Research Paper

Effect of organic fertilizers on morpho-physiological traits of grapevine (*Vitis vinifera*) in some vineyards of Zanjan province

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Abstract

In order to reduce the use of chemical fertilizers in the fruit production and increase the quality and yield, the use of organic fertilizers has become increasingly important. The purpose of this study was to investigate the effect of some organic fertilizers on some morpho-physiological traits of grapes. The experiment included the application of organic fertilizers, which were applied in a factorial randomized complete block design with three replications in three locations (garden) during two consecutive years. Treatments included animal manure (0 (control), 10 and 20 ton/ ha), humic acid (0 (control), 5 and 10 kg/ha) and folic acid (0 (control), 5 and 10 kg/ha). The results showed that the main and interaction effects of organic fertilizers were significant on all measured traits (18 traits), including fruit dry matter, sugar, pH of fruit juice, leaf area index, berry weight, number of berries, berry size, cluster size, and cluster weight. According to the results, higher concentrations of all three organic fertilizers used in this study had higher positive effects on final yield and yield components, especially the number of inflorescences per branch and the number of clusters. The combined application of 20 ton/ha animal manure, 5 kg/ha humic acid and 10 kg/ha folic acid is recommended as a desirable combination in vineyards. Due to the interaction effects between location and organic fertilizer treatments on measured traits, it is necessary to investigate the stability of these results through standard methods and tests.

Keywords: Animal manure, Dry matter, Folic acid, Humic acid, Yield

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Research Paper

Evaluation of genetic diversity of Sistan native apple genotypes using IRAP and REMP markers

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Abstract

In order to study the genetic diversity of 25 apple genotypes from three regions of Hamoon, Benjar and Emamiyeh of Zabol city and one region of Zahedan, 11 primers of IRAP and 3 primers of REMP were used. All 14 primers used were able to identify a total of 61 polymorphic gene loci. According to the obtained results, the average percentage of polymorphism among the studied accessions was 39.79 %, with the lowest percentage of polymorphism belonging to the primer 83003 + K001 and the highest percentage of polymorphism attributed to the primer 8565. The content of polymorphic information (PIC) and marker index (MI) varied between 0.02 to 0.28 and 0.29 to 0.54 in all studied genotypes, respectively. The highest PIC was related to K006 primer, and the lowest PIC was related to K001 + 83003 primer, and the highest and lowest MI were also related to 8565 and K001 + 83003primers, respectively. The results strengthened the possibility that the retrotransposons, which produced the most polymorphisms, were more translocated in the evolution of the plants under study and replicated more copies within the genome. The results of cluster analysis based on the UPGMA method, 25 studied genotypes were categorized into three separate groups. Genotypes with geographical origin, as well as morphological similarities and the same horticultural traits, were placed in different groups, which could be due to the different amounts of mobile elements present in these genotypes.

Keywords: Gene locus, Genome, Marker Index, Polymorphism, Retrotransposon

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Research Paper

Effect of winter spray of volck oil on photosynthesis, gas exchange and physiological traits of two olive cultivars

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Abstract

This study was conducted to investigate the effect of winter foliar application of volck oil (0, 1, 3 and 5%) on photosynthesis, gas exchanges and physiological index of two olive cultivars (Manzanilla and Khediri) as split plot based on randomized complete block design with four replications during 2018-2019 under Ahvaz climatic conditions. The results showed that the application of 5% volck oil reduced photosynthesis in Khediri and Manzanilla cultivars by 40 and 52.4% compared to the control treatment in the second week after spraying, and then photosynthesis increased. In the Khediri and Manzanilla cultivars, the application of all three concentrations of volck oil increased transpiration rate compared to the control. The stomatal conductance in the Khediri cultivar was higher than Manzanilla, and the highest stomatal conductance was observed 45 days after treatment. The lowest and highest leaf temperatures were recorded in the control and 3% of volck oil treatment, with an average of 29.34 and 32.17 °C, respectively. In both cultivars, radiation use efficiency decreased with the use of volck oil and a high percentage of leaf drop (59.05%) was observed in the Manzanilla cultivar. As a result, in order to use high doses of volck oil for olive trees, it should be done more cautiously due to the partial reduction of photosynthesis and increase in leaf temperature in both cultivars and as well as the high rate of leaf drop in the Manzanilla cultivar.

Keywords: Gas exchanges, Leaf drop, Olive, Photosynthesis, Volck oil

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Research Paper

The effect of mychorhizal fungi on increasing of drought resistance in Almond rootstocks under water deficit stress condition

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Abstract

In order to evaluate mycorrhizal fungi on physiological characteristics and increase resistance to water-deficient stress in conventional almond (*Prunus amygdalus* L.) rootstock, a factorial experiment was conducted as a randomized complete block design in three replications at the agricultural and natural research centre of Shahrekoard. The experimental factors of this study included the first factor, mycorrhizal fungi at two level (M0: without and M1 with using of mycorrhizal fungi), the second factor, rootstocks at four level (bitter, local Shorab 2, GF and GN) and third factor water stress at four levels (I1: without stress as a control, I2: 20, I3: 40 and I4: 60 percent of depletion of plant available moisture). The results revealed that the maximum amounts of the studied traits, except leaf proline, were obtained from the GF rootstock. As the water deficit stress increased from I1 to I4 treatment, the studied traits increased. The use of mycorrhizae fungi in deficit treatments significantly increased root and leaf proline, root soluble sugars, and the activity of catalase and peroxidase antioxidant enzymes. The maximum root soluble sugars and leaf proline were obtained from GF+M1 and GN+M0 treatments, respectively. The highest levels of catalase and peroxidase enzymes activity were obtained from I4+M1 and GF+I4 treatments. The maximum and minimum content of leaf soluble sugars were obtained from GN+I4+M0 and GN+I1+M1 treatments, respectively. Inoculation of mycorrhizal fungi increased the resistance of rootstocks to water deficit stress. According to the results of this study, the highest resistance to water deficit stress was obtained from the GF rootstock.

Keywords: Almond (*Prunus amygdalus* L.), Catalase, Peroxidase, Proline, Soluble sugars

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Research Paper

Effect of municipal waste compost and growth-promoting bacteria fertilizers on some morphological and physiological characteristics of mulberry tree (*Morus nigra*)

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Abstract

The mulberry trees can grow in different climate conditions. Mulberry leaf is a food for silkworms and plays an essential role in silk production. Therefore, improving the quality and quantity of mulberry leaves is very important in terms of silk production. The aim of this study was to investigate the effect of growth-promoting bacteria and municipal waste compost on morphological and physiological characteristics of mulberry tree cv. Ken Mochi. To conduct this research, 27 mulberry seedlings were obtained from the National Silk Research Institute. This research was conducted as a randomized complete block design with three replications. The treatments used included two levels of municipal waste (2 and 4 percent), two levels of Pseudomonas bacteria (106 and 5×106 cells per gram of soil) and a control. Some physiological properties such as phosphorus, nitrogen, potassium, protein and sugar were measured in the leaves. Also, some morphological characteristics of the plant, including fresh weight, leaf area index, specific leaf area, leaf length, etc., were measured. The results showed that the highest amount of protein and leaf area was obtained in the combined treatment of the second level of compost and bacteria were 22.57 % and 2005 mm2, respectively. The results showed that with increasing the amount of compost and bacteria in the soil, leaf quality increased significantly in terms of physiological indicators such as protein and sugar content and morphological indicators such as leaf area, specific surface area, etc. In general, the obtained results showed that the combination of organic and bio-fertilizers can be used instead of chemical fertilizers to provide the elements needed by the mulberry tree.

Keywords: Leaf area, Nutrition, Organic matter, Pseudomonas, Specific leaf area

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Research Paper

The effects of basal media and plant growth regulators on the microshoots proliferation and callus induction of cranberry (*Vaccinum. arctostaphylos* L.) explants

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(Received: Feb. 4, 2020 - Accepted: Nov. 10, 2020)

Abstract

Cranberry (*Vaccinium arctostaphylos* L.) is the only shrub species of the genus *Vaccinium* in Iran and grows in northern forests. This study was carried out to evaluate the effect of different basal culture media and growth regulators on the establishment, proliferation and callus induction of cranberry micro-shoots under in vitro conditions. In the proliferation of microshoots, three types of basal culture media, AN, QL and ½ MS and four concentrations of zeatin, 0 (control), 1, 2 and 3 mg/L, along with a fixed concentration of 0.2 mg/L of indole acetic acid (IAA) in each basal culture media were used in all replicates. The experiment was carried out as a factorial in a completely randomized basic design with 4 replications. For the callus formation of microshoots, the basal culture media ½ QL with two concentrations (10 and 20 µM) of zeatin, TDZ and BAP, along with three concentrations of NAA (1, 5 and 10 µM) were used in a completely randomized experimental design with five replications. In all experiments, some parameters such as shoot length, number of shoots, the number of nodes and leaves formed, the percentage and the number of days to callus formation were evaluated. The results showed that the number of shoots in explants grown in the basal medium did not differ significantly, while the shoot length of explants was higher in the AN basal medium compared to other basal media. However, the type of basal medium showed significant effects on the number of leaves, and the AN basal medium had the highest number of leaves. While the ½ MS and AN basal media, in terms of the number of nodes, performed better than QL. The concentration of 3 mg/L of zeatin in ½ MS basal medium had the best performance in shoot length, and 1 mg/L of zeatin in AN basal medium had the best performance in terms of shoot number, leaf number and node number. In the induction of callus formation, zeatin had the best performance, and BAP was the most efficient growth regulator in terms of callus formation time.

Keywords: Basel media, Callus, Cranberry, Proliferation

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Research Paper

Evaluation of canonical correlation functions on morpho-physiological and biochemical characteristics of Sistan Yaghooti grape cultivar

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(Received: Dec. 12, 2021 - Accepted: Jan. 23, 2022)

Abstract

Sistan Yaghooti is known as the earliest-ripening grape cultivar in Iran, which produces the best economic and commercial product due to the special climate conditions of this region. This research was conducted to investigate the correlation between canonical functions and morpho-physiological and biochemical characteristics of the Sistan Yaghooti grape cultivar at the Institute of Agricultural Research, University of Zabol. The studied traits included biochemical characteristics (total soluble solids, total acidity, flavor index, ascorbic acid content) and morpho-physiological characteristics (fruit quality, decay percentage, percentage of berries abscission, percentage of cluster weight loss and post-harvest life). The results showed that the highest and lowest eigenvalue of canonical correlation test was related to Hotelling-Lawley Trace and Wilks' Lambda with 2.76 and 0.19, respectively. Among the canonical function variables related to biochemical traits, the third canonical variable showed the highest contribution, with 58 % in explaining the traits. The first and second canonical variables had 22 and 15 % contributions, respectively. Canonical function variables related to morpho-physiological traits explained 32, 23 and 13 % respectively. In general, canonical equations resulting from interaction traits showed that with an increase in TSS content of Sistan Yaghooti grape, the fruit quality and storage life were increased, while decay percentage, percentage of berries abscission, and percentage of cluster weight loss were decreased. Also, as the total acidity of fruit increased, the storage life increased, and the percentage of cluster weight loss decreased.

Keywords: Coefficients, Decay percentage, Flavor index, Functions, Total acidity

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Research Paper

Comparison of quantitative and qualitative characteristics of native mango (*Mangifera indica* L.) genotypes fruits in some regions of Sistan and Baluchistan province

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Abstract

This study was conducted to evaluate fruit quantitative and qualitative characteristics of 32 genotypes of mango seedlings in Chabahar and Konarak cities of Sistan and Baluchistan province based on randomized complete block design (RCBD). Fifteen uniform mango fruits were harvested at full maturity stage (based on skin color) from each selected tree, and the characteristics of fruit length, fruit width, fruit weight, pH, total sugar, total soluble solids, and total acidity of fruit were measured. Leaf characteristics of trees, including leaf length, leaf width and petiole length, were also determined. There was also a great variation among the studied genotypes in terms of soluble solids, total acidity, and total sugars. According to the results, the highest variation was observed in fruit weight, seed weight, total sugar, and total acid of fruit traits. The results of the variance analysis of the data showed that the Chabahar and Konarak genotypes had a significant difference in quantitative and qualitative traits ($P<0.01$). According to the results of correlation analysis, there was a positive and significant correlation between fruit weight and fruit length and width among genotypes of the Konarak region, while there was no correlation between these traits among the studied genotypes in the Chabahar region. Based on cluster analysis, the studied genotypes were classified into four groups. Based on the results, among the genotypes studied in the Chabahar region, genotypes 11 and 6, and in the Konarak region, genotype number 14 were identified as the superior genotypes. These genotypes can be used in mango breeding programs.

Keywords: Breeding, Cluster analysis, Genetic diversity, Seedling, Superior genotype

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Research Paper

Evaluation of some morphological and biochemical traits of twelve pomegranate fruit cultivars (*Punica granatum* L.) in Yazd climatic conditions

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Abstract

Pomegranate (*Punica granatum* L.) is native to Iran, and numerous cultivars are cultivated across the country. This study was conducted to evaluate and compare twelve pomegranate cultivars grown in Yazd province. Fruits harvested at the full ripening stage from 32-year-old trees in the Yazd Pomegranate Collection were evaluated using 22 quantitative, qualitative and biochemical traits. The results showed significant differences among the cultivars in all evaluated parameters. Average fruit weight ranged from 134.85 (cv. Suski Ashkzar Yazd) to 315.55 g (cv. Malas Saveh). The proportions of peel, aril, juice, and seeds relative to the total fruit weight varied among cultivars. Total soluble solids ranged from 13.53 to 18.67 °Brix, titratable acidity from 0.44 to 1.83 mg/100 mL and the maturity index from 9.51 to 34.49. The results also showed that total phenol and flavonoids content in pomegranate cultivars ranged from 158.81-332.78 mg GAE/100 mL and 43.79- 91.31 mg CE/100 mL, respectively. Total anthocyanin content ranged from 13.79 to 165.41 mg/L and antioxidant capacity from 36.57 in the Pust Sefid Dezfol to 89.45 % in Suski Ashkzar Yazd cultivars. Overall, the findings demonstrated that the cultivar plays a pivotal role in determining the quantitative, qualitative, and biochemical characteristics of pomegranate fruits.

Keywords: Anthocyanin, Antioxidant activity, Diversity, Pomegranate, Total phenol

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Research Paper

Effects of anti-transpirant on morpho-physiological characteristics of olive cv. Mary

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Abstract

Olive (*Olea europaea* L.) is one of the most important horticultural crops, and its cultivation is expanding across various regions of Iran, primarily due to its lower water requirement compared to other fruit trees, especially in arid and semi-arid subtropical regions. With respect to the arid and semi-arid climate of Iran, using methods which mitigate water consumption is crucial for sustainable fruit production. This study aimed to investigate the effect of anti-transpirants and shade net on morpho-physiological characteristics and oil content in a native Iranian cultivar, Mary. The experiment was conducted in a completely randomized design with eight treatments: control, kaolin, talc, zinc oxide, silica, TSZ (combination of talc, silica, and zinc oxide), TSZK (combination of talc, silica, zinc oxide, and kaolin) and shade net and three replications. Fruit growth and quality characteristics were evaluated after harvest. The results showed that anti-transpirants reduced the leaf and fruit temperature compared to the control due to creating a coating layer on the leaf and fruit surface. Among the anti-transpirant agents, the TSZK treatment reduced the temperature of leaves and fruits by 4 °C. It also had the greatest effect on the fresh weight of fruit, fresh weight of flesh, dry weight of flesh and increased fruit length and diameter. In general, anti-transpirant agents improved fruit quality characteristics and increased oil content by reducing leaf and fruit temperature.

Key words: Anti-transpirants, Fruit growth and development, Oil content, Olive

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Research Paper

Evaluation of xenia and metaxenia in three hazelnut cultivars treated with different pollinizers and zinc and boron foliar application

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Abstract

Commercial cultivars of hazelnut (*Corylus avellana* L.) differ significantly in terms of pollen compatibility as well as fruit and kernel traits and compositions. This research aimed to evaluate the effects of different pollen sources on physical and chemical characteristics in some Iranian cultivars of hazelnut. This study was conducted as a split factorial experiment with three factors, the first factor consisted of selected commercial cultivars as maternal parents (Gerd Eshkevarat, Fertile, Segorbe), second factor was pollen in four levels including self-pollination, pollen obtained from three cultivar Garche, Boliba and Daviana and the third factor including foliar applications with two micronutrients boron and zinc, at four levels (control, boron, zinc and boron+zinc) based on a randomized complete block design with 3 replications in Eshkevarat region of Guilan province. The results showed that all studied cultivars had dichogamy and all cultivars were protandrous. Results showed the effects of pollen source on kernel and fruit traits of hazelnut were significant. According to the variance analysis of data, the triple effect of maternal cultivar, pollinizers and micronutrient foliar application on kernel dimensions, protein and phosphorus were significant ($P<0.01$). The highest (11.6%) and lowest (8.81%) protein content were observed in the Fertilede with Gercheh pollen grains and foliar application of boron and zinc, and the Gerd Eshkvarat with Daviana pollen grains without foliar application, respectively. The highest (201.9%) and lowest (26.8%) phosphorus content were observed in the Gerd Eshkvarat with Gercheh pollen grains and zinc foliar application, and the Segorb with Boliba pollen grains without foliar application, respectively. The highest (1125 mm3) and lowest (797.2 mm3) kernel volumes were observed with pollen source, and with and without foliar application, respectively.

Keyword: Fruit set, Hazelnut kernel, Incompatibility, Micronutrient, Protein

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Research Paper

Effect of Dormex (Hydrogen Cyanamid) in different concentrations on flowering and fruiting characteristics of three pear cultivars (*Pyrus communis* L.)

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Abstract

Nowadays, Dormex (Hydrogen Cyanamid) is widely used to overcome bud dormancy. This study was conducted to evaluate the effects of Dormex on bud break. A factorial experiment was arranged in a randomized complete block design with two factors, including cultivar (Spadana, Shahmiveh and Kochia) and Dormex spraying (0, 1.5 and 3 %) in one month before the buds opening (mid-February) and three replications. According to the results obtained, buds in all treatments reached flowering in a shorter time than the control. The lowest number of days to full bloom was observed under the 3 % Dormex treatment, with 54, 64, and 57 days for Spadana, Shahmiveh, and Kochia, respectively. Additionally, the 3 % Dormex treatment significantly reduced the number of dormant buds and increased the number of vegetative and reproductive buds, as well as the number of flowers across all pear cultivars compared to the control. The highest percentage of fruit set was recorded in 3 % Dormex treatment: 51.9% (Spadana), 53.56% (Kochia), and 48.35% (Shahmiveh). While the highest total fruit acidity was obtained in 3 % Dormex treatment, which was not significantly different from the 1.5 % Dormex treatment. Moreover, the 3 % and 1.5 % Dormex did not significantly affect biochemical traits such as soluble solids and flavor index of pear fruit. In conclusion, based on the present study results, the application of Dormex improved the percentage of opening buds, flowering and fruiting.

Keywords: Bud, Chilling requirement, Dormancy, Flavor index, Soluble solids

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Research Paper

Effect of sustained deficit irrigation (SDI) on yield and some morphological and biochemical traits of fruits in three jujube (*Ziziphus jujuba* Mill.) ecotypes

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Abstract

In this study, sustained deficit irrigation (SDI) on some fruit quantitative and qualitative traits of three jujube (*Ziziphus jujuba* Mill.) ecotypes was considered under lysimetric conditions at the Desert Research Station of the Agricultural and Natural Resources Research and Education Centre of Yazd Province, Iran. The treatments included full irrigation (control), 30% and 60% sustained deficit irrigation (mild and severe stress) and three ecotypes (Flarg, Gyuk, and Alqour). The experiment was carried out as a factorial with a completely randomized design during the 2017-2018 growing season. The results showed that the control treatment had a significant difference ($P<0.01$) with other treatments in terms of yield (239.36 g per tree), number of fruits (279.06 per tree), average fruit dry weight (0.89 g), fruit diameter and length (15.19 and 16.17 mm, respectively), soluble sugars (251899 mg/kg DW), and antioxidant activity (42.61%) and had the highest value. The highest total phenol (36.32 mg/g DW) was recorded in the 60% low irrigation treatment. Alqour produced the lowest fruit weight ($P < 0.05$) and the highest total phenol content ($P < 0.01$), showing significant differences compared to the other ecotypes. However, the overall response of ecotypes to drought stress was similar, with no significant interaction observed. Given the significant effect of relative soil moisture content on the quantitative and qualitative characteristics of fruit in all three jujube ecotypes, it is recommended that irrigation schedules be carefully managed to meet the crop's water requirements and minimize drought stress.

Key words: Anthocyanin, Antioxidant activity, Soluble sugars, Total phenols, Yield

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Research Paper

Evaluation of traits and selection of superior fruit quality in some Asian pear cultivars under Karaj climatic conditions using the adjusted selection index of ideal genotype

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Abstract

Asian pear (*Pyrus serotina* Rehd.) is one of the pear species recently introduced into the country. In order to evaluate the superior and compatible cultivars in Karaj climatic conditions, eight Asian pear cultivars were used along with two control cultivars of European pear species (*Pyrus communis* L.). These cultivars were evaluated in a randomized complete block design with three replications during four consecutive growing seasons (2011-2014) at the Karaj Horticultural Research Station. For this purpose, fruit set and fruit characteristics of the studied cultivars, including fruit set percentage, yield, fruit weight, fruit length, fruit diameter, length to diameter ratio, fruit firmness, acidity, total soluble solids (TSS), pH, fruit color, ripening date and fruit aroma, were recorded. Combined data analysis showed significant differences among the cultivars for all traits ($P \leq 0.01$). The highest yield was recorded in cultivar KS13 with 12.91 kg per tree, while the highest fruit set percentage (12.00%) was observed in cultivar KS7. A significant positive correlation was found between fruit weight and fruit set percentage ($P \leq 0.01$). To identify the most promising cultivar in terms of fruit quantity and quality, the adjusted selection index of the ideal genotype (ASIIG) method was used. According to this index, it was determined that the cultivar KS7 was the most ideal cultivar due to the maximum value of this index among the studied cultivars. Along with this cultivar, the KS13, KS14 and KS10 cultivars were collectively located at the favorable quarter, and therefore, these four cultivars were introduced as the most ideal cultivars based on the results of this study.

Keywords: Asian pear, ASIIG, Correlation, Combined analysis, Fruit quality, GGEBiplot, Yield

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