29	0.3412
B:STATO	2.6184E11	2	1.3092E11	2.99	0.0958
RESIDUAL	4.37575E11	10	4.37575E10		
TOTAL (CORRECTED)	9.81666E11	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M21 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M21 at the 95.0% confidence level.

Means Plot



This plot shows the mean M21 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M21 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	178803.			
VARIETA					
CAL	3	170628.	120772.	-98469.0	439725.
CAS	3	81379.2	120772.	-187718.	350476.

Allegato 1: ANOVA varietà-stato

CHI	3	141862.	120772.	-127235.	410959.
COM	3	123759.	120772.	-145339.	392856.
TAR	3	451680.	120772.	182583.	720777.
YEO	3	103510.	120772.	-165587.	372607.
STATO					
F	6	345561.	85398.6	155281.	535841.
P	6	64378.5	85398.6	-125902.	254659.
S	6	126469.	85398.6	-63811.3	316750.

The StatAdvisor
This table shows the mean M21 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M21 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	64378.5	85398.6	X
S	6	126469.	85398.6	X
F	6	345561.	85398.6	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		281183.	331431.
F - S		219092.	331431.
P - S		-62090.7	331431.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M22 - Type III Sums of Squares

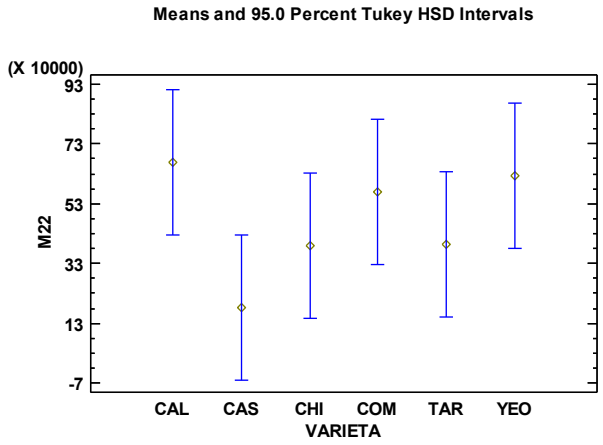
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	5.03039E11	5	1.00608E11	3.43	0.0461
B:STATO	2.59221E11	2	1.2961E11	4.41	0.0423
RESIDUAL	2.93647E11	10	2.93647E10		
TOTAL (CORRECTED)	1.05591E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M22 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since 2 P-values are less than 0.05, these factors have a statistically significant effect on M22 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M22 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M22 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	471416.			
VARIETA					
CAL	3	667806.	98935.5	447363.	888248.
CAS	3	181894.	98935.5	-38548.0	402337.
CHI	3	389993.	98935.5	169551.	610436.
COM	3	568018.	98935.5	347576.	788461.
TAR	3	395743.	98935.5	175301.	616186.
YEO	3	625039.	98935.5	404597.	845481.
STATO					
F	6	494716.	69957.9	338840.	650593.
P	6	314182.	69957.9	158305.	470058.
S	6	605349.	69957.9	449472.	761225.

The StatAdvisor
This table shows the mean M22 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M22 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	314182.	69957.9	X
F	6	494716.	69957.9	XX
S	6	605349.	69957.9	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		180535.	271506.
F - S		-110632.	271506.
P - S	*	-291167.	271506.

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 1 pair, indicating that this pair shows a statistically significant difference at the 95.0% confidence level. At the top of the page, 2 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

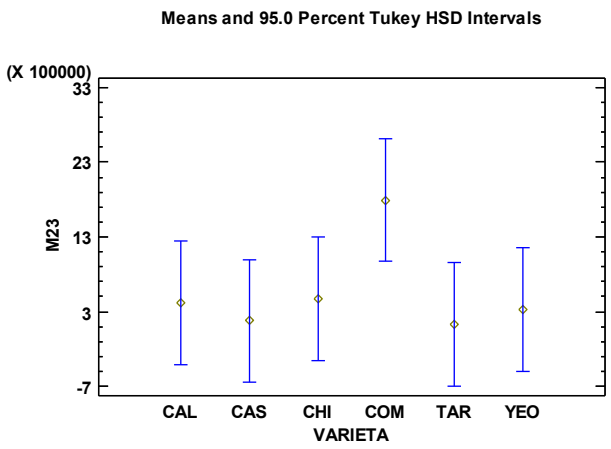
Analysis of Variance for M23 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	5.82061E12	5	1.16412E12	3.43	0.0461
B:STATO	9.86557E11	2	4.93278E11	1.45	0.2794
RESIDUAL	3.39598E12	10	3.39598E11		
TOTAL (CORRECTED)	1.02031E13	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M23 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M23 at the 95.0% confidence level.

Means Plot



This plot shows the mean M23 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M23 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	551466.			
VARIETA					
CAL	3	419100.	336451.	-330562.	1.16876E6
CAS	3	175225.	336451.	-574437.	924886.

Allegato 1: ANOVA varietà-stato

CHI	3	468928.	336451.	-280734.	1.21859E6
COM	3	1.79359E6	336451.	1.04393E6	2.54325E6
TAR	3	127078.	336451.	-622583.	876740.
YEO	3	324879.	336451.	-424783.	1.07454E6
STATO					
F	6	275441.	237907.	-254649.	805532.
P	6	531141.	237907.	1050.14	1.06123E6
S	6	847816.	237907.	317725.	1.37791E6

The StatAdvisor
This table shows the mean M23 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M23 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
F	6	275441.	237907.	X
P	6	531141.	237907.	X
S	6	847816.	237907.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		-255700.	923314.
F - S		-572375.	923314.
P - S		-316675.	923314.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M24 - Type III Sums of Squares

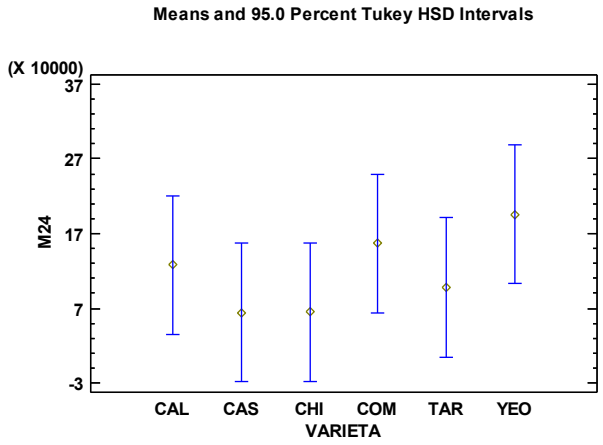
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	4.11646E10	5	8.23293E9	1.91	0.1803
B:STATO	1.13514E10	2	5.67572E9	1.31	0.3114
RESIDUAL	4.31965E10	10	4.31965E9		
TOTAL (CORRECTED)	9.57126E10	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M24 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M24 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M24 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M24 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	117917.			
VARIETA					
CAL	3	128085.	37945.8	43535.8	212633.
CAS	3	64465.1	37945.8	-20083.6	149014.
CHI	3	64785.0	37945.8	-19763.7	149334.
COM	3	156638.	37945.8	72089.2	241187.
TAR	3	97904.3	37945.8	13355.6	182453.
YEO	3	195623.	37945.8	111074.	280172.
STATO					
F	6	105027.	26831.7	45242.4	164812.
P	6	153021.	26831.7	93235.6	212806.
S	6	95702.0	26831.7	35917.1	155487.

The StatAdvisor
This table shows the mean M24 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M24 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
S	6	95702.0	26831.7	X
F	6	105027.	26831.7	X
P	6	153021.	26831.7	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		-47993.2	104134.
F - S		9325.33	104134.
P - S		57318.5	104134.

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

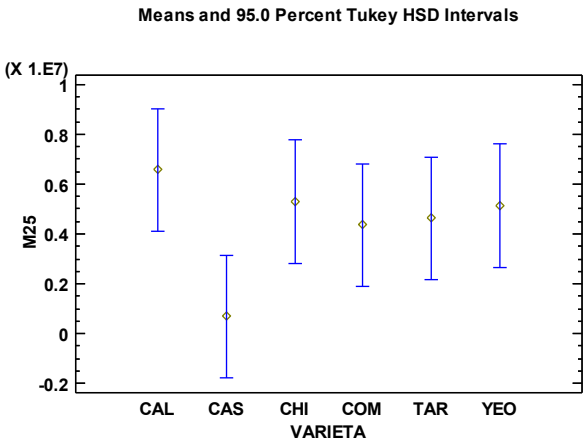
Analysis of Variance for M25 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	5.97546E13	5	1.19509E13	3.93	0.0312
B:STATO	1.03338E13	2	5.16691E12	1.70	0.2315
RESIDUAL	3.0396E13	10	3.0396E12		
TOTAL (CORRECTED)	1.00484E14	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M25 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M25 at the 95.0% confidence level.

Means Plot



This plot shows the mean M25 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M25 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	4.44859E6			
VARIETA					
CAL	3	6.56687E6	1.00658E6	4.32407E6	8.80967E6
CAS	3	683793.	1.00658E6	-1.55901E6	2.9266E6

Allegato 1: ANOVA varietà-stato

CHI	3	5.30518E6	1.00658E6	3.06238E6	7.54798E6
COM	3	4.36168E6	1.00658E6	2.11888E6	6.60448E6
TAR	3	4.6304E6	1.00658E6	2.3876E6	6.87321E6
YEO	3	5.14359E6	1.00658E6	2.90078E6	7.38639E6
STATO					
F	6	4.58998E6	711759.	3.00408E6	6.17588E6
P	6	3.45802E6	711759.	1.87212E6	5.04392E6
S	6	5.29776E6	711759.	3.71186E6	6.88366E6

The StatAdvisor
This table shows the mean M25 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M25 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	3.45802E6	711759.	X
F	6	4.58998E6	711759.	X
S	6	5.29776E6	711759.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		1.13196E6	2.76233E6
F - S		-707775.	2.76233E6
P - S		-1.83974E6	2.76233E6

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M26 - Type III Sums of Squares

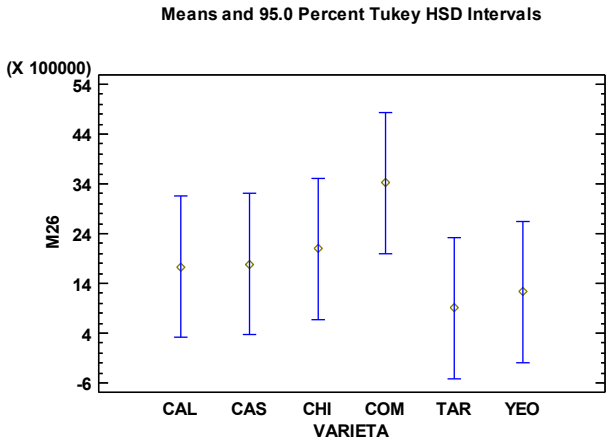
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.14465E13	5	2.2893E12	2.27	0.1265
B:STATO	3.28359E12	2	1.6418E12	1.63	0.2444
RESIDUAL	1.00891E13	10	1.00891E12		
TOTAL (CORRECTED)	2.48192E13	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M26 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M26 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M26 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M26 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	1.86231E6			
VARIETA					
CAL	3	1.7375E6	579917.	445359.	3.02963E6
CAS	3	1.78667E6	579917.	494532.	3.07881E6
CHI	3	2.09085E6	579917.	798713.	3.38299E6
COM	3	3.42132E6	579917.	2.12919E6	4.71346E6
TAR	3	907575.	579917.	-384563.	2.19971E6
YEO	3	1.22991E6	579917.	-62224.5	2.52205E6
STATO					
F	6	2.05837E6	410063.	1.14469E6	2.97205E6
P	6	1.2695E6	410063.	355819.	2.18318E6
S	6	2.25905E6	410063.	1.34537E6	3.17273E6

The StatAdvisor
This table shows the mean M26 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M26 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	1.2695E6	410063.	X
F	6	2.05837E6	410063.	X
S	6	2.25905E6	410063.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		788872.	1.59145E6
F - S		-200677.	1.59145E6
P - S		-989549.	1.59145E6

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

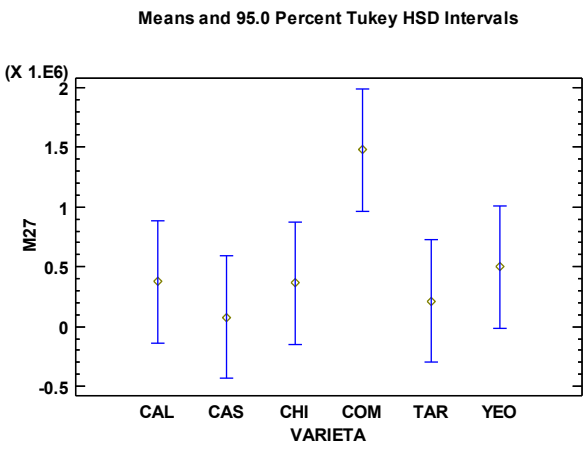
Analysis of Variance for M27 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	3.75796E12	5	7.51592E11	5.76	0.0093
B:STATO	1.29014E11	2	6.45069E10	0.49	0.6242
RESIDUAL	1.30506E12	10	1.30506E11		
TOTAL (CORRECTED)	5.19203E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M27 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M27 at the 95.0% confidence level.

Means Plot



This plot shows the mean M27 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M27 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	501932.			
VARIETA					
CAL	3	378134.	208571.	-86592.7	842861.
CAS	3	78966.2	208571.	-385761.	543693.

Allegato 1: ANOVA varietà-stato

CHI	3	362279.	208571.	-102448.	827006.
COM	3	1.47916E6	208571.	1.01443E6	1.94388E6
TAR	3	212178.	208571.	-252549.	676905.
YEO	3	500879.	208571.	36151.7	965605.
STATO					
F	6	474147.	147482.	145535.	802758.
P	6	414967.	147482.	86355.5	743579.
S	6	616681.	147482.	288070.	945293.

The StatAdvisor
This table shows the mean M27 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M27 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	414967.	147482.	X
F	6	474147.	147482.	X
S	6	616681.	147482.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		59180.0	572376.
F - S		-142534.	572376.
P - S		-201714.	572376.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M28 - Type III Sums of Squares

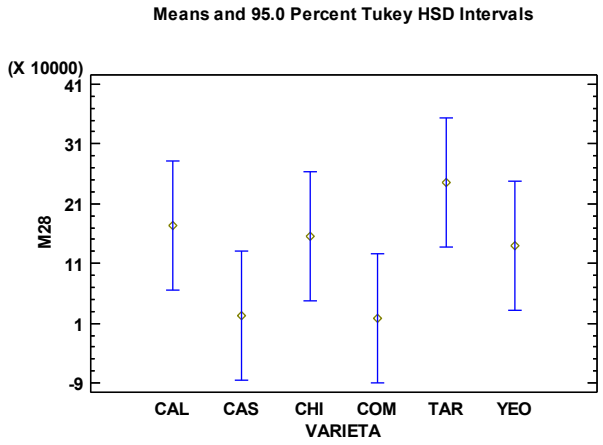
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.18656E11	5	2.37313E10	4.08	0.0280
B:STATO	1.73548E10	2	8.6774E9	1.49	0.2711
RESIDUAL	5.81755E10	10	5.81755E9		
TOTAL (CORRECTED)	1.94187E11	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M28 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M28 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M28 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M28 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	125677.			
VARIETA					
CAL	3	172962.	44036.1	74843.5	271081.
CAS	3	22805.6	44036.1	-75313.3	120924.
CHI	3	154619.	44036.1	56500.5	252738.
COM	3	18709.9	44036.1	-79408.9	116829.
TAR	3	245056.	44036.1	146938.	343175.
YEO	3	139911.	44036.1	41792.5	238030.
STATO					
F	6	123030.	31138.3	53649.6	192411.
P	6	89041.0	31138.3	19660.5	158422.
S	6	164961.	31138.3	95580.9	234342.

The StatAdvisor
This table shows the mean M28 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M28 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	89041.0	31138.3	X
F	6	123030.	31138.3	X
S	6	164961.	31138.3	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		33989.1	120847.
F - S		-41931.3	120847.
P - S		-75920.4	120847.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

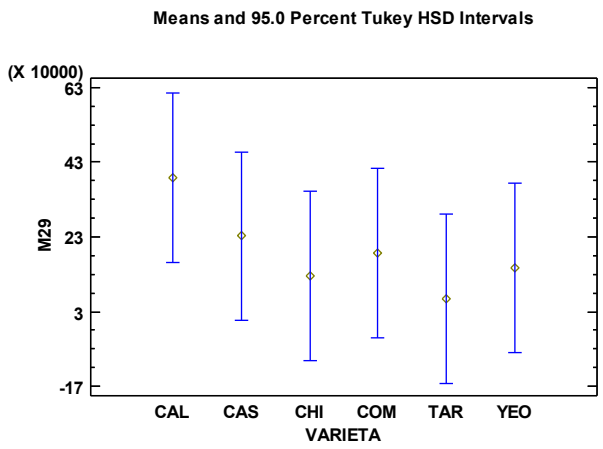
Analysis of Variance for M29 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.88296E11	5	3.76592E10	1.47	0.2822
B:STATO	3.80147E11	2	1.90074E11	7.42	0.0106
RESIDUAL	2.56282E11	10	2.56282E10		
TOTAL (CORRECTED)	8.24725E11	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M29 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M29 at the 95.0% confidence level.

Means Plot



This plot shows the mean M29 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M29 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	190718.			
VARIETA					
CAL	3	388369.	92426.9	182429.	594310.
CAS	3	231913.	92426.9	25972.2	437853.

Allegato 1: ANOVA varietà-stato

CHI	3	125652.	92426.9	-80288.2	331593.
COM	3	187193.	92426.9	-18747.7	393133.
TAR	3	65199.0	92426.9	-140741.	271139.
YEO	3	145982.	92426.9	-59958.1	351923.
STATO					
F	6	396100.	65355.7	250478.	541722.
P	6	81489.5	65355.7	-64132.5	227111.
S	6	94565.1	65355.7	-51056.8	240187.

The StatAdvisor
This table shows the mean M29 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M29 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	81489.5	65355.7	X
S	6	94565.1	65355.7	X
F	6	396100.	65355.7	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P	*	314610.	253645.
F - S	*	301534.	253645.
P - S		-13075.7	253645.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 2 pairs, indicating that these pairs show statistically significant differences at the 95.0% confidence level. At the top of the page, 2 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M30 - Type III Sums of Squares

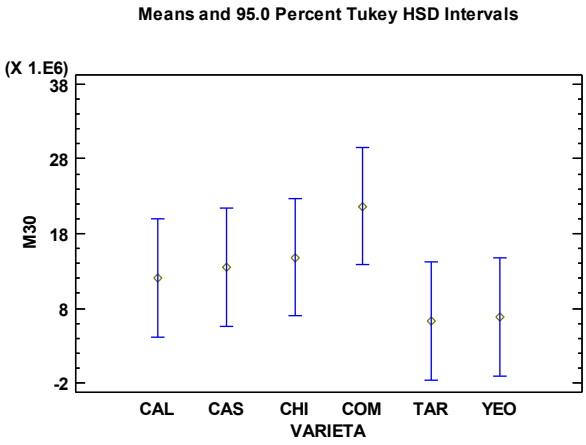
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	4.84036E14	5	9.68072E13	3.11	0.0596
B:STATO	5.30344E13	2	2.65172E13	0.85	0.4550
RESIDUAL	3.10952E14	10	3.10952E13		
TOTAL (CORRECTED)	8.48022E14	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M30 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M30 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M30 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M30 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	1.25281E7			
VARIETA					
CAL	3	1.2036E7	3.21948E6	4.86249E6	1.92094E7
CAS	3	1.34546E7	3.21948E6	6.28113E6	2.06281E7
CHI	3	1.48345E7	3.21948E6	7.66101E6	2.20079E7
COM	3	2.16894E7	3.21948E6	1.45159E7	2.88629E7
TAR	3	6.29088E6	3.21948E6	-882591.	1.34643E7
YEO	3	6.86306E6	3.21948E6	-310406.	1.40365E7
STATO					
F	6	1.45435E7	2.27652E6	9.4711E6	1.96159E7
P	6	1.03486E7	2.27652E6	5.27618E6	1.5421E7
S	6	1.26921E7	2.27652E6	7.6197E6	1.77645E7

The StatAdvisor
This table shows the mean M30 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M30 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	1.03486E7	2.27652E6	X
S	6	1.26921E7	2.27652E6	X
F	6	1.45435E7	2.27652E6	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		4.19493E6	8.83513E6
F - S		1.8514E6	8.83513E6
P - S		-2.34352E6	8.83513E6

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

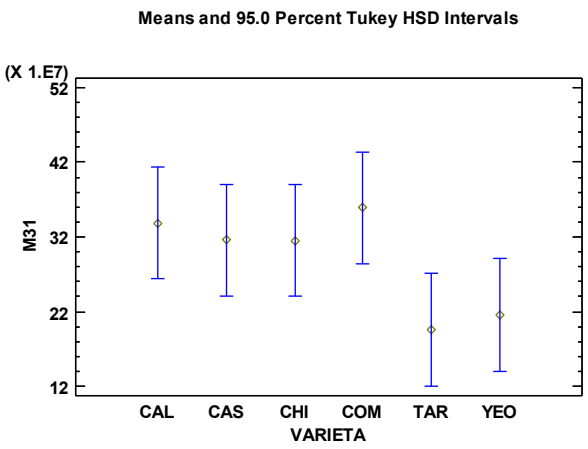
Analysis of Variance for M31 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	6.82833E16	5	1.36567E16	4.88	0.0161
B:STATO	3.19647E16	2	1.59824E16	5.71	0.0221
RESIDUAL	2.79752E16	10	2.79752E15		
TOTAL (CORRECTED)	1.28223E17	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M31 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since 2 P-values are less than 0.05, these factors have a statistically significant effect on M31 at the 95.0% confidence level.

Means Plot



This plot shows the mean M31 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M31 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	2.89907E8			
VARIETA					
CAL	3	3.38363E8	3.0537E7	2.70322E8	4.06404E8
CAS	3	3.15836E8	3.0537E7	2.47796E8	3.83877E8

Allegato 1: ANOVA varietà-stato

CHI	3	3.14986E8	3.0537E7	2.46945E8	3.83027E8
COM	3	3.58777E8	3.0537E7	2.90736E8	4.26817E8
TAR	3	1.95724E8	3.0537E7	1.27683E8	2.63764E8
YEO	3	2.15757E8	3.0537E7	1.47716E8	2.83797E8
STATO					
F	6	3.36273E8	2.15929E7	2.88161E8	3.84385E8
P	6	2.34299E8	2.15929E7	1.86187E8	2.82412E8
S	6	2.99148E8	2.15929E7	2.51036E8	3.47261E8

The StatAdvisor
This table shows the mean M31 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M31 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	2.34299E8	2.15929E7	X
S	6	2.99148E8	2.15929E7	XX
F	6	3.36273E8	2.15929E7	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P	*	1.01974E8	8.38018E7
F - S		3.7125E7	8.38018E7
P - S		-6.4849E7	8.38018E7

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 1 pair, indicating that this pair shows a statistically significant difference at the 95.0% confidence level. At the top of the page, 2 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M32 - Type III Sums of Squares

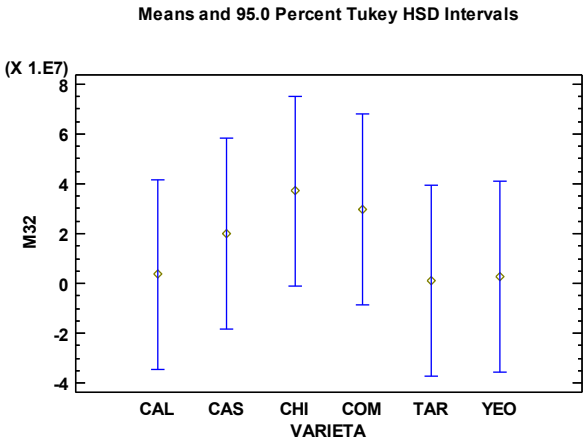
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	3.57687E15	5	7.15374E14	0.98	0.4760
B:STATO	2.19936E14	2	1.09968E14	0.15	0.8623
RESIDUAL	7.3128E15	10	7.3128E14		
TOTAL (CORRECTED)	1.11096E16	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M32 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M32 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M32 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M32 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	1.56903E7			
VARIETA					
CAL	3	3.57643E6	1.56128E7	-3.12112E7	3.8364E7
CAS	3	1.97892E7	1.56128E7	-1.49984E7	5.45768E7
CHI	3	3.70327E7	1.56128E7	2.24515E6	7.18203E7
COM	3	2.97302E7	1.56128E7	-5.05735E6	6.45178E7
TAR	3	1.10132E6	1.56128E7	-3.36863E7	3.58889E7
YEO	3	2.91198E6	1.56128E7	-3.18756E7	3.76996E7
STATO					
F	6	1.84161E7	1.10399E7	-6.18242E6	4.30147E7
P	6	1.78989E7	1.10399E7	-6.69964E6	4.24974E7
S	6	1.07559E7	1.10399E7	-1.38426E7	3.53545E7

The StatAdvisor
This table shows the mean M32 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M32 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
S	6	1.07559E7	1.10399E7	X
P	6	1.78989E7	1.10399E7	X
F	6	1.84161E7	1.10399E7	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		517224.	4.28458E7
F - S		7.66019E6	4.28458E7
P - S		7.14297E6	4.28458E7

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

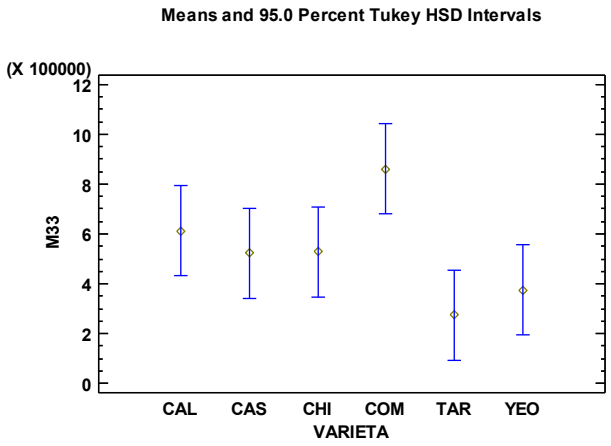
Analysis of Variance for M33 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	6.18036E11	5	1.23607E11	7.61	0.0034
B:STATO	4.48906E11	2	2.24453E11	13.82	0.0013
RESIDUAL	1.62405E11	10	1.62405E10		
TOTAL (CORRECTED)	1.22935E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M33 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since 2 P-values are less than 0.05, these factors have a statistically significant effect on M33 at the 95.0% confidence level.

Means Plot



This plot shows the mean M33 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M33 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	528470.			
VARIETA					
CAL	3	611891.	73576.5	447951.	775830.
CAS	3	521779.	73576.5	357840.	685718.

Allegato 1: ANOVA varietà-stato

CHI	3	527665.	73576.5	363725.	691604.
COM	3	860913.	73576.5	696974.	1.02485E6
TAR	3	273749.	73576.5	109810.	437688.
YEO	3	374826.	73576.5	210887.	538765.
STATO					
F	6	673073.	52026.4	557151.	788995.
P	6	308770.	52026.4	192848.	424693.
S	6	603568.	52026.4	487645.	719490.

The StatAdvisor
This table shows the mean M33 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M33 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	308770.	52026.4	X
S	6	603568.	52026.4	X
F	6	673073.	52026.4	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P	*	364303.	201914.
F - S		69505.4	201914.
P - S	*	-294797.	201914.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 2 pairs, indicating that these pairs show statistically significant differences at the 95.0% confidence level. At the top of the page, 2 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M34 - Type III Sums of Squares

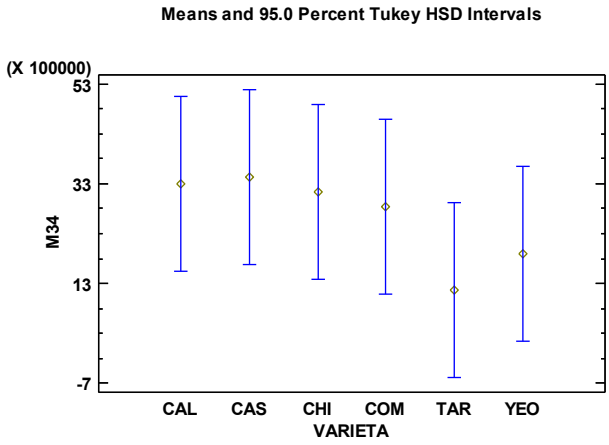
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.23368E13	5	2.46735E12	1.61	0.2448
B:STATO	8.23423E12	2	4.11712E12	2.68	0.1170
RESIDUAL	1.5367E13	10	1.5367E12		
TOTAL (CORRECTED)	3.5938E13	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M34 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M34 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M34 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M34 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	2.62913E6			
VARIETA					
CAL	3	3.28913E6	715706.	1.69443E6	4.88382E6
CAS	3	3.44593E6	715706.	1.85124E6	5.04063E6
CHI	3	3.14466E6	715706.	1.54996E6	4.73935E6
COM	3	2.83631E6	715706.	1.24161E6	4.43101E6
TAR	3	1.15398E6	715706.	-440717.	2.74867E6
YEO	3	1.90475E6	715706.	310054.	3.49945E6
STATO					
F	6	3.5856E6	506080.	2.45798E6	4.71322E6
P	6	2.15864E6	506080.	1.03102E6	3.28626E6
S	6	2.14314E6	506080.	1.01552E6	3.27076E6

The StatAdvisor
This table shows the mean M34 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M34 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
S	6	2.14314E6	506080.	X
P	6	2.15864E6	506080.	X
F	6	3.5856E6	506080.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		1.42695E6	1.96409E6
F - S		1.44246E6	1.96409E6
P - S		15502.4	1.96409E6

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

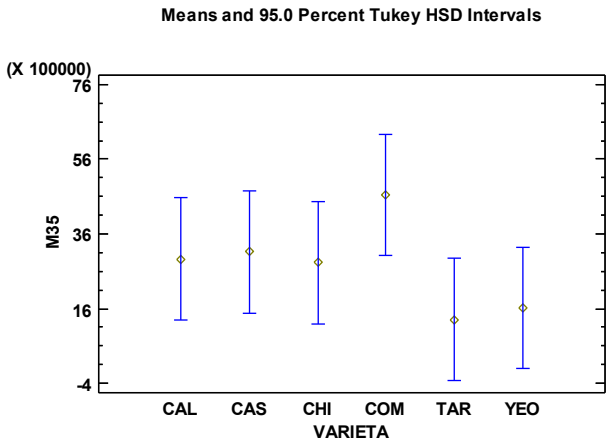
Analysis of Variance for M35 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	2.13492E13	5	4.26983E12	3.19	0.0557
B:STATO	5.23151E12	2	2.61575E12	1.96	0.1917
RESIDUAL	1.33641E13	10	1.33641E12		
TOTAL (CORRECTED)	3.99448E13	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M35 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M35 at the 95.0% confidence level.

Means Plot



This plot shows the mean M35 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M35 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	2.74436E6			
VARIETA					
CAL	3	2.9239E6	667436.	1.43676E6	4.41105E6
CAS	3	3.12989E6	667436.	1.64275E6	4.61704E6

Allegato 1: ANOVA varietà-stato

CHI	3	2.83401E6	667436.	1.34687E6	4.32115E6
COM	3	4.64551E6	667436.	3.15836E6	6.13265E6
TAR	3	1.31341E6	667436.	-173736.	2.80055E6
YEO	3	1.61942E6	667436.	132273.	3.10656E6
STATO					
F	6	3.35755E6	471949.	2.30598E6	4.40912E6
P	6	2.04539E6	471949.	993818.	3.09696E6
S	6	2.83014E6	471949.	1.77857E6	3.8817E6

The StatAdvisor
This table shows the mean M35 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M35 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	2.04539E6	471949.	X
S	6	2.83014E6	471949.	X
F	6	3.35755E6	471949.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		1.31216E6	1.83163E6
F - S		527412.	1.83163E6
P - S		-784748.	1.83163E6

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M36 - Type III Sums of Squares

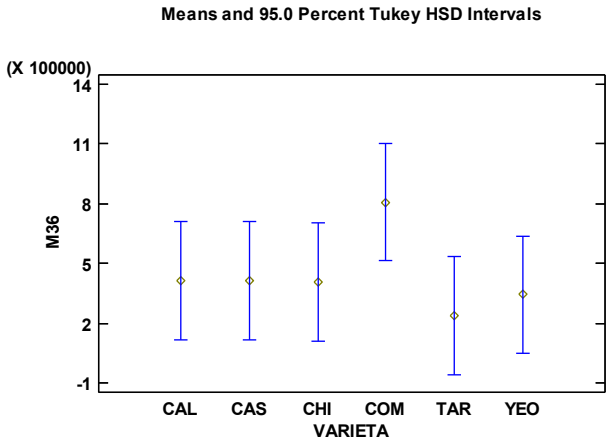
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	5.64424E11	5	1.12885E11	2.60	0.0933
B:STATO	2.52033E11	2	1.26017E11	2.90	0.1015
RESIDUAL	4.34508E11	10	4.34508E10		
TOTAL (CORRECTED)	1.25097E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M36 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M36 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M36 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M36 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	437260.			
VARIETA					
CAL	3	413619.	120348.	145466.	681771.
CAS	3	412992.	120348.	144839.	681144.
CHI	3	408021.	120348.	139869.	676174.
COM	3	807897.	120348.	539745.	1.07605E6
TAR	3	237136.	120348.	-31016.0	505289.
YEO	3	343893.	120348.	75740.8	612045.
STATO					
F	6	464916.	85098.8	275303.	654528.
P	6	280501.	85098.8	90888.9	470114.
S	6	566362.	85098.8	376750.	755974.

The StatAdvisor
This table shows the mean M36 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M36 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	280501.	85098.8	X
F	6	464916.	85098.8	X
S	6	566362.	85098.8	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		184414.	330267.
F - S		-101446.	330267.
P - S		-285861.	330267.

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

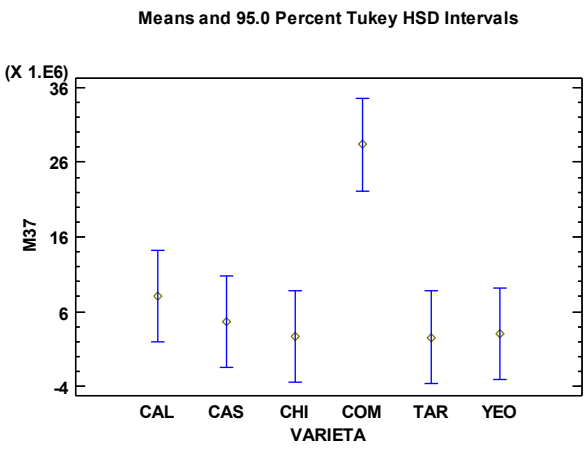
Analysis of Variance for M37 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.52278E15	5	3.04556E14	16.24	0.0002
B:STATO	4.26913E13	2	2.13456E13	1.14	0.3586
RESIDUAL	1.87505E14	10	1.87505E13		
TOTAL (CORRECTED)	1.75298E15	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M37 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M37 at the 95.0% confidence level.

Means Plot



This plot shows the mean M37 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M37 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	8.21365E6			
VARIETA					
CAL	3	8.11504E6	2.50003E6	2.54461E6	1.36855E7
CAS	3	4.60894E6	2.50003E6	-961486.	1.01794E7

Allegato 1: ANOVA varietà-stato

CHI	3	2.66381E6	2.50003E6	-2.90662E6	8.23424E6
COM	3	2.83308E7	2.50003E6	2.27603E7	3.39012E7
TAR	3	2.58395E6	2.50003E6	-2.98648E6	8.15437E6
YEO	3	2.97941E6	2.50003E6	-2.59102E6	8.54984E6
STATO					
F	6	7.90266E6	1.76779E6	3.96377E6	1.18415E7
P	6	6.50232E6	1.76779E6	2.56343E6	1.04412E7
S	6	1.0236E7	1.76779E6	6.2971E6	1.41749E7

The StatAdvisor
This table shows the mean M37 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M37 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	6.50232E6	1.76779E6	X
F	6	7.90266E6	1.76779E6	X
S	6	1.0236E7	1.76779E6	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		1.40034E6	6.86076E6
F - S		-2.33332E6	6.86076E6
P - S		-3.73367E6	6.86076E6

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M38 - Type III Sums of Squares

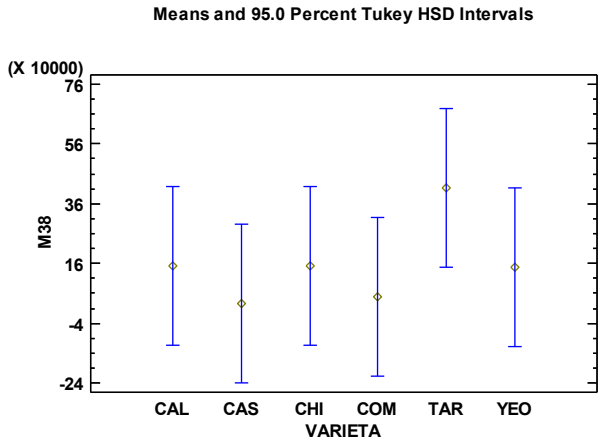
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	2.85203E11	5	5.70405E10	1.63	0.2397
B:STATO	4.47614E10	2	2.23807E10	0.64	0.5486
RESIDUAL	3.50798E11	10	3.50798E10		
TOTAL (CORRECTED)	6.80762E11	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M38 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M38 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M38 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M38 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	156745.			
VARIETA					
CAL	3	153657.	108135.	-87284.2	394598.
CAS	3	25594.6	108135.	-215347.	266536.
CHI	3	150791.	108135.	-90150.3	391732.
COM	3	49678.4	108135.	-191263.	290620.
TAR	3	414148.	108135.	173206.	655089.
YEO	3	146604.	108135.	-94337.0	387545.
STATO					
F	6	108345.	76463.3	-62026.1	278716.
P	6	136525.	76463.3	-33845.9	306896.
S	6	225366.	76463.3	54994.8	395737.

The StatAdvisor
This table shows the mean M38 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M38 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
F	6	108345.	76463.3	X
P	6	136525.	76463.3	X
S	6	225366.	76463.3	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		-28180.2	296753.
F - S		-117021.	296753.
P - S		-88840.7	296753.

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

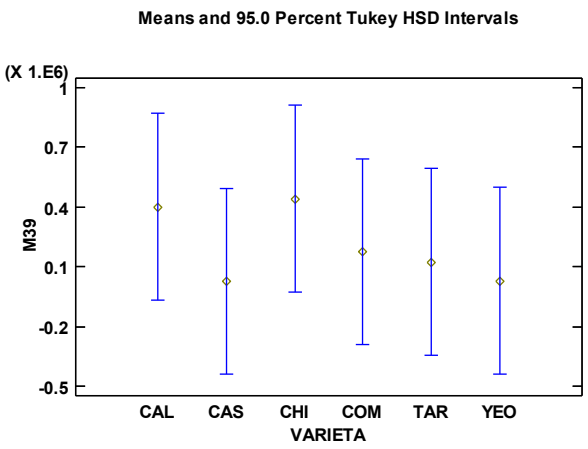
Analysis of Variance for M39 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	4.91791E11	5	9.83581E10	0.90	0.5176
B:STATO	1.70673E11	2	8.53363E10	0.78	0.4844
RESIDUAL	1.0939E12	10	1.0939E11		
TOTAL (CORRECTED)	1.75637E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M39 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M39 at the 95.0% confidence level.

Means Plot



This plot shows the mean M39 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M39 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	199468.			
VARIETA					
CAL	3	400751.	190954.	-24721.8	826224.
CAS	3	26630.5	190954.	-398842.	452103.

Allegato 1: ANOVA varietà-stato

CHI	3	440613.	190954.	15139.8	866086.
COM	3	176297.	190954.	-249176.	601770.
TAR	3	123662.	190954.	-301811.	549134.
YEO	3	28856.6	190954.	-396616.	454330.
STATO					
F	6	178358.	135025.	-122497.	479213.
P	6	92173.9	135025.	-208681.	393029.
S	6	327873.	135025.	27018.0	628728.

The StatAdvisor
This table shows the mean M39 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M39 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	92173.9	135025.	X
F	6	178358.	135025.	X
S	6	327873.	135025.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		86183.9	524030.
F - S		-149515.	524030.
P - S		-235699.	524030.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M40 - Type III Sums of Squares

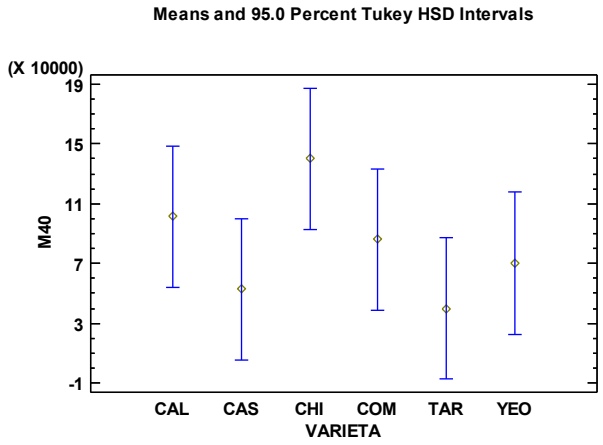
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.95826E10	5	3.91653E9	3.49	0.0438
B:STATO	5.19916E9	2	2.59958E9	2.32	0.1490
RESIDUAL	1.12218E10	10	1.12218E9		
TOTAL (CORRECTED)	3.60036E10	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M40 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M40 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M40 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M40 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	81722.3			
VARIETA					
CAL	3	101254.	19340.6	58160.4	144348.
CAS	3	52915.8	19340.6	9822.16	96009.4
CHI	3	140138.	19340.6	97044.2	183231.
COM	3	86030.9	19340.6	42937.3	129125.
TAR	3	39883.1	19340.6	-3210.52	82976.7
YEO	3	70112.4	19340.6	27018.8	113206.
STATO					
F	6	101929.	13675.9	71457.7	132401.
P	6	82889.0	13675.9	52417.2	113361.
S	6	60348.6	13675.9	29876.8	90820.4

The StatAdvisor
This table shows the mean M40 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M40 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
S	6	60348.6	13675.9	X
P	6	82889.0	13675.9	X
F	6	101929.	13675.9	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		19040.5	53075.8
F - S		41580.9	53075.8
P - S		22540.4	53075.8

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

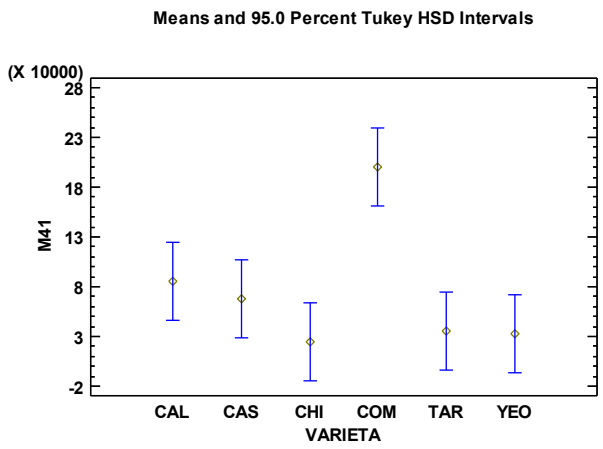
Analysis of Variance for M41 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	6.54229E10	5	1.30846E10	17.13	0.0001
B:STATO	1.84565E9	2	9.22827E8	1.21	0.3390
RESIDUAL	7.64045E9	10	7.64045E8		
TOTAL (CORRECTED)	7.4909E10	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M41 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M41 at the 95.0% confidence level.

Means Plot



This plot shows the mean M41 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M41 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	74417.8			
VARIETA					
CAL	3	84919.1	15958.7	49360.7	120477.
CAS	3	68049.1	15958.7	32490.7	103608.

Allegato 1: ANOVA varietà-stato

CHI	3	25331.0	15958.7	-10227.4	60889.4
COM	3	200668.	15958.7	165110.	236227.
TAR	3	35093.3	15958.7	-465.046	70651.7
YEO	3	32446.0	15958.7	-3112.43	68004.3
STATO					
F	6	62235.6	11284.5	37092.0	87379.1
P	6	73989.8	11284.5	48846.3	99133.4
S	6	87028.1	11284.5	61884.5	112172.

The StatAdvisor
This table shows the mean M41 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M41 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
F	6	62235.6	11284.5	X
P	6	73989.8	11284.5	X
S	6	87028.1	11284.5	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		-11754.3	43795.1
F - S		-24792.5	43795.1
P - S		-13038.2	43795.1

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M42 - Type III Sums of Squares

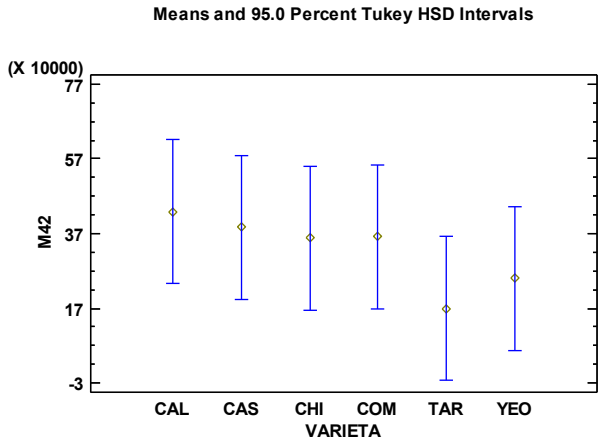
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.40943E11	5	2.81886E10	1.52	0.2665
B:STATO	1.74995E11	2	8.74976E10	4.73	0.0358
RESIDUAL	1.84954E11	10	1.84954E10		
TOTAL (CORRECTED)	5.00892E11	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M42 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M42 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M42 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M42 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	325782.			
VARIETA					
CAL	3	428718.	78518.3	253768.	603668.
CAS	3	387219.	78518.3	212269.	562169.
CHI	3	357696.	78518.3	182745.	532646.
COM	3	361753.	78518.3	186803.	536703.
TAR	3	168872.	78518.3	-6077.89	343822.
YEO	3	250433.	78518.3	75483.1	425383.
STATO					
F	6	465222.	55520.8	341514.	588931.
P	6	255652.	55520.8	131943.	379360.
S	6	256471.	55520.8	132763.	380180.

The StatAdvisor
This table shows the mean M42 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M42 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	255652.	55520.8	X
S	6	256471.	55520.8	X
F	6	465222.	55520.8	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		209571.	215476.
F - S		208751.	215476.
P - S		-819.867	215476.

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

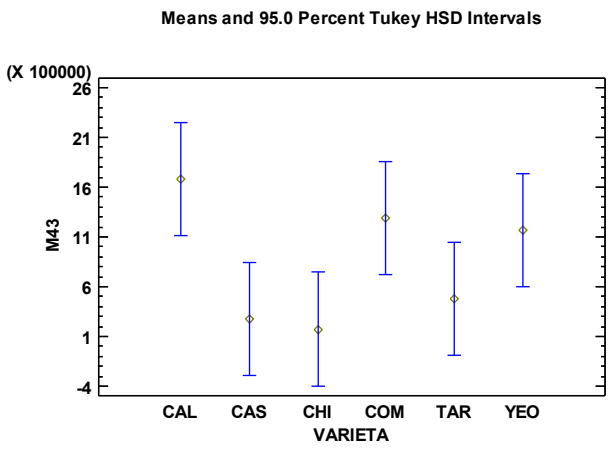
Analysis of Variance for M43 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	5.72675E12	5	1.14535E12	7.10	0.0044
B:STATO	1.33159E12	2	6.65795E11	4.13	0.0493
RESIDUAL	1.61271E12	10	1.61271E11		
TOTAL (CORRECTED)	8.67105E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M43 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since 2 P-values are less than 0.05, these factors have a statistically significant effect on M43 at the 95.0% confidence level.

Means Plot



This plot shows the mean M43 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M43 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	843621.			
VARIETA					
CAL	3	1.68508E6	231855.	1.16847E6	2.20169E6
CAS	3	276047.	231855.	-240560.	792654.

Allegato 1: ANOVA varietà-stato

CHI	3	173878.	231855.	-342730.	690485.
COM	3	1.2839E6	231855.	767290.	1.8005E6
TAR	3	478383.	231855.	-38224.2	994991.
YEO	3	1.16444E6	231855.	647833.	1.68105E6
STATO					
F	6	1.14865E6	163947.	783350.	1.51394E6
P	6	488166.	163947.	122870.	853463.
S	6	894050.	163947.	528753.	1.25935E6

The StatAdvisor
This table shows the mean M43 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M43 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	488166.	163947.	X
S	6	894050.	163947.	XX
F	6	1.14865E6	163947.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P	*	660480.	636275.
F - S		254597.	636275.
P - S		-405884.	636275.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 1 pair, indicating that this pair shows a statistically significant difference at the 95.0% confidence level. At the top of the page, 2 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M44 - Type III Sums of Squares

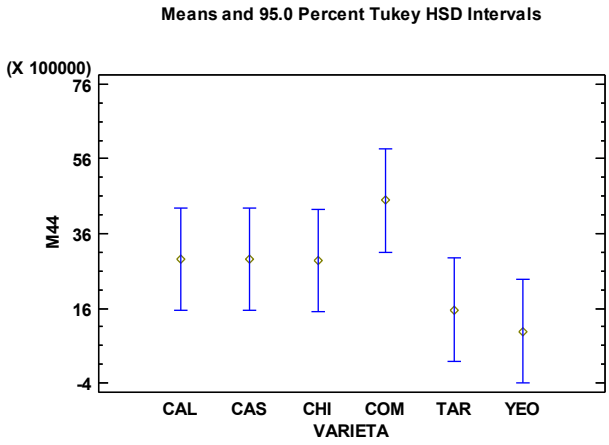
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	2.25846E13	5	4.51693E12	4.77	0.0173
B:STATO	2.38212E12	2	1.19106E12	1.26	0.3259
RESIDUAL	9.47605E12	10	9.47605E11		
TOTAL (CORRECTED)	3.44428E13	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M44 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M44 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M44 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M44 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	2.62093E6			
VARIETA					
CAL	3	2.9086E6	562022.	1.65634E6	4.16087E6
CAS	3	2.91005E6	562022.	1.65779E6	4.16232E6
CHI	3	2.87318E6	562022.	1.62092E6	4.12545E6
COM	3	4.49022E6	562022.	3.23795E6	5.74248E6
TAR	3	1.55768E6	562022.	305418.	2.80995E6
YEO	3	985843.	562022.	-266422.	2.23811E6
STATO					
F	6	3.11877E6	397409.	2.23329E6	4.00426E6
P	6	2.25966E6	397409.	1.37417E6	3.14514E6
S	6	2.48436E6	397409.	1.59887E6	3.36984E6

The StatAdvisor
This table shows the mean M44 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M44 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	2.25966E6	397409.	X
S	6	2.48436E6	397409.	X
F	6	3.11877E6	397409.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		859118.	1.54234E6
F - S		634418.	1.54234E6
P - S		-224700.	1.54234E6

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

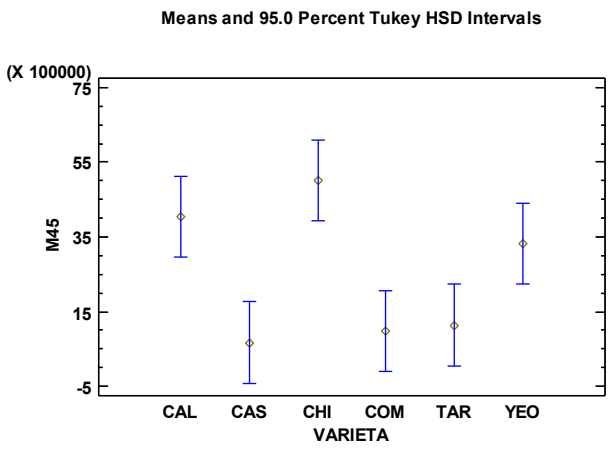
Analysis of Variance for M45 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	5.06985E13	5	1.01397E13	17.11	0.0001
B:STATO	1.05948E12	2	5.2974E11	0.89	0.4393
RESIDUAL	5.92455E12	10	5.92455E11		
TOTAL (CORRECTED)	5.76825E13	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M45 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M45 at the 95.0% confidence level.

Means Plot



This plot shows the mean M45 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M45 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	2.52452E6			
VARIETA					
CAL	3	4.04466E6	444393.	3.05449E6	5.03483E6
CAS	3	667475.	444393.	-322697.	1.65765E6

Allegato 1: ANOVA varietà-stato

CHI	3	5.00457E6	444393.	4.0144E6	5.99474E6
COM	3	972248.	444393.	-17922.7	1.96242E6
TAR	3	1.13243E6	444393.	142257.	2.1226E6
YEO	3	3.32573E6	444393.	2.33556E6	4.3159E6
STATO					
F	6	2.81722E6	314233.	2.11707E6	3.51738E6
P	6	2.22314E6	314233.	1.52298E6	2.9233E6
S	6	2.53319E6	314233.	1.83304E6	3.23335E6

The StatAdvisor
This table shows the mean M45 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M45 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	2.22314E6	314233.	X
S	6	2.53319E6	314233.	X
F	6	2.81722E6	314233.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		594083.	1.21953E6
F - S		284030.	1.21953E6
P - S		-310053.	1.21953E6

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M46 - Type III Sums of Squares

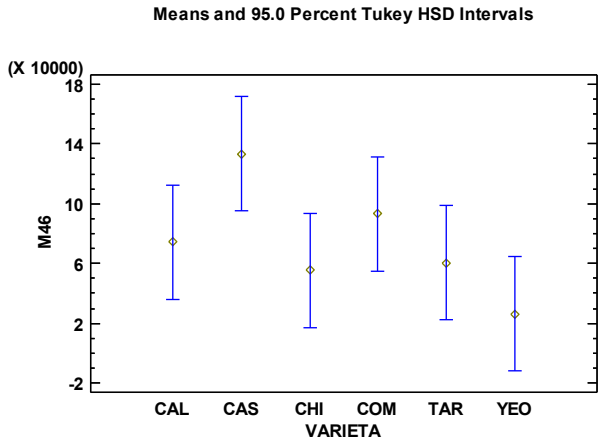
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	2.01328E10	5	4.02655E9	5.53	0.0107
B:STATO	5.87603E9	2	2.93801E9	4.03	0.0520
RESIDUAL	7.28461E9	10	7.28461E8		
TOTAL (CORRECTED)	3.32934E10	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M46 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M46 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M46 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M46 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	73879.4			
VARIETA					
CAL	3	74538.9	15582.7	39818.5	109259.
CAS	3	133335.	15582.7	98614.5	168055.
CHI	3	55382.4	15582.7	20661.9	90102.8
COM	3	93353.4	15582.7	58633.0	128074.
TAR	3	60479.9	15582.7	25759.4	95200.4
YEO	3	26186.7	15582.7	-8533.82	60907.2
STATO					
F	6	99430.0	11018.6	74878.9	123981.
P	6	61312.6	11018.6	36761.5	85863.7
S	6	60895.5	11018.6	36344.4	85446.6

The StatAdvisor
This table shows the mean M46 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M46 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
S	6	60895.5	11018.6	X
P	6	61312.6	11018.6	X
F	6	99430.0	11018.6	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		38117.4	42763.2
F - S		38534.5	42763.2
P - S		417.089	42763.2

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

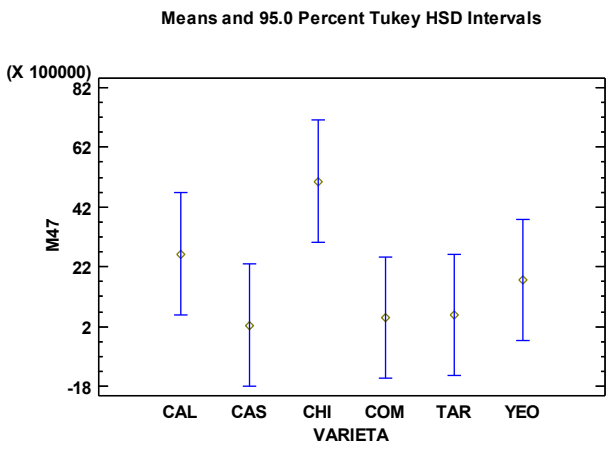
Analysis of Variance for M47 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	5.06966E13	5	1.01393E13	4.89	0.0160
B:STATO	7.29233E12	2	3.64617E12	1.76	0.2217
RESIDUAL	2.07406E13	10	2.07406E12		
TOTAL (CORRECTED)	7.87295E13	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M47 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M47 at the 95.0% confidence level.

Means Plot



This plot shows the mean M47 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M47 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	1.79667E6			
VARIETA					
CAL	3	2.63333E6	831476.	780681.	4.48598E6
CAS	3	252252.	831476.	-1.6004E6	2.1049E6

Allegato 1: ANOVA varietà-stato

CHI	3	5.05825E6	831476.	3.2056E6	6.9109E6
COM	3	493006.	831476.	-1.35964E6	2.34565E6
TAR	3	582207.	831476.	-1.27044E6	2.43485E6
YEO	3	1.76097E6	831476.	-91676.4	3.61362E6
STATO					
F	6	2.69225E6	587942.	1.38223E6	4.00227E6
P	6	1.42728E6	587942.	117260.	2.7373E6
S	6	1.27048E6	587942.	-39542.3	2.5805E6

The StatAdvisor
This table shows the mean M47 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M47 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
S	6	1.27048E6	587942.	X
P	6	1.42728E6	587942.	X
F	6	2.69225E6	587942.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		1.26497E6	2.2818E6
F - S		1.42177E6	2.2818E6
P - S		156803.	2.2818E6

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M48 - Type III Sums of Squares

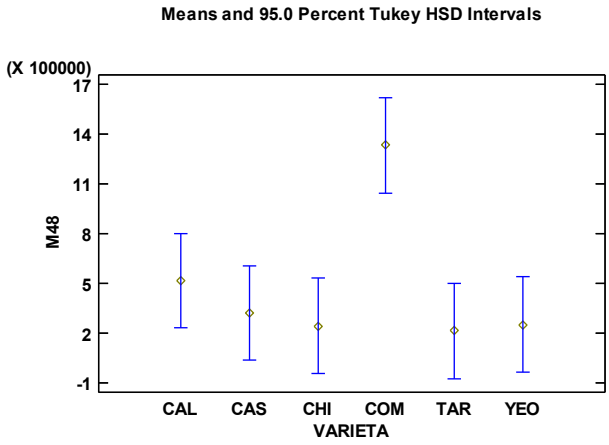
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	2.7998E12	5	5.5996E11	13.64	0.0003
B:STATO	2.2311E11	2	1.11555E11	2.72	0.1141
RESIDUAL	4.10411E11	10	4.10411E10		
TOTAL (CORRECTED)	3.43332E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M48 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M48 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M48 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M48 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	480353.			
VARIETA					
CAL	3	516460.	116963.	255850.	777071.
CAS	3	321640.	116963.	61029.5	582250.
CHI	3	244784.	116963.	-15826.3	505395.
COM	3	1.33363E6	116963.	1.07302E6	1.59424E6
TAR	3	214859.	116963.	-45751.0	475470.
YEO	3	250750.	116963.	-9860.71	511360.
STATO					
F	6	447170.	82705.4	262891.	631449.
P	6	363653.	82705.4	179374.	547933.
S	6	630237.	82705.4	445957.	814516.

The StatAdvisor
This table shows the mean M48 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M48 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	363653.	82705.4	X
F	6	447170.	82705.4	X
S	6	630237.	82705.4	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		83516.5	320978.
F - S		-183067.	320978.
P - S		-266583.	320978.

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

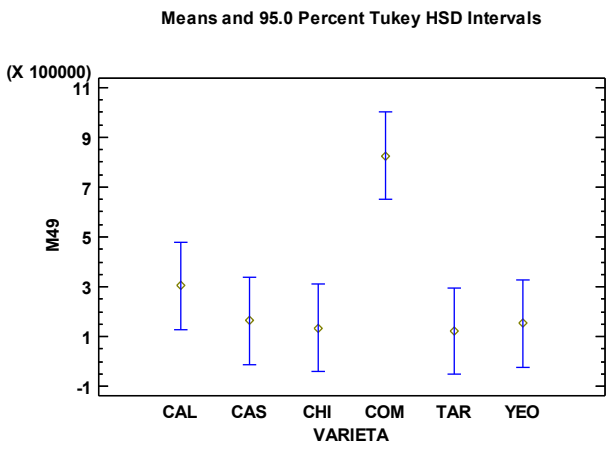
Analysis of Variance for M49 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.12087E12	5	2.24174E11	14.71	0.0002
B:STATO	1.09371E11	2	5.46854E10	3.59	0.0668
RESIDUAL	1.52359E11	10	1.52359E10		
TOTAL (CORRECTED)	1.3826E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M49 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M49 at the 95.0% confidence level.

Means Plot



This plot shows the mean M49 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M49 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	283872.			
VARIETA					
CAL	3	303354.	71264.5	144566.	462141.
CAS	3	164100.	71264.5	5312.65	322888.

Allegato 1: ANOVA varietà-stato

CHI	3	135183.	71264.5	-23604.6	293970.
COM	3	825616.	71264.5	666828.	984403.
TAR	3	122506.	71264.5	-36281.2	281294.
YEO	3	152473.	71264.5	-6314.78	311260.
STATO					
F	6	282023.	50391.6	169744.	394303.
P	6	189341.	50391.6	77061.4	301621.
S	6	380251.	50391.6	267972.	492531.

The StatAdvisor
This table shows the mean M49 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M49 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	189341.	50391.6	X
F	6	282023.	50391.6	X
S	6	380251.	50391.6	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		92682.3	195569.
F - S		-98227.8	195569.
P - S		-190910.	195569.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M50 - Type III Sums of Squares

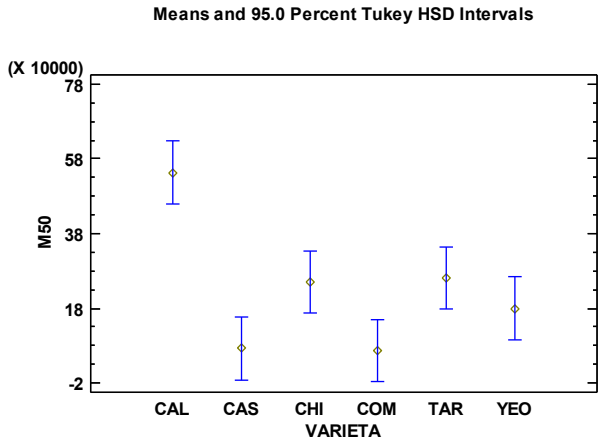
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	4.60369E11	5	9.20739E10	26.47	0.0000
B:STATO	1.09533E10	2	5.47665E9	1.57	0.2544
RESIDUAL	3.47785E10	10	3.47785E9		
TOTAL (CORRECTED)	5.06101E11	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M50 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M50 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M50 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M50 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	229177.			
VARIETA					
CAL	3	543486.	34048.3	467621.	619350.
CAS	3	72608.4	34048.3	-3255.98	148473.
CHI	3	251104.	34048.3	175240.	326969.
COM	3	67201.7	34048.3	-8662.76	143066.
TAR	3	260822.	34048.3	184958.	336687.
YEO	3	179837.	34048.3	103972.	255701.
STATO					
F	6	259899.	24075.8	206255.	313544.
P	6	199502.	24075.8	145858.	253147.
S	6	228128.	24075.8	174484.	281772.

The StatAdvisor
This table shows the mean M50 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M50 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	199502.	24075.8	X
S	6	228128.	24075.8	X
F	6	259899.	24075.8	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		60397.0	93437.7
F - S		31771.6	93437.7
P - S		-28625.4	93437.7

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

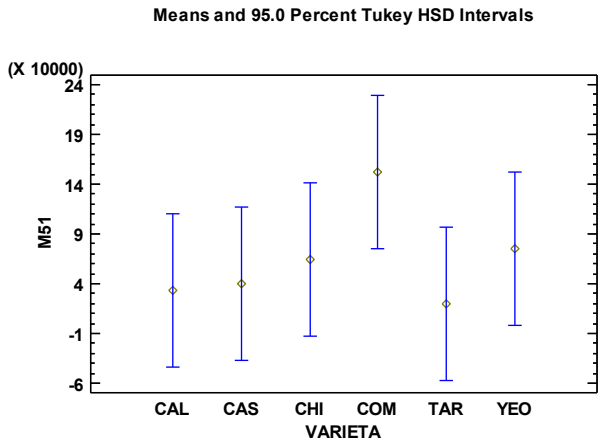
Analysis of Variance for M51 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	3.43596E10	5	6.87192E9	2.32	0.1206
B:STATO	1.11561E8	2	5.57806E7	0.02	0.9814
RESIDUAL	2.96243E10	10	2.96243E9		
TOTAL (CORRECTED)	6.40955E10	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M51 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M51 at the 95.0% confidence level.

Means Plot



This plot shows the mean M51 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M51 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	64228.1			
VARIETA					
CAL	3	33575.5	31424.1	-36442.0	103593.
CAS	3	40057.5	31424.1	-29960.0	110075.

Allegato 1: ANOVA varietà-stato

CHI	3	64869.3	31424.1	-5148.22	134887.
COM	3	152653.	31424.1	82635.8	222671.
TAR	3	19505.0	31424.1	-50512.5	89522.5
YEO	3	74708.0	31424.1	4690.45	144725.
STATO					
F	6	60731.2	22220.2	11221.4	110241.
P	6	65621.9	22220.2	16112.0	115132.
S	6	66331.2	22220.2	16821.3	115841.

The StatAdvisor
This table shows the mean M51 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M51 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
F	6	60731.2	22220.2	X
P	6	65621.9	22220.2	X
S	6	66331.2	22220.2	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		-4890.64	86236.4
F - S		-5599.93	86236.4
P - S		-709.281	86236.4

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M52 - Type III Sums of Squares

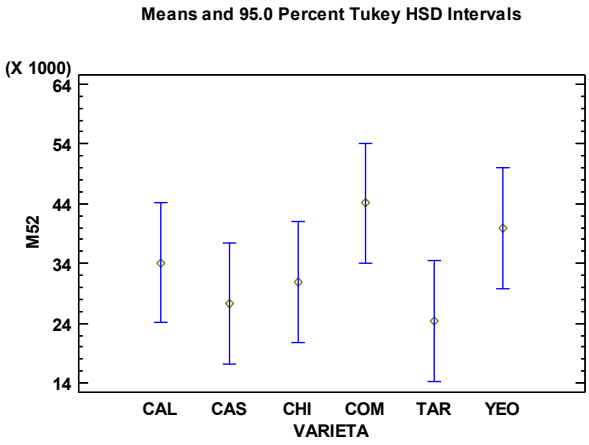
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	8.45958E8	5	1.69192E8	3.35	0.0489
B:STATO	3.03267E8	2	1.51633E8	3.01	0.0950
RESIDUAL	5.04525E8	10	5.04525E7		
TOTAL (CORRECTED)	1.65375E9	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M52 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M52 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M52 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M52 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	33467.4			
VARIETA					
CAL	3	34162.2	4100.91	25024.8	43299.7
CAS	3	27309.3	4100.91	18171.9	36446.8
CHI	3	30922.1	4100.91	21784.7	40059.6
COM	3	44085.0	4100.91	34947.5	53222.4
TAR	3	24385.9	4100.91	15248.4	33523.3
YEO	3	39940.1	4100.91	30802.7	49077.5
STATO					
F	6	38232.2	2899.78	31771.1	44693.3
P	6	28213.6	2899.78	21752.5	34674.8
S	6	33956.5	2899.78	27495.3	40417.6

The StatAdvisor
This table shows the mean M52 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M52 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	28213.6	2899.78	X
S	6	33956.5	2899.78	X
F	6	38232.2	2899.78	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		10018.6	11254.0
F - S		4275.74	11254.0
P - S		-5742.82	11254.0

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

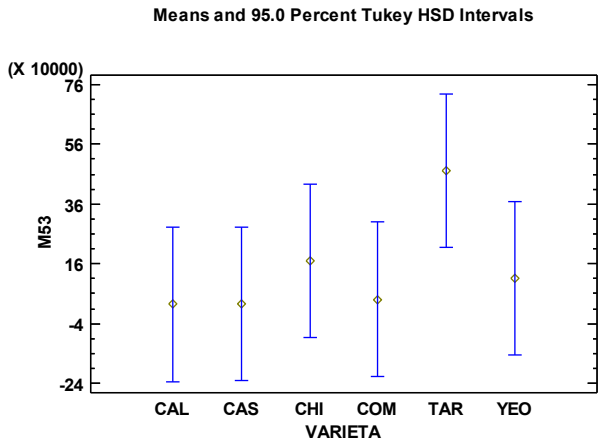
Analysis of Variance for M53 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	4.43611E11	5	8.87221E10	2.67	0.0873
B:STATO	1.67873E10	2	8.39366E9	0.25	0.7815
RESIDUAL	3.32096E11	10	3.32096E10		
TOTAL (CORRECTED)	7.92494E11	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M53 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M53 at the 95.0% confidence level.

Means Plot



This plot shows the mean M53 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M53 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	140894.			
VARIETA					
CAL	3	24459.2	105213.	-209972.	258890.
CAS	3	26668.3	105213.	-207763.	261099.

Allegato 1: ANOVA varietà-stato

CHI	3	170425.	105213.	-64005.8	404856.
COM	3	41141.3	105213.	-193289.	275572.
TAR	3	471859.	105213.	237428.	706290.
YEO	3	110810.	105213.	-123621.	345241.
STATO					
F	6	119641.	74397.2	-46126.7	285409.
P	6	118960.	74397.2	-46807.6	284728.
S	6	184081.	74397.2	18313.1	349848.

The StatAdvisor
This table shows the mean M53 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M53 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	118960.	74397.2	X
F	6	119641.	74397.2	X
S	6	184081.	74397.2	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		680.92	288734.
F - S		-64439.8	288734.
P - S		-65120.7	288734.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M54 - Type III Sums of Squares

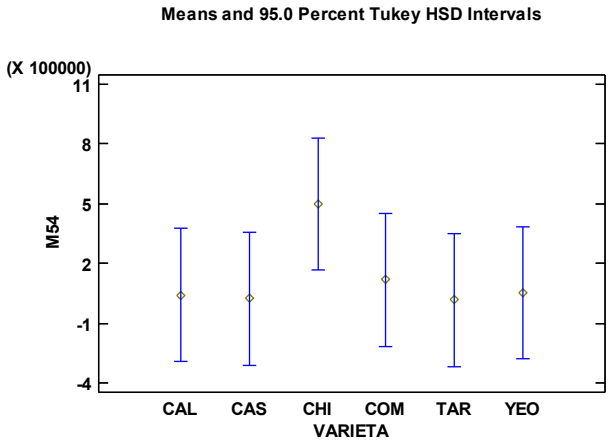
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	5.21136E11	5	1.04227E11	1.88	0.1854
B:STATO	9.99908E10	2	4.99954E10	0.90	0.4368
RESIDUAL	5.5501E11	10	5.5501E10		
TOTAL (CORRECTED)	1.17614E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M54 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M54 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M54 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M54 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	125612.			
VARIETA					
CAL	3	40491.5	136016.	-262572.	343555.
CAS	3	24399.7	136016.	-278663.	327463.
CHI	3	498837.	136016.	195774.	801900.
COM	3	119024.	136016.	-184039.	422087.
TAR	3	17752.6	136016.	-285310.	320816.
YEO	3	53167.1	136016.	-249896.	356230.
STATO					
F	6	229377.	96177.8	15078.9	443675.
P	6	57691.7	96177.8	-156606.	271990.
S	6	89767.7	96177.8	-124530.	304066.

The StatAdvisor
This table shows the mean M54 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M54 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	57691.7	96177.8	X
S	6	89767.7	96177.8	X
F	6	229377.	96177.8	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		171685.	373265.
F - S		139609.	373265.
P - S		-32076.1	373265.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

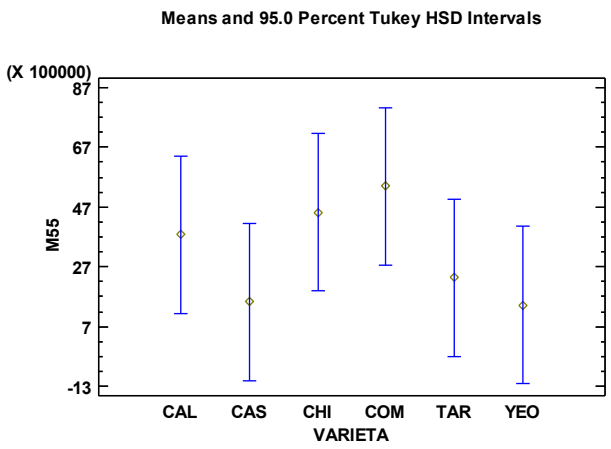
Analysis of Variance for M55 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	4.09216E13	5	8.18432E12	2.36	0.1163
B:STATO	3.81387E12	2	1.90693E12	0.55	0.5937
RESIDUAL	3.4695E13	10	3.4695E12		
TOTAL (CORRECTED)	7.94305E13	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M55 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M55 at the 95.0% confidence level.

Means Plot



This plot shows the mean M55 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M55 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	3.16517E6			
VARIETA					
CAL	3	3.78559E6	1.07541E6	1.38942E6	6.18175E6
CAS	3	1.52547E6	1.07541E6	-870693.	3.92163E6

CHI	3	4.53147E6	1.07541E6	2.13531E6	6.92763E6
COM	3	5.39479E6	1.07541E6	2.99863E6	7.79095E6
TAR	3	2.3294E6	1.07541E6	-66766.3	4.72556E6
YEO	3	1.42434E6	1.07541E6	-971826.	3.8205E6
STATO					
F	6	3.59855E6	760428.	1.90421E6	5.2929E6
P	6	2.52782E6	760428.	833477.	4.22216E6
S	6	3.36915E6	760428.	1.67481E6	5.06349E6

The StatAdvisor
This table shows the mean M55 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M55 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	2.52782E6	760428.	X
S	6	3.36915E6	760428.	X
F	6	3.59855E6	760428.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		1.07073E6	2.95121E6
F - S		229404.	2.95121E6
P - S		-841330.	2.95121E6

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M56 - Type III Sums of Squares

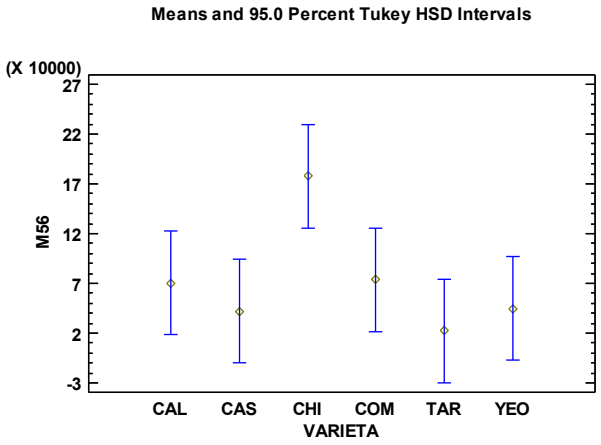
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	4.58445E10	5	9.1689E9	6.87	0.0050
B:STATO	7.57556E9	2	3.78778E9	2.84	0.1057
RESIDUAL	1.33488E10	10	1.33488E9		
TOTAL (CORRECTED)	6.67688E10	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M56 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M56 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M56 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M56 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	71820.5			
VARIETA					
CAL	3	70340.6	21094.1	23339.9	117341.
CAS	3	42296.2	21094.1	-4704.43	89296.8
CHI	3	177745.	21094.1	130745.	224746.
COM	3	73442.8	21094.1	26442.2	120443.
TAR	3	22246.5	21094.1	-24754.1	69247.1
YEO	3	44851.6	21094.1	-2148.98	91852.3
STATO					
F	6	98104.4	14915.8	64869.9	131339.
P	6	48040.7	14915.8	14806.2	81275.1
S	6	69316.5	14915.8	36082.1	102551.

The StatAdvisor
This table shows the mean M56 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M56 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	48040.7	14915.8	X
S	6	69316.5	14915.8	X
F	6	98104.4	14915.8	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		50063.7	57887.9
F - S		28787.9	57887.9
P - S		-21275.8	57887.9

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

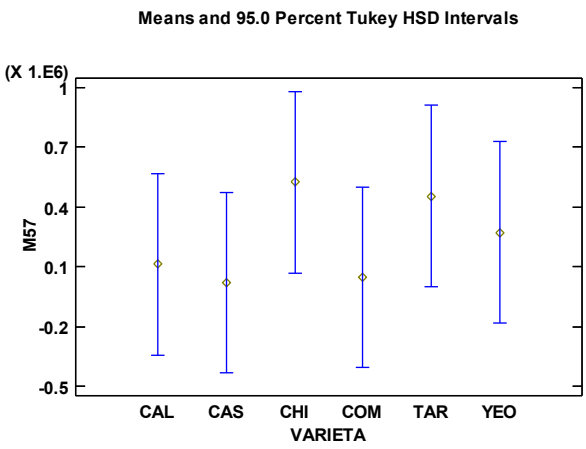
Analysis of Variance for M57 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	6.88499E11	5	1.377E11	1.33	0.3254
B:STATO	3.34371E11	2	1.67186E11	1.62	0.2457
RESIDUAL	1.03164E12	10	1.03164E11		
TOTAL (CORRECTED)	2.05451E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M57 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M57 at the 95.0% confidence level.

Means Plot



This plot shows the mean M57 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M57 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	238570.			
VARIETA					
CAL	3	111834.	185440.	-301352.	525020.
CAS	3	20715.5	185440.	-392471.	433902.

Allegato 1: ANOVA varietà-stato

CHI	3	524384.	185440.	111198.	937571.
COM	3	47562.6	185440.	-365624.	460749.
TAR	3	454587.	185440.	41400.6	867773.
YEO	3	272336.	185440.	-140850.	685522.
STATO					
F	6	213228.	131126.	-78938.5	505395.
P	6	85763.8	131126.	-206403.	377931.
S	6	416718.	131126.	124551.	708885.

The StatAdvisor
This table shows the mean M57 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M57 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	85763.8	131126.	X
F	6	213228.	131126.	X
S	6	416718.	131126.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		127465.	508897.
F - S		-203489.	508897.
P - S		-330954.	508897.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M58 - Type III Sums of Squares

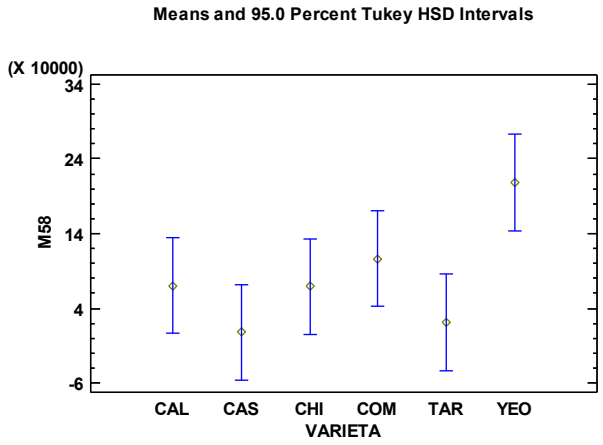
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	7.83491E10	5	1.56698E10	7.64	0.0034
B:STATO	1.15138E10	2	5.75689E9	2.81	0.1078
RESIDUAL	2.05097E10	10	2.05097E9		
TOTAL (CORRECTED)	1.10373E11	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M58 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M58 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M58 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M58 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	80619.2			
VARIETA					
CAL	3	70133.8	26146.8	11874.9	128393.
CAS	3	7793.59	26146.8	-50465.3	66052.5
CHI	3	69430.6	26146.8	11171.7	127689.
COM	3	106519.	26146.8	48260.4	164778.
TAR	3	21233.6	26146.8	-37025.3	79492.5
YEO	3	208604.	26146.8	150345.	266863.
STATO					
F	6	116316.	18488.6	75120.7	157511.
P	6	64717.3	18488.6	23522.0	105913.
S	6	60824.4	18488.6	19629.1	102020.

The StatAdvisor
This table shows the mean M58 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M58 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
S	6	60824.4	18488.6	X
P	6	64717.3	18488.6	X
F	6	116316.	18488.6	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		51598.7	71754.0
F - S		55491.5	71754.0
P - S		3892.87	71754.0

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

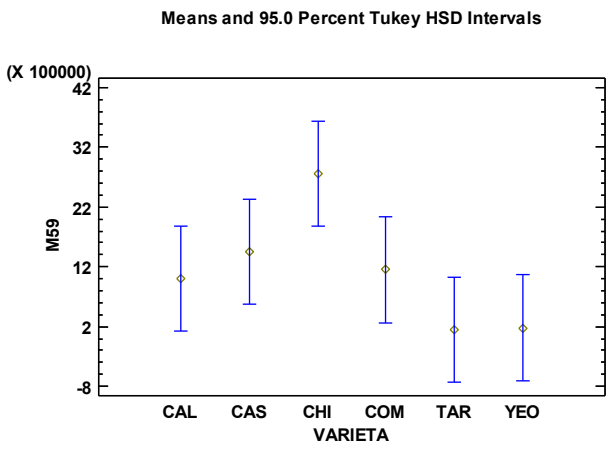
Analysis of Variance for M59 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.38945E13	5	2.77891E12	7.17	0.0043
B:STATO	2.94426E12	2	1.47213E12	3.80	0.0593
RESIDUAL	3.87779E12	10	3.87779E11		
TOTAL (CORRECTED)	2.07166E13	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M59 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M59 at the 95.0% confidence level.

Means Plot



This plot shows the mean M59 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M59 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	1.11438E6			
VARIETA					
CAL	3	998434.	359527.	197356.	1.79951E6
CAS	3	1.45516E6	359527.	654079.	2.25624E6

Allegato 1: ANOVA varietà-stato

CHI	3	2.75534E6	359527.	1.95426E6	3.55642E6
COM	3	1.14984E6	359527.	348765.	1.95092E6
TAR	3	147617.	359527.	-653461.	948694.
YEO	3	179876.	359527.	-621202.	980954.
STATO					
F	6	1.39682E6	254224.	830377.	1.96327E6
P	6	542431.	254224.	-24016.7	1.10888E6
S	6	1.40388E6	254224.	837431.	1.97033E6

The StatAdvisor
This table shows the mean M59 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M59 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	542431.	254224.	X
F	6	1.39682E6	254224.	X
S	6	1.40388E6	254224.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		854394.	986640.
F - S		-7053.38	986640.
P - S		-861447.	986640.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M60 - Type III Sums of Squares

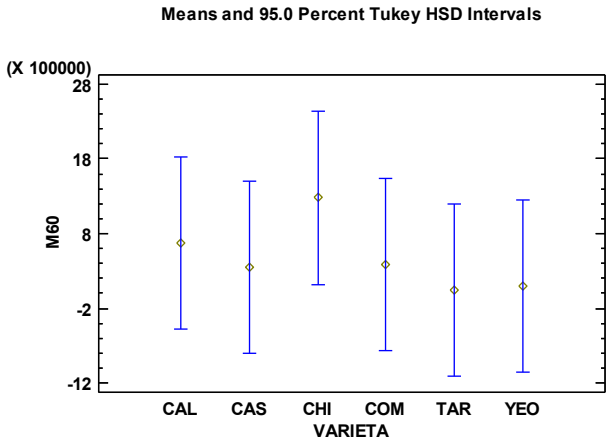
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	3.11319E12	5	6.22639E11	0.93	0.4989
B:STATO	1.91835E12	2	9.59175E11	1.44	0.2824
RESIDUAL	6.66606E12	10	6.66606E11		
TOTAL (CORRECTED)	1.16976E13	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M60 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M60 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M60 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M60 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	469945.			
VARIETA					
CAL	3	672412.	471383.	-377897.	1.72272E6
CAS	3	347845.	471383.	-702465.	1.39815E6
CHI	3	1.27741E6	471383.	227102.	2.32772E6
COM	3	383505.	471383.	-666804.	1.43381E6
TAR	3	44358.9	471383.	-1.00595E6	1.09467E6
YEO	3	94135.7	471383.	-956174.	1.14445E6
STATO					
F	6	915708.	333318.	173027.	1.65839E6
P	6	351147.	333318.	-391534.	1.09383E6
S	6	142978.	333318.	-599703.	885659.

The StatAdvisor
This table shows the mean M60 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M60 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
S	6	142978.	333318.	X
P	6	351147.	333318.	X
F	6	915708.	333318.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		564561.	1.2936E6
F - S		772730.	1.2936E6
P - S		208169.	1.2936E6

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

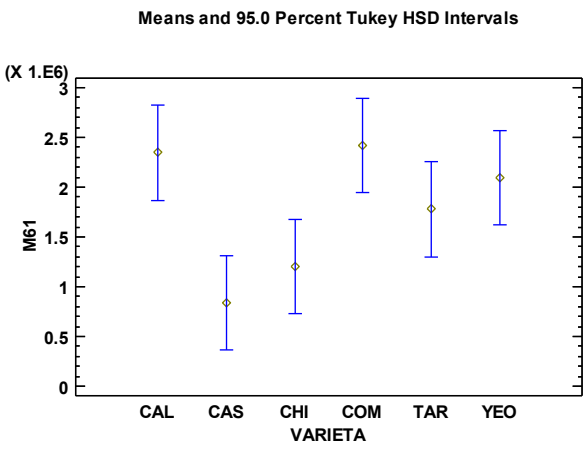
Analysis of Variance for M61 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	6.12477E12	5	1.22495E12	10.82	0.0009
B:STATO	1.11121E12	2	5.55606E11	4.91	0.0328
RESIDUAL	1.1326E12	10	1.1326E11		
TOTAL (CORRECTED)	8.36858E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M61 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since 2 P-values are less than 0.05, these factors have a statistically significant effect on M61 at the 95.0% confidence level.

Means Plot



This plot shows the mean M61 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M61 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	1.7789E6			
VARIETA					
CAL	3	2.34622E6	194302.	1.91328E6	2.77915E6
CAS	3	839163.	194302.	406230.	1.2721E6

Allegato 1: ANOVA varietà-stato

CHI	3	1.20177E6	194302.	768841.	1.63471E6
COM	3	2.4157E6	194302.	1.98277E6	2.84863E6
TAR	3	1.77851E6	194302.	1.34558E6	2.21145E6
YEO	3	2.09203E6	194302.	1.65909E6	2.52496E6
STATO					
F	6	2.10586E6	137392.	1.79973E6	2.41199E6
P	6	1.50396E6	137392.	1.19783E6	1.81009E6
S	6	1.72687E6	137392.	1.42074E6	2.033E6

The StatAdvisor
This table shows the mean M61 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M61 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	1.50396E6	137392.	X
S	6	1.72687E6	137392.	XX
F	6	2.10586E6	137392.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P	*	601899.	533217.
F - S		378993.	533217.
P - S		-222906.	533217.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 1 pair, indicating that this pair shows a statistically significant difference at the 95.0% confidence level. At the top of the page, 2 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M62 - Type III Sums of Squares

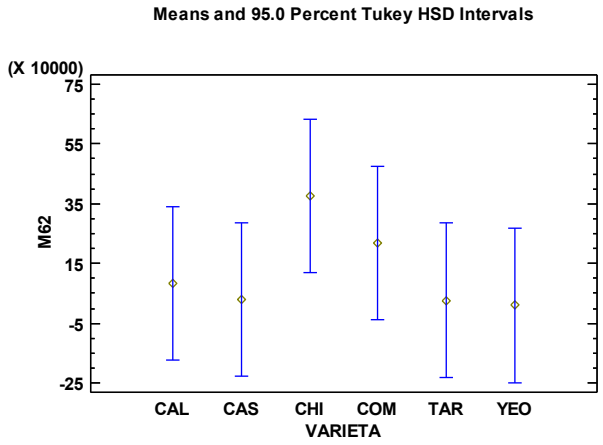
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	3.16925E11	5	6.33849E10	1.92	0.1783
B:STATO	5.87296E10	2	2.93648E10	0.89	0.4415
RESIDUAL	3.30612E11	10	3.30612E10		
TOTAL (CORRECTED)	7.06266E11	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M62 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M62 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M62 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M62 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	124053.			
VARIETA					
CAL	3	83160.5	104978.	-150746.	317067.
CAS	3	28969.2	104978.	-204937.	262876.
CHI	3	375952.	104978.	142046.	609858.
COM	3	219206.	104978.	-14700.5	453112.
TAR	3	27033.1	104978.	-206873.	260939.
YEO	3	9998.46	104978.	-223908.	243905.
STATO					
F	6	199694.	74230.7	34297.6	365091.
P	6	61677.7	74230.7	-103719.	227074.
S	6	110787.	74230.7	-54609.3	276184.

The StatAdvisor
This table shows the mean M62 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M62 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	61677.7	74230.7	X
S	6	110787.	74230.7	X
F	6	199694.	74230.7	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		138017.	288089.
F - S		88906.9	288089.
P - S		-49109.8	288089.

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

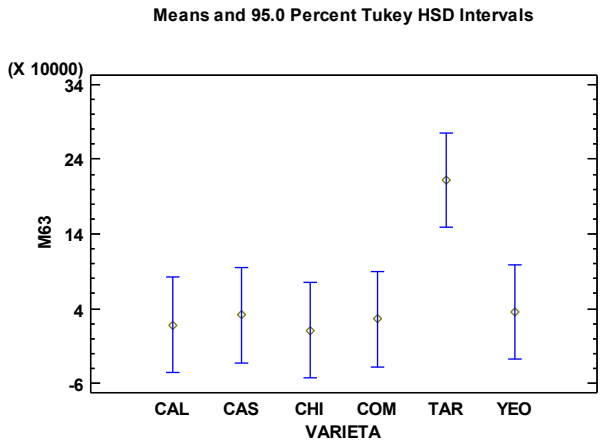
Analysis of Variance for M63 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	8.87191E10	5	1.77438E10	8.84	0.0020
B:STATO	6.0584E9	2	3.0292E9	1.51	0.2675
RESIDUAL	2.00755E10	10	2.00755E9		
TOTAL (CORRECTED)	1.14853E11	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M63 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M63 at the 95.0% confidence level.

Means Plot



This plot shows the mean M63 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M63 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	55710.9			
VARIETA					
CAL	3	18487.9	25868.6	-39151.1	76126.8
CAS	3	31505.0	25868.6	-26134.0	89143.9

Allegato 1: ANOVA varietà-stato

CHI	3	11138.8	25868.6	-46500.2	68777.7
COM	3	26039.3	25868.6	-31599.6	83678.3
TAR	3	211669.	25868.6	154030.	269308.
YEO	3	35425.2	25868.6	-22213.7	93064.2
STATO					
F	6	40314.5	18291.9	-442.389	81071.4
P	6	45323.7	18291.9	4566.83	86080.6
S	6	81494.4	18291.9	40737.5	122251.

The StatAdvisor
This table shows the mean M63 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M63 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
F	6	40314.5	18291.9	X
P	6	45323.7	18291.9	X
S	6	81494.4	18291.9	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		-5009.22	70990.5
F - S		-41179.9	70990.5
P - S		-36170.7	70990.5

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M64 - Type III Sums of Squares

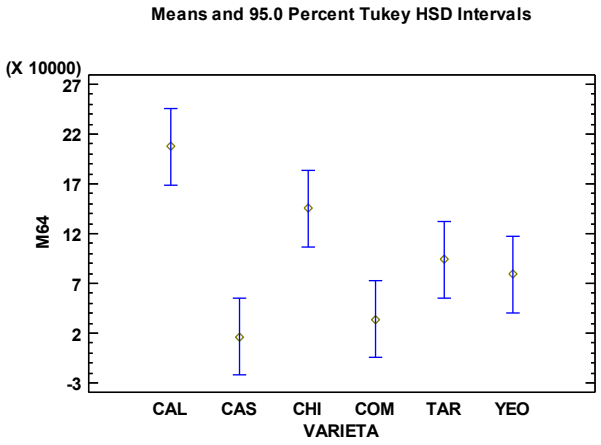
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	7.62527E10	5	1.52505E10	20.70	0.0001
B:STATO	6.66968E9	2	3.33484E9	4.53	0.0398
RESIDUAL	7.36601E9	10	7.36601E8		
TOTAL (CORRECTED)	9.02884E10	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M64 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since 2 P-values are less than 0.05, these factors have a statistically significant effect on M64 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M64 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M64 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	95957.1			
VARIETA					
CAL	3	207632.	15669.5	172718.	242546.
CAS	3	16169.7	15669.5	-18744.2	51083.6
CHI	3	145369.	15669.5	110455.	180283.
COM	3	33961.0	15669.5	-952.98	68874.9
TAR	3	93684.1	15669.5	58770.1	128598.
YEO	3	78926.7	15669.5	44012.7	113841.
STATO					
F	6	121880.	11080.0	97192.2	146568.
P	6	75798.0	11080.0	51110.1	100486.
S	6	90193.1	11080.0	65505.2	114881.

The StatAdvisor
This table shows the mean M64 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M64 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	75798.0	11080.0	X
S	6	90193.1	11080.0	XX
F	6	121880.	11080.0	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P	*	46082.1	43001.4
F - S		31687.0	43001.4
P - S		-14395.1	43001.4

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 1 pair, indicating that this pair shows a statistically significant difference at the 95.0% confidence level. At the top of the page, 2 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

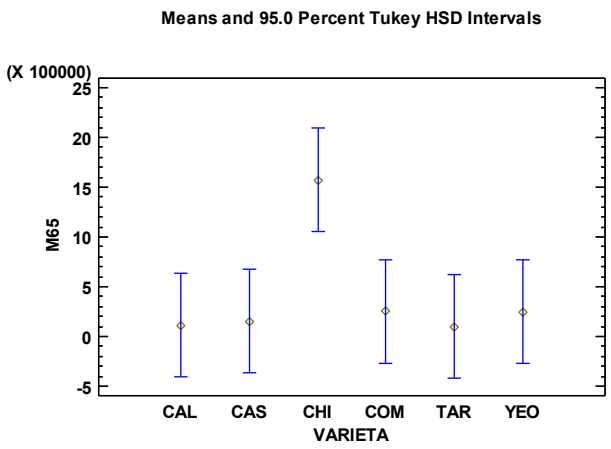
Analysis of Variance for M65 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	4.9505E12	5	9.90099E11	7.38	0.0038
B:STATO	3.99524E11	2	1.99762E11	1.49	0.2714
RESIDUAL	1.34081E12	10	1.34081E11		
TOTAL (CORRECTED)	6.69083E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M65 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M65 at the 95.0% confidence level.

Means Plot



This plot shows the mean M65 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M65 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	407255.			
VARIETA					
CAL	3	113506.	211409.	-357543.	584555.
CAS	3	153872.	211409.	-317177.	624921.

Allegato 1: ANOVA varietà-stato

CHI	3	1.57233E6	211409.	1.10128E6	2.04338E6
COM	3	255040.	211409.	-216010.	726089.
TAR	3	101421.	211409.	-369628.	572470.
YEO	3	247362.	211409.	-223687.	718411.
STATO					
F	6	592558.	149489.	259476.	925640.
P	6	401442.	149489.	68359.7	734524.
S	6	227766.	149489.	-105316.	560848.

The StatAdvisor
This table shows the mean M65 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M65 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
S	6	227766.	149489.	X
P	6	401442.	149489.	X
F	6	592558.	149489.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		191116.	580163.
F - S		364792.	580163.
P - S		173676.	580163.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M66 - Type III Sums of Squares

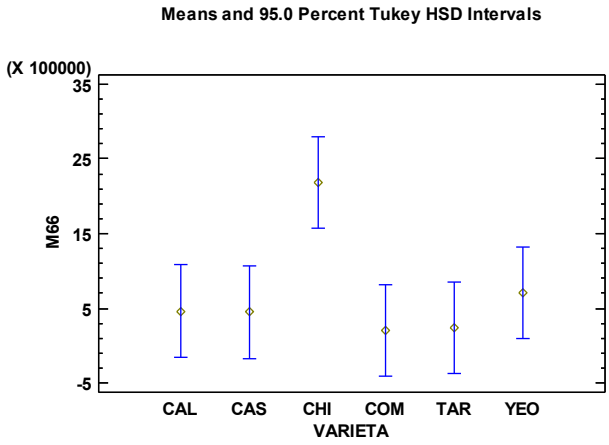
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	8.37316E12	5	1.67463E12	8.84	0.0020
B:STATO	1.25212E12	2	6.26062E11	3.30	0.0791
RESIDUAL	1.8945E12	10	1.8945E11		
TOTAL (CORRECTED)	1.15198E13	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M66 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M66 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M66 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M66 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	707059.			
VARIETA					
CAL	3	461033.	251297.	-98892.4	1.02096E6
CAS	3	450116.	251297.	-109809.	1.01004E6
CHI	3	2.18673E6	251297.	1.6268E6	2.74665E6
COM	3	200429.	251297.	-359496.	760355.
TAR	3	239713.	251297.	-320212.	799638.
YEO	3	704337.	251297.	144412.	1.26426E6
STATO					
F	6	1.07937E6	177694.	683440.	1.47529E6
P	6	540502.	177694.	144575.	936429.
S	6	501309.	177694.	105382.	897236.

The StatAdvisor
This table shows the mean M66 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M66 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
S	6	501309.	177694.	X
P	6	540502.	177694.	X
F	6	1.07937E6	177694.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		538865.	689626.
F - S		578058.	689626.
P - S		39192.9	689626.

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

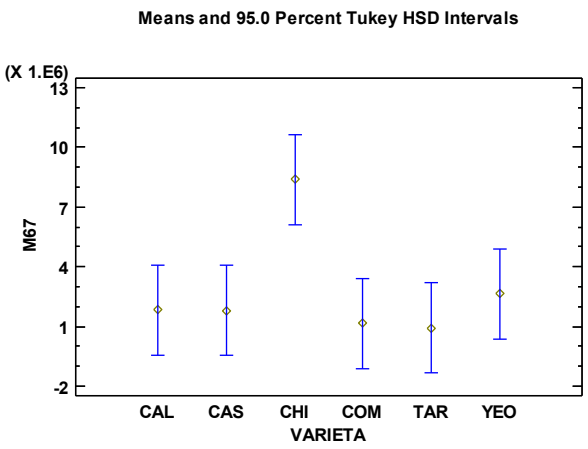
Analysis of Variance for M67 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.17763E14	5	2.35526E13	9.24	0.0016
B:STATO	1.77484E13	2	8.87421E12	3.48	0.0712
RESIDUAL	2.54936E13	10	2.54936E12		
TOTAL (CORRECTED)	1.61005E14	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M67 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M67 at the 95.0% confidence level.

Means Plot



This plot shows the mean M67 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M67 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	2.78902E6			
VARIETA					
CAL	3	1.83862E6	921839.	-215367.	3.89261E6
CAS	3	1.79267E6	921839.	-261318.	3.84666E6

Allegato 1: ANOVA varietà-stato

CHI	3	8.3739E6	921839.	6.31991E6	1.04279E7
COM	3	1.16353E6	921839.	-890463.	3.21752E6
TAR	3	916691.	921839.	-1.1373E6	2.97068E6
YEO	3	2.6487E6	921839.	594711.	4.70269E6
STATO					
F	6	4.19185E6	651838.	2.73946E6	5.64424E6
P	6	2.1431E6	651838.	690713.	3.59549E6
S	6	2.0321E6	651838.	579711.	3.48449E6

The StatAdvisor
This table shows the mean M67 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M67 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
S	6	2.0321E6	651838.	X
P	6	2.1431E6	651838.	X
F	6	4.19185E6	651838.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		2.04875E6	2.52978E6
F - S		2.15975E6	2.52978E6
P - S		111002.	2.52978E6

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M68 - Type III Sums of Squares

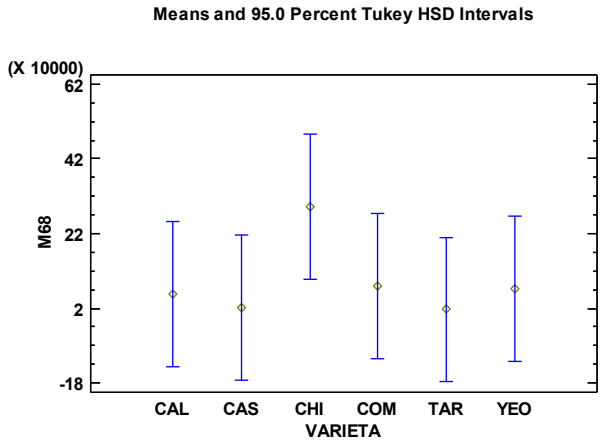
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.57439E11	5	3.14879E10	1.68	0.2270
B:STATO	5.6497E10	2	2.82485E10	1.51	0.2681
RESIDUAL	1.87575E11	10	1.87575E10		
TOTAL (CORRECTED)	4.01512E11	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M68 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M68 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M68 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M68 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	90538.0			
VARIETA					
CAL	3	58345.0	79072.8	-117841.	234531.
CAS	3	22491.9	79072.8	-153694.	198677.
CHI	3	292913.	79072.8	116728.	469099.
COM	3	80861.4	79072.8	-95324.1	257047.
TAR	3	17019.6	79072.8	-159166.	193205.
YEO	3	71596.4	79072.8	-104589.	247782.
STATO					
F	6	96001.7	55912.9	-28580.3	220584.
P	6	19353.9	55912.9	-105228.	143936.
S	6	156258.	55912.9	31676.3	280840.

The StatAdvisor
This table shows the mean M68 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M68 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	19353.9	55912.9	X
F	6	96001.7	55912.9	X
S	6	156258.	55912.9	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		76647.7	216997.
F - S		-60256.6	216997.
P - S		-136904.	216997.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

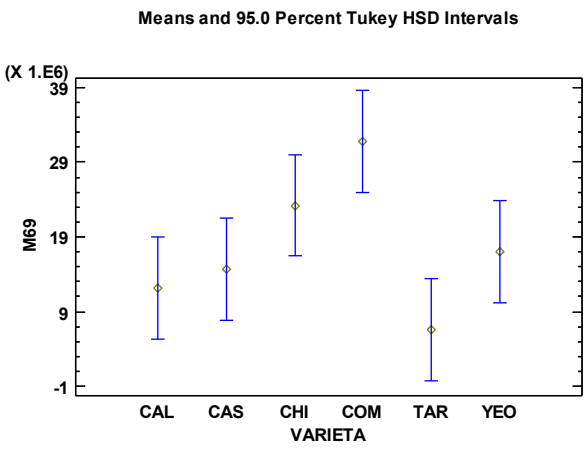
Analysis of Variance for M69 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.17436E15	5	2.34872E14	10.09	0.0012
B:STATO	4.07897E14	2	2.03949E14	8.76	0.0063
RESIDUAL	2.32751E14	10	2.32751E13		
TOTAL (CORRECTED)	1.81501E15	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M69 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since 2 P-values are less than 0.05, these factors have a statistically significant effect on M69 at the 95.0% confidence level.

Means Plot



This plot shows the mean M69 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M69 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	1.75661E7			
VARIETA					
CAL	3	1.21541E7	2.78538E6	5.94785E6	1.83603E7
CAS	3	1.46155E7	2.78538E6	8.40922E6	2.08217E7

Allegato 1: ANOVA varietà-stato

CHI	3	2.32282E7	2.78538E6	1.7022E7	2.94345E7
COM	3	3.17758E7	2.78538E6	2.55696E7	3.7982E7
TAR	3	6.65145E6	2.78538E6	445216.	1.28577E7
YEO	3	1.69716E7	2.78538E6	1.07654E7	2.31778E7
STATO					
F	6	2.41964E7	1.96956E6	1.98079E7	2.85849E7
P	6	1.32406E7	1.96956E6	8.85213E6	1.76291E7
S	6	1.52613E7	1.96956E6	1.08728E7	1.96498E7

The StatAdvisor
This table shows the mean M69 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M69 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	1.32406E7	1.96956E6	X
S	6	1.52613E7	1.96956E6	X
F	6	2.41964E7	1.96956E6	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P	*	1.09558E7	7.64385E6
F - S	*	8.9351E6	7.64385E6
P - S		-2.0207E6	7.64385E6

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 2 pairs, indicating that these pairs show statistically significant differences at the 95.0% confidence level. At the top of the page, 2 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M70 - Type III Sums of Squares

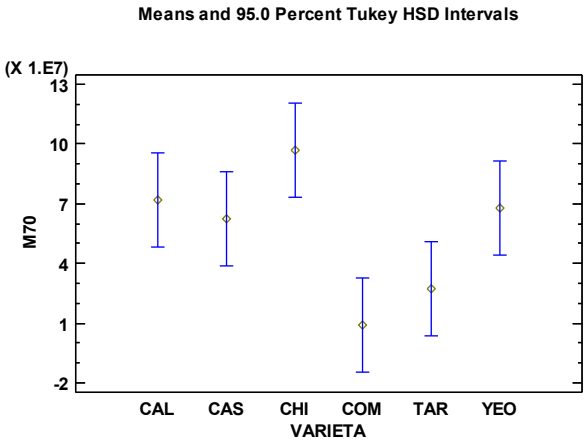
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.54951E16	5	3.09901E15	11.13	0.0008
B:STATO	3.29953E15	2	1.64977E15	5.92	0.0201
RESIDUAL	2.78508E15	10	2.78508E14		
TOTAL (CORRECTED)	2.15797E16	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M70 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since 2 P-values are less than 0.05, these factors have a statistically significant effect on M70 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M70 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M70 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	5.58689E7			
VARIETA					
CAL	3	7.16732E7	9.63514E6	5.02047E7	9.31417E7
CAS	3	6.23228E7	9.63514E6	4.08543E7	8.37913E7
CHI	3	9.70329E7	9.63514E6	7.55644E7	1.18501E8
COM	3	8.94529E6	9.63514E6	-1.25232E7	3.04138E7
TAR	3	2.71112E7	9.63514E6	5.64272E6	4.85797E7
YEO	3	6.81278E7	9.63514E6	4.66593E7	8.95963E7
STATO					
F	6	7.49513E7	6.81307E6	5.97708E7	9.01318E7
P	6	4.76906E7	6.81307E6	3.251E7	6.28711E7
S	6	4.49648E7	6.81307E6	2.97843E7	6.01453E7

The StatAdvisor
This table shows the mean M70 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M70 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
S	6	4.49648E7	6.81307E6	X
P	6	4.76906E7	6.81307E6	X
F	6	7.49513E7	6.81307E6	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P	*	2.72607E7	2.64415E7
F - S	*	2.99865E7	2.64415E7
P - S		2.72575E6	2.64415E7

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 2 pairs, indicating that these pairs show statistically significant differences at the 95.0% confidence level. At the top of the page, 2 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

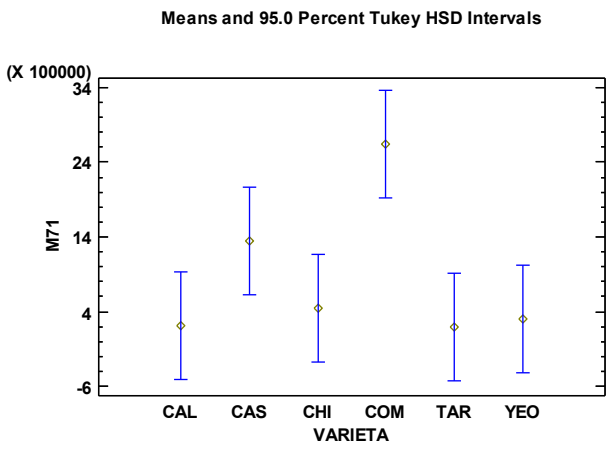
Analysis of Variance for M71 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.42371E13	5	2.84741E12	11.04	0.0008
B:STATO	3.56354E11	2	1.78177E11	0.69	0.5234
RESIDUAL	2.57812E12	10	2.57812E11		
TOTAL (CORRECTED)	1.71715E13	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M71 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M71 at the 95.0% confidence level.

Means Plot



This plot shows the mean M71 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M71 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	856223.			
VARIETA					
CAL	3	210238.	293151.	-442944.	863420.
CAS	3	1.34457E6	293151.	691387.	1.99775E6

Allegato 1: ANOVA varietà-stato

CHI	3	450786.	293151.	-202396.	1.10397E6
COM	3	2.63855E6	293151.	1.98537E6	3.29173E6
TAR	3	193858.	293151.	-459324.	847040.
YEO	3	299337.	293151.	-353845.	952519.
STATO					
F	6	1.02285E6	207289.	560976.	1.48471E6
P	6	678710.	207289.	216841.	1.14058E6
S	6	867113.	207289.	405243.	1.32898E6

The StatAdvisor
This table shows the mean M71 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M71 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	678710.	207289.	X
S	6	867113.	207289.	X
F	6	1.02285E6	207289.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		344135.	804485.
F - S		155733.	804485.
P - S		-188402.	804485.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M72 - Type III Sums of Squares

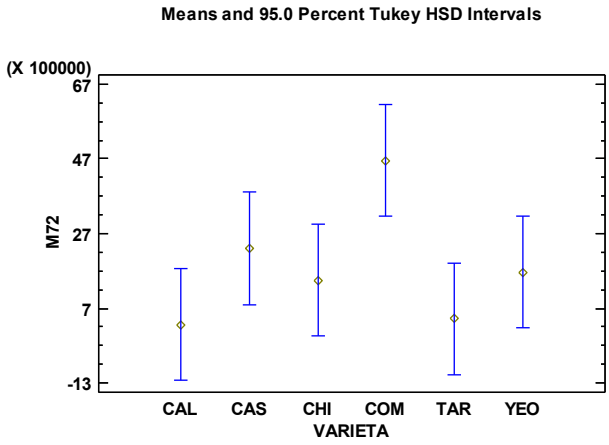
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	3.8477E13	5	7.69539E12	6.83	0.0051
B:STATO	1.23814E13	2	6.19072E12	5.49	0.0246
RESIDUAL	1.12708E13	10	1.12708E12		
TOTAL (CORRECTED)	6.21292E13	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M72 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since 2 P-values are less than 0.05, these factors have a statistically significant effect on M72 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M72 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M72 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	1.79541E6			
VARIETA					
CAL	3	268030.	612939.	-1.09769E6	1.63375E6
CAS	3	2.30438E6	612939.	938662.	3.6701E6
CHI	3	1.45044E6	612939.	84719.9	2.81615E6
COM	3	4.6597E6	612939.	3.29398E6	6.02542E6
TAR	3	418780.	612939.	-946937.	1.7845E6
YEO	3	1.67115E6	612939.	305428.	3.03686E6
STATO					
F	6	2.95101E6	433414.	1.98531E6	3.91672E6
P	6	1.04376E6	433414.	78055.6	2.00947E6
S	6	1.39146E6	433414.	425749.	2.35716E6

The StatAdvisor
This table shows the mean M72 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M72 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	1.04376E6	433414.	X
S	6	1.39146E6	433414.	XX
F	6	2.95101E6	433414.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P	*	1.90725E6	1.68207E6
F - S		1.55956E6	1.68207E6
P - S		-347694.	1.68207E6

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 1 pair, indicating that this pair shows a statistically significant difference at the 95.0% confidence level. At the top of the page, 2 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

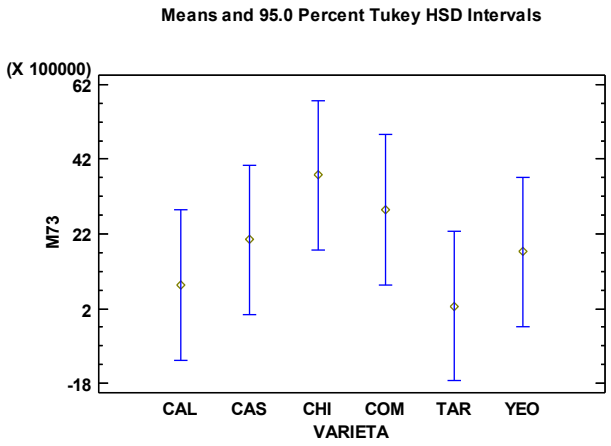
Analysis of Variance for M73 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	2.46598E13	5	4.93195E12	2.46	0.1062
B:STATO	1.41621E13	2	7.08104E12	3.53	0.0693
RESIDUAL	2.00782E13	10	2.00782E12		
TOTAL (CORRECTED)	5.89001E13	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M73 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M73 at the 95.0% confidence level.

Means Plot



This plot shows the mean M73 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M73 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	1.91177E6			
VARIETA					
CAL	3	833280.	818092.	-989546.	2.65611E6
CAS	3	2.04344E6	818092.	220617.	3.86627E6

CHI	3	3.7663E6	818092.	1.94347E6	5.58912E6
COM	3	2.84139E6	818092.	1.01856E6	4.66421E6
TAR	3	269193.	818092.	-1.55363E6	2.09202E6
YEO	3	1.71701E6	818092.	-105812.	3.53984E6
STATO					
F	6	3.12758E6	578478.	1.83865E6	4.41651E6
P	6	1.57131E6	578478.	282377.	2.86024E6
S	6	1.03642E6	578478.	-252515.	2.32535E6

The StatAdvisor
This table shows the mean M73 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M73 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
S	6	1.03642E6	578478.	X
P	6	1.57131E6	578478.	X
F	6	3.12758E6	578478.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		1.55627E6	2.24507E6
F - S		2.09116E6	2.24507E6
P - S		534891.	2.24507E6

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M74 - Type III Sums of Squares

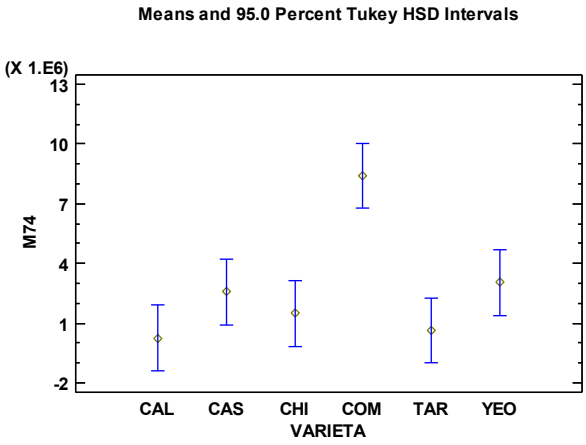
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.33253E14	5	2.66506E13	20.11	0.0001
B:STATO	1.43266E13	2	7.16332E12	5.40	0.0256
RESIDUAL	1.32538E13	10	1.32538E12		
TOTAL (CORRECTED)	1.60834E14	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M74 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since 2 P-values are less than 0.05, these factors have a statistically significant effect on M74 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M74 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M74 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	2.74337E6			
VARIETA					
CAL	3	265403.	664675.	-1.21559E6	1.74639E6
CAS	3	2.57307E6	664675.	1.09207E6	4.05406E6
CHI	3	1.49338E6	664675.	12385.7	2.97437E6
COM	3	8.42383E6	664675.	6.94284E6	9.90482E6
TAR	3	662686.	664675.	-818305.	2.14368E6
YEO	3	3.04184E6	664675.	1.56085E6	4.52283E6
STATO					
F	6	3.99712E6	469996.	2.9499E6	5.04434E6
P	6	1.99415E6	469996.	946933.	3.04137E6
S	6	2.23883E6	469996.	1.19161E6	3.28605E6

The StatAdvisor
This table shows the mean M74 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M74 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	1.99415E6	469996.	X
S	6	2.23883E6	469996.	XX
F	6	3.99712E6	469996.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P	*	2.00297E6	1.82405E6
F - S		1.75829E6	1.82405E6
P - S		-244678.	1.82405E6

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 1 pair, indicating that this pair shows a statistically significant difference at the 95.0% confidence level. At the top of the page, 2 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

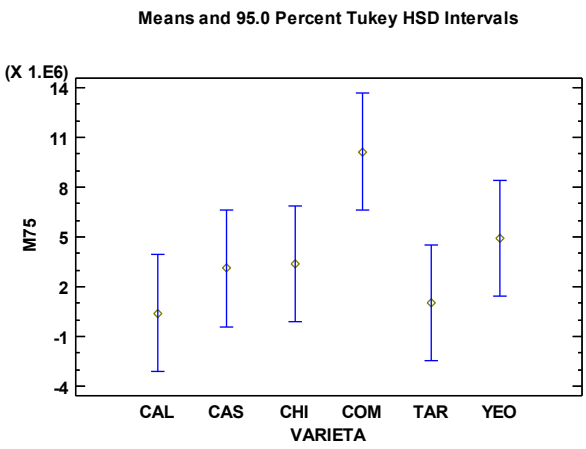
Analysis of Variance for M75 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.83865E14	5	3.67731E13	6.02	0.0080
B:STATO	1.85648E12	2	9.2824E11	0.15	0.8610
RESIDUAL	6.11184E13	10	6.11184E12		
TOTAL (CORRECTED)	2.4684E14	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M75 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M75 at the 95.0% confidence level.

Means Plot



This plot shows the mean M75 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M75 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	3.83469E6			
VARIETA					
CAL	3	421603.	1.42733E6	-2.7587E6	3.60191E6
CAS	3	3.10485E6	1.42733E6	-75456.8	6.28515E6

Allegato 1: ANOVA varietà-stato

CHI	3	3.37439E6	1.42733E6	194085.	6.55469E6
COM	3	1.0141E7	1.42733E6	6.96066E6	1.33213E7
TAR	3	1.02415E6	1.42733E6	-2.15615E6	4.20445E6
YEO	3	4.9422E6	1.42733E6	1.7619E6	8.12251E6
STATO					
F	6	4.23613E6	1.00928E6	1.98732E6	6.48495E6
P	6	3.45001E6	1.00928E6	1.2012E6	5.69883E6
S	6	3.81793E6	1.00928E6	1.56912E6	6.06674E6

The StatAdvisor
This table shows the mean M75 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M75 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	3.45001E6	1.00928E6	X
S	6	3.81793E6	1.00928E6	X
F	6	4.23613E6	1.00928E6	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		786119.	3.91699E6
F - S		418202.	3.91699E6
P - S		-367918.	3.91699E6

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M76 - Type III Sums of Squares

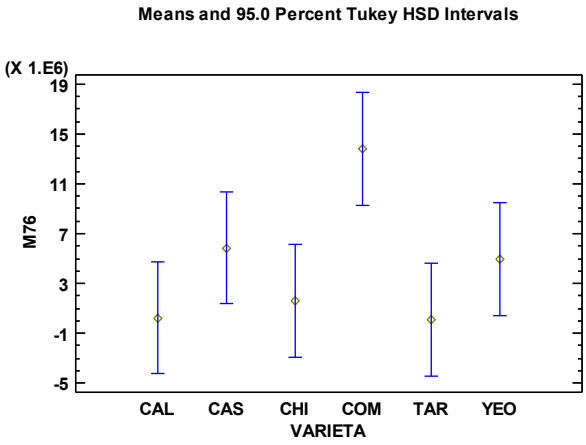
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	4.03321E14	5	8.06642E13	7.96	0.0029
B:STATO	4.75116E13	2	2.37558E13	2.34	0.1464
RESIDUAL	1.01393E14	10	1.01393E13		
TOTAL (CORRECTED)	5.52225E14	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M76 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M76 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M76 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M76 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	4.41857E6			
VARIETA					
CAL	3	246601.	1.83841E6	-3.84965E6	4.34285E6
CAS	3	5.84423E6	1.83841E6	1.74798E6	9.94047E6
CHI	3	1.58804E6	1.83841E6	-2.50821E6	5.68429E6
COM	3	1.38009E7	1.83841E6	9.70469E6	1.78972E7
TAR	3	94974.2	1.83841E6	-4.00127E6	4.19122E6
YEO	3	4.93662E6	1.83841E6	840376.	9.03287E6
STATO					
F	6	6.71609E6	1.29995E6	3.8196E6	9.61257E6
P	6	3.28866E6	1.29995E6	392172.	6.18514E6
S	6	3.25096E6	1.29995E6	354476.	6.14744E6

The StatAdvisor
This table shows the mean M76 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M76 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
S	6	3.25096E6	1.29995E6	X
P	6	3.28866E6	1.29995E6	X
F	6	6.71609E6	1.29995E6	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		3.42743E6	5.0451E6
F - S		3.46513E6	5.0451E6
P - S		37696.2	5.0451E6

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

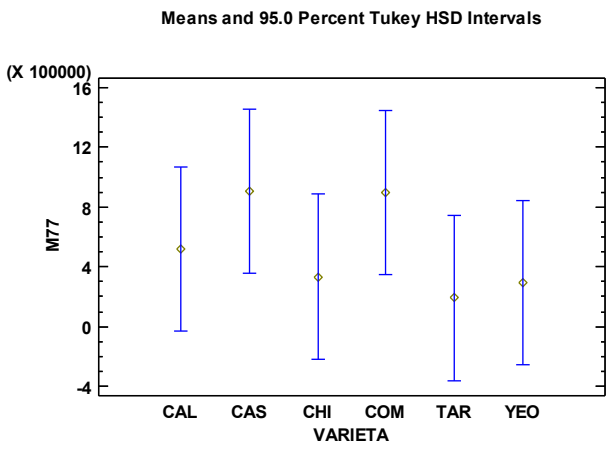
Analysis of Variance for M77 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.45743E12	5	2.91485E11	1.92	0.1781
B:STATO	5.32987E11	2	2.66493E11	1.75	0.2224
RESIDUAL	1.51955E12	10	1.51955E11		
TOTAL (CORRECTED)	3.50996E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M77 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M77 at the 95.0% confidence level.

Means Plot



This plot shows the mean M77 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M77 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	523716.			
VARIETA					
CAL	3	519103.	225059.	17638.2	1.02057E6
CAS	3	907672.	225059.	406208.	1.40914E6

Allegato 1: ANOVA varietà-stato

CHI	3	332198.	225059.	-169266.	833663.
COM	3	896589.	225059.	395125.	1.39805E6
TAR	3	191113.	225059.	-310352.	692578.
YEO	3	295623.	225059.	-205842.	797087.
STATO					
F	6	765564.	159141.	410975.	1.12015E6
P	6	379388.	159141.	24798.9	733977.
S	6	426197.	159141.	71608.0	780786.

The StatAdvisor
This table shows the mean M77 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M77 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	379388.	159141.	X
S	6	426197.	159141.	X
F	6	765564.	159141.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		386176.	617624.
F - S		339367.	617624.
P - S		-46809.1	617624.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M78 - Type III Sums of Squares

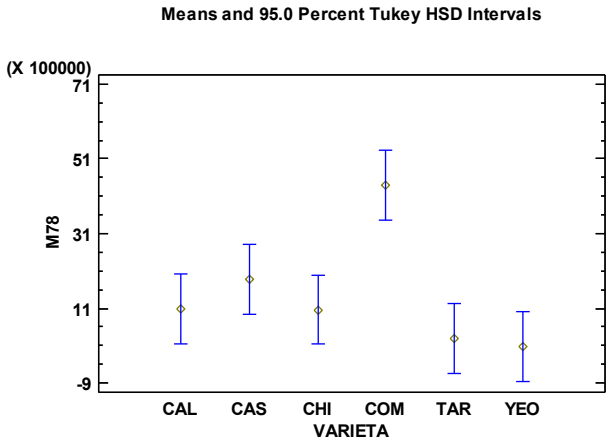
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	3.72296E13	5	7.44592E12	17.30	0.0001
B:STATO	3.5528E11	2	1.7764E11	0.41	0.6726
RESIDUAL	4.30387E12	10	4.30387E11		
TOTAL (CORRECTED)	4.18887E13	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M78 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M78 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M78 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M78 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	1.46196E6			
VARIETA					
CAL	3	1.07794E6	378764.	233999.	1.92188E6
CAS	3	1.86716E6	378764.	1.02322E6	2.7111E6
CHI	3	1.05898E6	378764.	215043.	1.90292E6
COM	3	4.40131E6	378764.	3.55737E6	5.24525E6
TAR	3	295926.	378764.	-548016.	1.13987E6
YEO	3	70417.7	378764.	-773523.	914359.
STATO					
F	6	1.47573E6	267827.	878971.	2.07248E6
P	6	1.28342E6	267827.	686662.	1.88018E6
S	6	1.62672E6	267827.	1.02997E6	2.22348E6

The StatAdvisor
This table shows the mean M78 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M78 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	1.28342E6	267827.	X
F	6	1.47573E6	267827.	X
S	6	1.62672E6	267827.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		192308.	1.03943E6
F - S		-150996.	1.03943E6
P - S		-343304.	1.03943E6

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

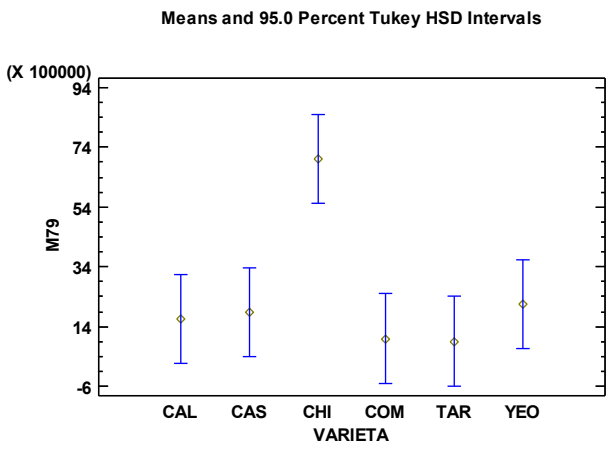
Analysis of Variance for M79 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	7.9293E13	5	1.58586E13	14.28	0.0003
B:STATO	7.85182E12	2	3.92591E12	3.53	0.0690
RESIDUAL	1.1107E13	10	1.1107E12		
TOTAL (CORRECTED)	9.82518E13	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M79 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M79 at the 95.0% confidence level.

Means Plot



This plot shows the mean M79 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M79 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	2.43821E6			
VARIETA					
CAL	3	1.66898E6	608468.	313226.	3.02473E6
CAS	3	1.88554E6	608468.	529790.	3.2413E6

Allegato 1: ANOVA varietà-stato

CHI	3	7.02454E6	608468.	5.66878E6	8.38029E6
COM	3	1.00105E6	608468.	-354708.	2.3568E6
TAR	3	906300.	608468.	-449454.	2.26205E6
YEO	3	2.14283E6	608468.	787076.	3.49858E6
STATO					
F	6	3.33901E6	430252.	2.38035E6	4.29767E6
P	6	1.77395E6	430252.	815286.	2.73261E6
S	6	2.20166E6	430252.	1.243E6	3.16032E6

The StatAdvisor
This table shows the mean M79 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M79 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	1.77395E6	430252.	X
S	6	2.20166E6	430252.	X
F	6	3.33901E6	430252.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		1.56506E6	1.6698E6
F - S		1.13735E6	1.6698E6
P - S		-427712.	1.6698E6

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M80 - Type III Sums of Squares

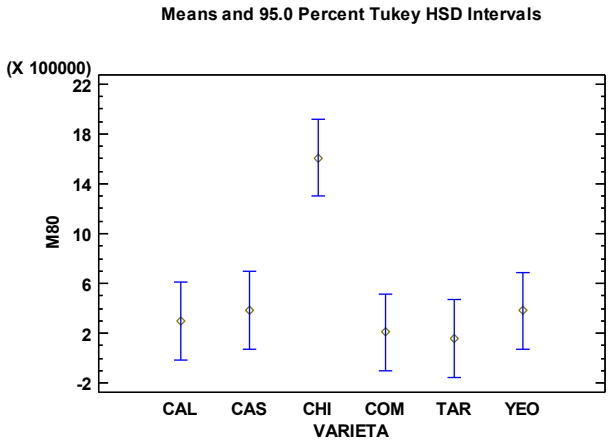
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	4.50228E12	5	9.00457E11	18.64	0.0001
B:STATO	2.25271E11	2	1.12636E11	2.33	0.1475
RESIDUAL	4.83105E11	10	4.83105E10		
TOTAL (CORRECTED)	5.21066E12	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M80 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M80 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M80 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M80 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	506632.			
VARIETA					
CAL	3	300299.	126900.	17548.9	583050.
CAS	3	382155.	126900.	99404.2	664905.
CHI	3	1.6099E6	126900.	1.32715E6	1.89265E6
COM	3	207088.	126900.	-75662.5	489838.
TAR	3	160761.	126900.	-121990.	443511.
YEO	3	379591.	126900.	96840.2	662341.
STATO					
F	6	664765.	89731.5	464830.	864700.
P	6	431826.	89731.5	231891.	631761.
S	6	423306.	89731.5	223371.	623241.

The StatAdvisor
This table shows the mean M80 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M80 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
S	6	423306.	89731.5	X
P	6	431826.	89731.5	X
F	6	664765.	89731.5	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		232939.	348247.
F - S		241459.	348247.
P - S		8520.2	348247.

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

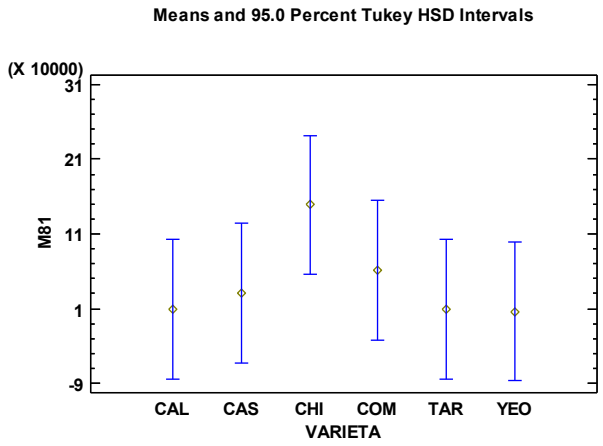
Analysis of Variance for M81 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	4.60629E10	5	9.21257E9	2.11	0.1469
B:STATO	7.66127E9	2	3.83063E9	0.88	0.4451
RESIDUAL	4.35908E10	10	4.35908E9		
TOTAL (CORRECTED)	9.7315E10	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M81 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M81 at the 95.0% confidence level.

Means Plot



This plot shows the mean M81 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M81 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	44287.2			
VARIETA					
CAL	3	8756.24	38118.6	-76177.5	93690.0
CAS	3	31289.1	38118.6	-53644.7	116223.

Allegato 1: ANOVA varietà-stato

CHI	3	148710.	38118.6	63776.2	233644.
COM	3	61940.6	38118.6	-22993.1	146874.
TAR	3	8641.29	38118.6	-76292.4	93575.0
YEO	3	6385.84	38118.6	-78547.9	91319.6
STATO					
F	6	73392.0	26953.9	13334.8	133449.
P	6	27968.4	26953.9	-32088.8	88025.6
S	6	31501.1	26953.9	-28556.1	91558.3

The StatAdvisor
This table shows the mean M81 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M81 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	27968.4	26953.9	X
S	6	31501.1	26953.9	X
F	6	73392.0	26953.9	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		45423.6	104608.
F - S		41890.9	104608.
P - S		-3532.71	104608.

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M82 - Type III Sums of Squares

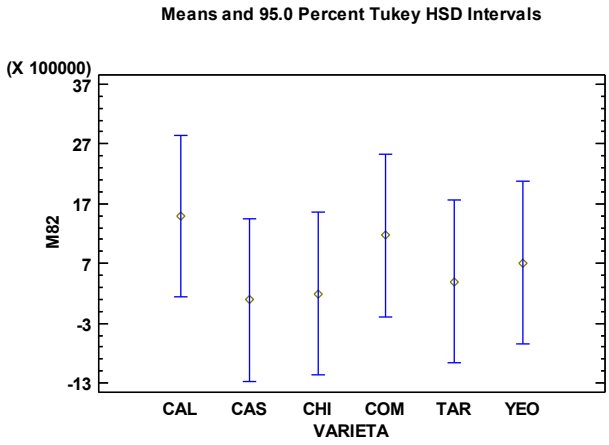
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	4.69895E12	5	9.39789E11	1.02	0.4543
B:STATO	7.76596E12	2	3.88298E12	4.22	0.0468
RESIDUAL	9.19451E12	10	9.19451E11		
TOTAL (CORRECTED)	2.16594E13	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M82 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M82 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M82 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M82 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	674937.			
VARIETA					
CAL	3	1.49319E6	553610.	259666.	2.72671E6
CAS	3	87064.9	553610.	-1.14646E6	1.32059E6
CHI	3	193915.	553610.	-1.03961E6	1.42744E6
COM	3	1.16681E6	553610.	-66713.4	2.40033E6
TAR	3	398165.	553610.	-835358.	1.63169E6
YEO	3	710480.	553610.	-523042.	1.944E6
STATO					
F	6	420684.	391461.	-451548.	1.29292E6
P	6	28319.7	391461.	-843912.	900552.
S	6	1.57581E6	391461.	703576.	2.44804E6

The StatAdvisor
This table shows the mean M82 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M82 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	28319.7	391461.	X
F	6	420684.	391461.	XX
S	6	1.57581E6	391461.	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		392364.	1.51926E6
F - S		-1.15512E6	1.51926E6
P - S	*	-1.54749E6	1.51926E6

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 1 pair, indicating that this pair shows a statistically significant difference at the 95.0% confidence level. At the top of the page, 2 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

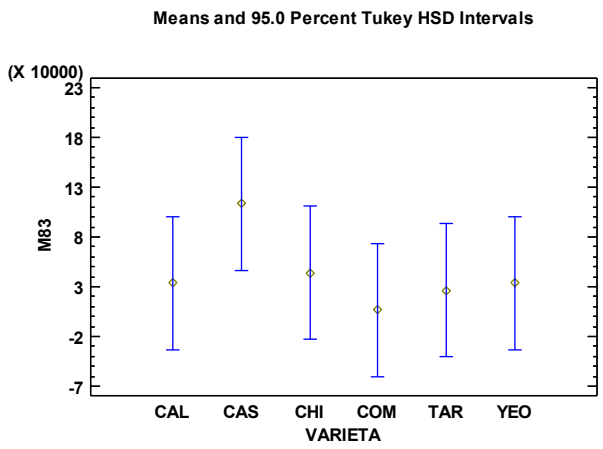
Analysis of Variance for M83 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	2.01937E10	5	4.03874E9	1.81	0.1977
B:STATO	7.58518E9	2	3.79259E9	1.70	0.2309
RESIDUAL	2.22654E10	10	2.22654E9		
TOTAL (CORRECTED)	5.00442E10	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M83 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M83 at the 95.0% confidence level.

Means Plot



This plot shows the mean M83 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M83 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	42888.4			
VARIETA					
CAL	3	33499.7	27243.0	-27201.5	94200.9
CAS	3	113397.	27243.0	52695.3	174098.

Allegato 1: ANOVA varietà-stato

CHI	3	43975.6	27243.0	-16725.6	104677.
COM	3	6783.86	27243.0	-53917.4	67485.1
TAR	3	26210.5	27243.0	-34490.7	86911.7
YEO	3	33464.1	27243.0	-27237.1	94165.4
STATO					
F	6	20647.5	19263.7	-22274.8	63569.7
P	6	70167.6	19263.7	27245.3	113090.
S	6	37850.1	19263.7	-5072.14	80772.3

The StatAdvisor
This table shows the mean M83 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M83 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
F	6	20647.5	19263.7	X
S	6	37850.1	19263.7	X
P	6	70167.6	19263.7	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		-49520.1	74762.1
F - S		-17202.6	74762.1
P - S		32317.5	74762.1

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M84 - Type III Sums of Squares

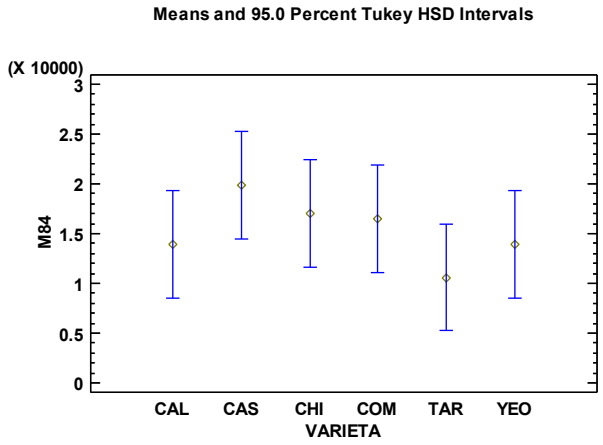
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.51964E8	5	3.03927E7	2.11	0.1479
B:STATO	2.77278E8	2	1.38639E8	9.61	0.0047
RESIDUAL	1.44246E8	10	1.44246E7		
TOTAL (CORRECTED)	5.73488E8	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M84 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M84 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M84 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M84 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	15311.1			
VARIETA					
CAL	3	13960.8	2192.76	9075.05	18846.6
CAS	3	19823.3	2192.76	14937.5	24709.1
CHI	3	17036.9	2192.76	12151.1	21922.6
COM	3	16518.9	2192.76	11633.1	21404.7
TAR	3	10611.5	2192.76	5725.76	15497.3
YEO	3	13915.3	2192.76	9029.52	18801.1
STATO					
F	6	14437.5	1550.52	10982.7	17892.2
P	6	20495.0	1550.52	17040.2	23949.7
S	6	11001.0	1550.52	7546.2	14455.7

The StatAdvisor
This table shows the mean M84 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M84 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
S	6	11001.0	1550.52	X
F	6	14437.5	1550.52	X
P	6	20495.0	1550.52	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P	*	-6057.53	6017.53
F - S		3436.48	6017.53
P - S	*	9494.0	6017.53

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. An asterisk has been placed next to 2 pairs, indicating that these pairs show statistically significant differences at the 95.0% confidence level. At the top of the page, 2 homogenous groups are identified using columns of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

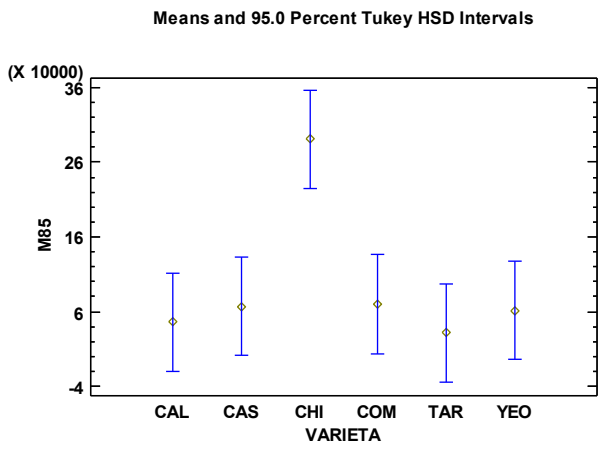
Analysis of Variance for M85 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.42316E11	5	2.84631E10	13.16	0.0004
B:STATO	3.18671E9	2	1.59335E9	0.74	0.5030
RESIDUAL	2.16298E10	10	2.16298E9		
TOTAL (CORRECTED)	1.67132E11	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M85 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M85 at the 95.0% confidence level.

Means Plot



This plot shows the mean M85 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M85 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	94588.1			
VARIETA					
CAL	3	46181.6	26851.3	-13647.0	106010.
CAS	3	66648.4	26851.3	6819.79	126477.

Allegato 1: ANOVA varietà-stato

CHI	3	291248.	26851.3	231420.	351077.
COM	3	69945.7	26851.3	10117.1	129774.
TAR	3	31657.0	26851.3	-28171.6	91485.6
YEO	3	61847.4	26851.3	2018.79	121676.
STATO					
F	6	107823.	18986.7	65517.7	150128.
P	6	76386.7	18986.7	34081.5	118692.
S	6	99554.6	18986.7	57249.4	141860.

The StatAdvisor
This table shows the mean M85 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M85 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	76386.7	18986.7	X
S	6	99554.6	18986.7	X
F	6	107823.	18986.7	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		31436.2	73687.3
F - S		8268.33	73687.3
P - S		-23167.9	73687.3

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M85 - Type III Sums of Squares

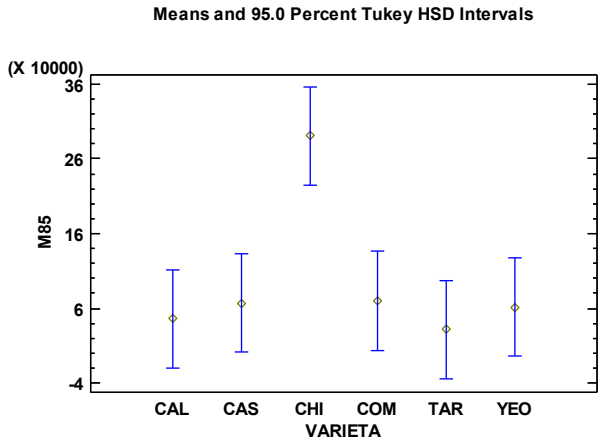
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.42316E11	5	2.84631E10	13.16	0.0004
B:STATO	3.18671E9	2	1.59335E9	0.74	0.5030
RESIDUAL	2.16298E10	10	2.16298E9		
TOTAL (CORRECTED)	1.67132E11	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M85 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M85 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M85 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M85 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	94588.1			
VARIETA					
CAL	3	46181.6	26851.3	-13647.0	106010.
CAS	3	66648.4	26851.3	6819.79	126477.
CHI	3	291248.	26851.3	231420.	351077.
COM	3	69945.7	26851.3	10117.1	129774.
TAR	3	31657.0	26851.3	-28171.6	91485.6
YEO	3	61847.4	26851.3	2018.79	121676.
STATO					
F	6	107823.	18986.7	65517.7	150128.
P	6	76386.7	18986.7	34081.5	118692.
S	6	99554.6	18986.7	57249.4	141860.

The StatAdvisor
This table shows the mean M85 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M85 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	76386.7	18986.7	X
S	6	99554.6	18986.7	X
F	6	107823.	18986.7	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		31436.2	73687.3
F - S		8268.33	73687.3
P - S		-23167.9	73687.3

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

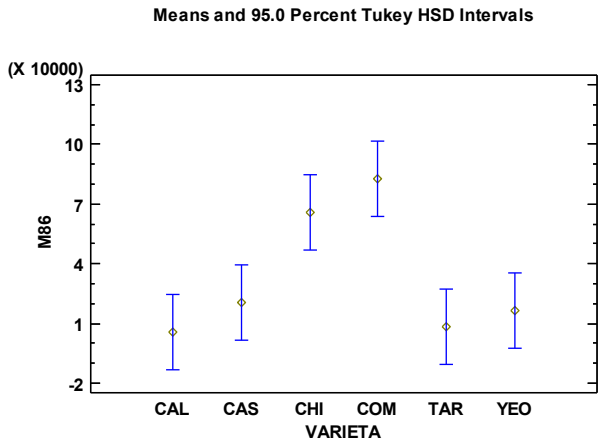
Analysis of Variance for M86 - Type III Sums of Squares

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	1.60341E10	5	3.20683E9	17.82	0.0001
B:STATO	6.39598E8	2	3.19799E8	1.78	0.2186
RESIDUAL	1.79938E9	10	1.79938E8		
TOTAL (CORRECTED)	1.84731E10	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M86 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since one P-value is less than 0.05, this factor has a statistically significant effect on M86 at the 95.0% confidence level.

Means Plot



This plot shows the mean M86 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M86 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	33376.2			
VARIETA					
CAL	3	5820.13	7744.64	-11436.0	23076.3
CAS	3	20641.7	7744.64	3385.57	37897.9

Allegato 1: ANOVA varietà-stato

CHI	3	65923.8	7744.64	48667.7	83180.0
COM	3	82912.0	7744.64	65655.8	100168.
TAR	3	8193.51	7744.64	-9062.67	25449.7
YEO	3	16766.0	7744.64	-490.195	34022.2
STATO					
F	6	38754.0	5476.29	26552.0	50955.9
P	6	25065.1	5476.29	12863.1	37267.0
S	6	36309.5	5476.29	24107.6	48511.5

The StatAdvisor
This table shows the mean M86 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M86 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	25065.1	5476.29	X
S	6	36309.5	5476.29	X
F	6	38754.0	5476.29	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		13688.9	21253.4
F - S		2444.42	21253.4
P - S		-11244.5	21253.4

* denotes a statistically significant difference.

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.

Analysis of Variance for M87 - Type III Sums of Squares

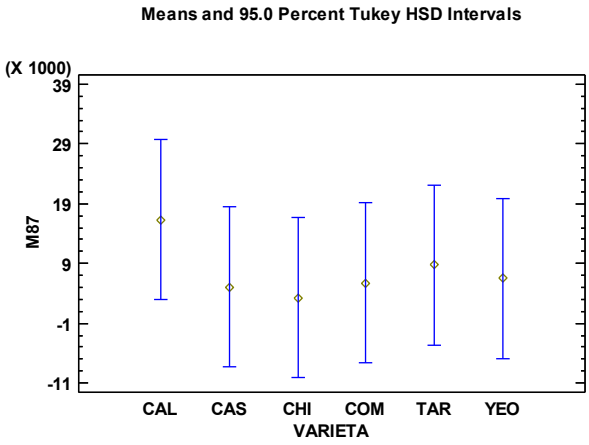
Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
MAIN EFFECTS					
A:VARIETA	3.21384E8	5	6.42768E7	0.72	0.6243
B:STATO	4.59728E8	2	2.29864E8	2.57	0.1258
RESIDUAL	8.94827E8	10	8.94827E7		
TOTAL (CORRECTED)	1.67594E9	17			

All F-ratios are based on the residual mean square error.

The StatAdvisor
The ANOVA table decomposes the variability of M87 into contributions due to various factors. Since Type III sums of squares (the default) have been chosen, the contribution of each factor is measured having removed the effects of all other factors. The P-values test the statistical significance of each of the factors. Since no P-values are less than 0.05, none of the factors have a statistically significant effect on M87 at the 95.0% confidence level.

Means Plot

Allegato 1: ANOVA varietà-stato



This plot shows the mean M87 for each level of VARIETA. It also shows an interval around each mean. The intervals currently displayed are based on Tukey's honestly significant difference (HSD) procedure. They are constructed in such a way that if all the means are the same, all the intervals will overlap 95.0% of the time. Any pair of intervals that do not overlap vertically correspond to a pair of means which have a statistically significant difference. You can do a detailed comparison of the means by selecting Multiple Range Tests from the list of Tabular Options.

Table of Least Squares Means for M87 with 95.0% Confidence Intervals

Level	*Count*	*Mean*	*Stnd. Error*	*Lower Limit*	*Upper Limit*
GRAND MEAN	18	7588.21			
VARIETA					
CAL	3	16286.3	5461.46	4117.34	28455.2
CAS	3	5081.72	5461.46	-7087.2	17250.6
CHI	3	3203.45	5461.46	-8965.48	15372.4
COM	3	5687.85	5461.46	-6481.08	17856.8
TAR	3	8718.39	5461.46	-3450.53	20887.3
YEO	3	6551.61	5461.46	-5617.31	18720.5
STATO					
F	6	4228.11	3861.84	-4376.62	12832.8
P	6	3805.4	3861.84	-4799.33	12410.1
S	6	14731.1	3861.84	6126.4	23335.9

The StatAdvisor
This table shows the mean M87 for each level of the factors. It also shows the standard error of each mean, which is a measure of its sampling variability. The rightmost two columns show 95.0% confidence intervals for each of the means. You can display these means and intervals by selecting Means Plot from the list of Graphical Options.

Multiple Range Tests for M87 by STATO

Method: 95.0 percent Tukey HSD

STATO	*Count*	*LS Mean*	*LS Sigma*	*Homogeneous Groups*
P	6	3805.4	3861.84	X
F	6	4228.11	3861.84	X
S	6	14731.1	3861.84	X

Contrast	*Sig.*	*Difference*	*+/- Limits*
F - P		422.71	14987.7
F - S		-10503.0	14987.7
P - S		-10925.7	14987.7

* denotes a statistically significant difference.

Allegato 1: ANOVA varietà-stato

The StatAdvisor
This table applies a multiple comparison procedure to determine which means are significantly different from which others. The bottom half of the output shows the estimated difference between each pair of means. There are no statistically significant differences between any pair of means at the 95.0% confidence level. At the top of the page, one homogenous group is identified by a column of X's. Within each column, the levels containing X's form a group of means within which there are no statistically significant differences. The method currently being used to discriminate among the means is Tukey's honestly significant difference (HSD) procedure. With this method, there is a 5.0% risk of calling one or more pairs significantly different when their actual difference equals 0.