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# Performance Evaluation of Peanut Genotypes in Terms of Agronomic and Quality Parameters

Tahsin BEYCİOGLU[1*], Oktay Burak ÖZCAN[2]

[1]Pamukkale University, Faculty of Agriculture, Department of Field Crop, Denizli, TÜRKİYE

[2]Osmaniye Oilseeds Research Institute Directorate, Osmaniye, TÜRKİYE

ORCID[1]: https://orcid.org 0000-0001-5338-8836; ORCİD[2]: https://orcid.org 0000-0001-8438-7932

*Corresponding author: tbeycioglu@pau.edu.tr; e-posta[2]: oktayburak.ozcan@tarimorman.gov.tr

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## ABSTRACT

In this study, the agronomic and quality parameters of nine different peanut genotypes (57-422 Senegal, 96-Australia, 98-Australia, Argentina, Florispan, Georgia Green, New Mexico, Starr, and Starr Spanish) were evaluated. The study was conducted in a randomized block design with three replications, and the following parameters were examined: yield, first-quality pod ratio (FiQuPoRa), second-quality pod ratio (SeQuPoRa), hundred-pod weight (OHuPoWe), hundred-seed weight (OHuSeWe), and shelling ratio (SeRA). The F values calculated for all parameters were found to be statistically significant, and significant differences were detected between genotypes. In terms of yield, Georgia Green (408.50 kg da$^{-1}$) showed the highest value, while Starr Spanish (259.91 kg da$^{-1}$) had the lowest value. In terms of first-quality pod ratio, 98-Australia (66.63%), second-quality pod ratio, Argentina (46.24%), hundred pod and seed weight, Florispan (190.89 g and 111.28 g, respectively), and shelling ratio, 96-Australia (64.85%) were the standout genotypes. Correlation analysis results showed positive and significant relationships between yield and first-quality pod ratio, hundred-pod weight, and hundred-seed weight. Principal component analysis (PCA) revealed that the examined traits explained 78.1% of the total variation and that genotypes were distinctly grouped according to different traits. The results provide valuable information for selecting suitable genotypes for different cultivation purposes and for use in breeding programs.

**Keywords:** Peanut, genotype, yield, quality, principal component analyse

# Yerfıstığı Genotiplerinin Agronomik ve Kalite Parametrelerinin Değerlendirmesi

## ÖZ

Bu çalışmada, dokuz farklı yer fıstığı genotipinin (57-422 Senegal, 96-Avustralya, 98-Avustralya, Arjantin, Florispan, Georgia Green, New Mexico, Starr ve Starr Spanish) agronomik ve kalite parametreleri değerlendirilmiştir. Çalışma, tesadüf blokları deneme deseninde üç tekrarlamalı olarak gerçekleştirilmiş ve şu parametreler incelenmiştir: verim, birinci kalite meyve oranı (FiQuPoRa), ikinci kalite meyve oranı (SeQuPoRa), yüz meyve ağırlığı (OHuPoWe), yüz tohum ağırlığı (OHuSeWe) ve iç oranı (SeRA). Tüm parametreler için hesaplanan F değerlerinin istatistiksel olarak çok anlamlı olduğu ve genotipler arasında önemli farklılıklar olduğu tespit edilmiştir. Verim açısından Georgia Green (408,50 kg $da^{-1}$) en yüksek değeri gösterirken, Starr Spanish (259,91 kg $da^{-1}$) en düşük değeri almıştır. Birinci kalite meyve oranı açısından 98-Australia (66,63%), ikinci kalite meyve oranı açısından Argentina (46,24%), yüz meyve ve tohum ağırlığı açısından Florispan (sırasıyla 190,89 g ve 111,28 g) ve iç oranı açısından 96-Australia (64,85%) öne çıkan genotiplerdir. Korelasyon analizi sonuçları, verim ile birinci kalite meyve oranı, yüz meyve ağırlığı ve yüz tohum ağırlığı arasında pozitif ve anlamlı ilişkiler olduğunu göstermiştir. Temel bileşen analizi (PCA), incelenen özelliklerin toplam varyasyonun %78,1'ini açıkladığını ve genotiplerin farklı özelliklere göre belirgin bir şekilde gruplandırıldığını ortaya koymuştur. Sonuçlar, farklı yetiştirme amaçları için uygun genotiplerin seçilmesi ve ıslah programlarında kullanılması için değerli bilgiler sağlamaktadır.

**Anahtar kelimeler:** Yer fıstığı, genotip, verim, kalite, temel bileşen analizi

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## INTRODUCTION

Peanut (*Arachis hypogaea* L.) belongs to the *Dalbergieae* tribe of the *Papilionoideae* subfamily of the Fabaceae family (Stalker et al., 2016). Peanut, a high-protein oilseed crop (Khedikar et al., 2018), is one of the most important oil and protein crops in the world (Zhao et al., 2012). Peanut is a self-pollinating, annual herbaceous plant (Adinya et al., 2010). A legume native to South America, peanuts (Hammons et al., 2016) were spread worldwide by the Portuguese due to their tasty large seeds (Silva et al., 2017). The earliest known records of peanut cultivation date back 7,600 years (Becker and Jappe, 2014). Peanuts are among the most important industrial crops worldwide as food, oil, and commercial products. Primarily cultivated in tropical and subtropical regions, peanuts are native to South America and belong to the “oilseed” group of plants due to their high oil content of 44-55%. Peanut seeds also contain 22-30% protein, 18% carbohydrates, and high amounts of minerals such as Ca, Mg, K, P, S, Fe, and Zn (Ağan, 2025). In terms of oil crop cultivation areas, peanuts rank fourth after soybeans, rapeseed, and sunflowers. Peanuts are an important food source for human nutrition, as their seeds contain oil, protein, carbohydrates, and vitamins. In addition, the oil extracted from peanut seeds leaves behind a significant amount of protein in the meal, which is highly valuable for animal feed. The protein content in peanut seeds varies depending on the variety (Elinç and Erman, 2021). In our country, it is believed that producers first started planting peanuts in the Thrace region, and then it spread to the Aegean, Mediterranean, and Southeast Anatolia regions (Arıoğlu, 1999). Approximately 90% of production in Turkey takes place in the Çukurova region. The highest peanut production is in Adana province, while Osmaniye is the province where peanut trade and industry are most developed (Kadiroğlu, 2016). Peanuts exhibit significant genetic variation in terms of morphological and agronomic characteristics. To fully realize this potential, studies aimed at identifying varieties that can adapt to regional conditions in terms of yield and yield parameters, as well as appropriate agronomic techniques, are of considerable importance (Baran and Andırman, 2022).

The objective of this study is to compare the performance of nine different peanut genotypes in terms of agronomic and quality parameters such as yield, first and second quality pod ratio, hundred pod weight, hundred seed weight, and shelling ratio under a randomized block design, and to identify the genotypes that best adapt to regional conditions and exhibit superior characteristics.

## MATERIALS AND METHODS

### *Plant Material and Trial Area*

The research was conducted in the peanut growing season under the main crop conditions of 2023 in Çal district of Denizli province. Nine different peanut genotypes (57-422 Senegal, 96-Australia, 98-Australia, Argentina, Florispan, Georgia Green, New Mexico, Starr, and Starr Spanish) were obtained from the Osmaniye Oilseed Research Institute Directorate. According to soil analysis results (0-30 cm depth), the experimental area exhibited moderate alkaline characteristics with a pH level of 8.3. The electrical conductivity (EC) value of 450 µS $cm^{-1}$ indicates saline soil conditions. The soil has an extremely high lime content (25.77%), which has the potential to affect nutrient mobility and availability. When examining the results of macro nutrient elements, potassium (365 mg $kg^{-1}$) and phosphorus (26.37 mg $kg^{-1}$) levels were found to be sufficient. However, organic matter content (1.17%) is below the recommended limit value (2-5%) for agricultural lands. When examining micro-nutrient elements, copper (1.7 mg $kg^{-1}$) and manganese (11.4 mg $kg^{-1}$) concentrations appear moderate, while iron (5.4 mg $kg^{-1}$) levels are sufficient but may be negatively affected by high soil pH and calcareous structure. Zinc concentration (0.4 mg $kg^{-1}$) is significantly insufficient. Climate data for the main crop growing season in Denizli-Çal were obtained from the Denizli Meteorological Station Directorate. In the Denizli-Çal district, during the April-October growing season of 2023, the monthly total rainfall was 295.5 mm, average temperature values ranged from 10.5°C (April) to 27.1°C (August), and average relative humidity values ranged from 42.6% (July) to 75.4 (May). The highest rainfall was recorded in May (125.4 mm), and the lowest in August (5.2 mm). During the first half of the vegetation period (April-June), 82% (243.2 mm) of the total precipitation occurred, while a significant decrease in precipitation was observed during the second half (July-October). Temperature values showed a steady increase starting from April, reaching their maximum level in August, and then gradually decreasing (Anonymous, 2024).

### *Method*

The research was conducted at the Research and Application Center of the Faculty of Agriculture, Pamukkale University, located in the Çal district of Denizli province, at 38°05'57"north latitude and 29°25'04" east longitude in the Aegean Region. The experiment was set up in a randomized block design with three replications. A total of nine peanut genotypes were evaluated, including the following varieties: 57-422 Senegal, 96-Australia, 98-Australia, Argentina, Florispan, Georgia Green, New Mexico, Starr, and Starr Spanish. The total trial area was 529,2 $m^2$, with plot dimensions of 2.8 m × 5.0 m (14 $m^2$), and each block contained 9 plots, each consisting of 4 rows. Before sowing, the row spacing was set to 70 cm, and seeds were manually sown into 6–7 cm deep furrows marked with markers, ensuring that each plot received 132.0 seeds. In the experiment, the distance between blocks was set at 3 m. Immediately before planting, 30 kg $da^{-1}$ of diammonium phosphate fertilizer (18% N, 46% $P_2O_5$) was applied and mixed into the soil. After planting, 15 kg $da^{-1}$ of urea fertilizer (46% N) was applied as top dressing. All necessary maintenance operations, including weed control, disease and pest management, and irrigation, were carried out throughout the growing season. Harvesting was done by manually pulling the plants from the plots and turning them upside down to dry. Threshing was performed manually when the plant leaves turned brown and the above-ground parts dried out. In this study, yield and quality parameters such as yield (kg $da^{-1}$), first-quality pod ratio (FiQuPoRa, %), second-quality pod ratio (SeQuPoRa, %), hundred-pod weight (OHuPoWe, g), hundred-seed weight (OHuSeWe, g), and shelling ratio (SeRA, %) were examined. Yield was calculated by weighing the product obtained from each plot and converting it to decares. The first and second quality pod ratios were determined by separating the harvested products according to their quality classes. The hundred pod and hundred seed weights were measured by weighing randomly selected samples from each plot. The shelling ratio was calculated as the ratio of seed weight to pod weight.

### *Statistical Analysis*

The field trial was established on May 11, 2023, according to a three-replicated Randomized Block Design. The data were analyzed using the JMP (Pro 17) statistical software. Mean values were calculated for all measured parameters, including yield components and quality parameters. The data were analyzed using analysis of variance with Tukey's test to compare the means. Correlation coefficients and principal component analyses (PCA) were calculated and evaluated on average data (JMP 17 SAS Institute Inc, 2020).

## RESULT AND DISCUSSION

In this study on peanut genotypes, the yield and quality characteristics of nine different genotypes were investigated. The study was conducted in a randomized block design with three replications, and the F values calculated for all parameters were found to be statistically significant (**), indicating significant differences between the genotypes studied.

**Table 1. Mean Values and Groupings of Yield and Agromorphological Characteristics of Different Peanut Genotypes**

| Genotype | Yield (kg $da^{-1}$) | FiQuPoRa (%) | SeQuPoRa (%) | OHuPoWe (g) | OHuSeWe (g) | SeRA (%) |
|---|---|---|---|---|---|---|
| 57-422 Senegal | 325,05 de | 59,18 c | 38,42 de | 98,88 d | 62,52 bc | 63,23 ab |
| 96-Australia | 343,44 cd | 61,10 bc | 34,91 fg | 89,95 e | 58,33 c | 64,85 a |
| 98-Australia | 350,15 c | 66,63 a | 32,22 g | 103,94 cd | 60,84 bc | 58,53 d |
| Argentina | 346,45 c | 52,05 e | 46,24 a | 106,22 c | 65,27 b | 61,40 bc |
| Florispan | 383,00 b | 62,27 b | 32,84 fg | 190,89 a | 111,28 a | 58,28 d |
| Georgia Green | 408,50 a | 63,28 b | 35,86 ef | 166,56 b | 106,42 a | 63,89 a |
| New Mexico | 379,07 b | 58,83 c | 39,38 cd | 105,14 cd | 63,04 bc | 59,96 cd |
| Starr | 307,04 e | 54,68 d | 42,70 bc | 104,32 cd | 65,53 b | 62,82 ab |
| Starr Spanish | 259,91 f | 55,30 d | 42,88 ab | 101,50 cd | 64,77 bc | 63,81 a |
| **Anova** | | | | | | |
| **F Ratio** | 106,58** | 92,05** | 49,78** | 582,89** | 239,11** | 34,92** |

When the results were evaluated in terms of yield, the Georgia Green genotype showed the highest yield value of 408.50 kg $da^{-1}$. This value is significantly higher than the trial average of 344.73 kg $da^{-1}$. Following Georgia Green were the Florispan (383.00 kg da-1) and New Mexico (379.07 kg da-1) genotypes. The 98-Australia

(350.15 kg da$^{-1}$), Argentina (346.45 kg da$^{-1}$), and 96-Australia (343.44 kg da$^{-1}$) genotypes showed moderate yield performance, while 57-422 Senegal (325.05 kg da$^{-1}$), Starr (307.04 kg da$^{-1}$), and Starr Spanish (259.91 kg da$^{-1}$) genotypes had lower yield values. There is a significant difference of 148.59 kg da$^{-1}$ between Georgia Green, which has the highest yield, and Starr Spanish, which has the lowest yield. In the studies conducted, Ekin and Yolbaş (2022) reported a yield of 367.86-451.67 kg da$^{-1}$, Boydak (2020) 352.01-553.45 kg da$^{-1}$, and Çil et al. (2016) 252.5-428.3 kg da$^{-1}$. These results are partially consistent with our findings, and the lower values in our results can be attributed to the differences in market types among the varieties. In terms of the first-quality pod ratio (FiQuPoRa), the 98-Australia genotype showed the highest value at 66.63%. This genotype was followed by Georgia Green (63.28%), Florispan (62.27%), and 96-Australia (61.10%) genotypes. The 57-422 Senegal (59.18%), New Mexico (58.83%), Starr Spanish (55.30%), and Starr (54.68%) genotypes had an average first-quality pod ratio, while the Argentina genotype showed the lowest value at 52.05%. There is a 14.58% difference between 98-Australia, which has the highest percentage of first-quality fruit, and Argentina, which has the lowest percentage. Kurt et al. (2016) reported that the marketability of produced peanuts depends on the first-grade pod ratio. In their study, they found the first-grade pod ratio to be between 71.8% and 91.6%, while Aşık et al. (2018) found the first-grade pod ratio of the Flower 22 variety belonging to the Virginia group to be the lowest; Batem-5025 (87.37%), NC-7 (85.24%), and Brantley (84.43%) varieties. Compared to previous studies, the first-quality pod ratio obtained in this study is at lower levels. This situation can be attributed to ecological and regional climatic conditions.

In terms of the second-grade pod ratio (SeQuPoRa), the Argentina genotype has the highest value at 46.24%. This genotype is followed by Starr Spanish (42.88%), Starr (42.70%), New Mexico (39.38%), and 57-422 Senegal (38.42%). Georgia Green (35.86%), 96-Australia (34.91%), Florispan (32.84%), and 98-Australia (32.22%) genotypes have lower second-quality pod ratios. There is a 14.02% difference between the highest second-quality pod ratio of Argentina and the lowest ratio of 98-Australia. In terms of hundred pod weight (OHuPoWe), the Florispan genotype stands out significantly from the others with 190.89 g. The Georgia Green genotype ranks second with 166.56 g. Argentina (106.22 g), New Mexico (105.14 g), Starr (104.32 g), 98-Australia (103.94 g), Starr Spanish (101.50 g), and 57-422 Senegal (98.88 g) genotypes show similar values, while the 96-Australia genotype has the lowest pod weight at 89.95 g. There is a significant difference of 100.94 g between Florispan, which has the highest hundred pod weight, and 96-Australia, which has the lowest value. In terms of 100 pod weight, studies conducted on the subject indicate that Kadiroğlu (2012) found the highest 100 pod weight (334.60 g) among different peanut varieties (Georgia Green, NC-7, Florispan, and Halisbey) from the Halisbey variety, while Koldanca (2016) reported the highest 100 pod weight (64.3 g) from the Halisbey variety among different peanut varieties (Halisbey, NC-7, and Batem-5025). In terms of hundred-seed weight (OHuSeWe), the Florispan (111.28 g) and Georgia Green (106.42 g) genotypes showed the highest values. These two genotypes are distinctly different from the others. Starr (65.53 g), Argentina (65.27 g), Starr Spanish (64.77 g), New Mexico (63.04 g), 57-422 Senegal (62.52 g), 98-Australia (60.84 g), and 96-Australia (58.33 g) genotypes have lower seed weight values. There is a significant difference of 52.95 g between Florispan, which has the highest hundred-seed weight, and 96-Australia, which has the lowest value. Hundred-seed weight is a fundamental yield-determining factor in peanuts because the healthier and heavier the seed, the higher the seed yield (Güven, 2025). Agan

(2010) reported 114–134 g, Canavar (2011) 59.13–94.06 g, and Hatipoğlu (2014) 60.28–63.92 g for hundred-seed weight. These results are consistent with the hundred-seed weight values obtained in our study. In terms of shelling ratio (SeRA), the genotypes 96-Australia (64.85%), Georgia Green (63.89%), Starr Spanish (63.81%), and 57-422 Senegal (63.23%) showed the highest values. The genotypes Starr (62.82%), Argentina (61.40%), New Mexico (59.96%), 98-Australia (58.53%), and Florispan (58.28%) had lower shelling ratio values. There is a 6.57% difference between the genotype with the highest shelling ratio (96-Australia) and the one with the lowest value (Florispan). The shelling ratio in the study ranged from 62.92% to 66.43% in 2014, 64.78% in 2014, 67.70% in 2015, and between 63.85% and 67.07% on a two-year average (Güllüoğlu et al. 2016). When all parameters are evaluated together, it is observed that the Georgia Green genotype exhibits a balanced and superior performance in terms of both yield and quality parameters. This genotype ranks among the top in terms of first-quality pod ratio, hundred-pod weight, hundred-seed weight, and shelling ratio, in addition to having the highest yield value. The Florispan genotype ranks second in terms of yield and has the highest values for hundred pod weight and hundred seed weight. However, its low shelling ratio is considered a disadvantage. The 98-Australia genotype stands out in terms of quality due to its highest first-grade pod ratio and lowest second-grade pod ratio. However, the low shelling ratio of this genotype can be seen as a disadvantage. The Argentina genotype is at a disadvantage in terms of quality due to its lowest first-grade pod ratio and highest second-grade pod ratio. The 96-Australia genotype attracts attention with its highest shelling ratio, but its lowest hundred pod weight and hundred seed weight are among its disadvantages. The Starr Spanish genotype, despite having the lowest yield value, stands out due to its high shelling ratio. These detailed analysis results provide important information for selecting suitable genotypes according to different cultivation objectives. For yield-focused production systems, Georgia Green and Florispan are recommended, while 98-Australia and Georgia Green are suggested for quality-focused production systems. For balanced production systems, Georgia Green is recommended. Additionally, breeding studies between 98-Australia, which has a high first-quality pod ratio, and Georgia Green, which has a high yield value, could contribute to the development of new varieties with superior traits in both yield and quality. Florispan's significant superiority in terms of pod and seed weight indicates that this genotype can be used in breeding programs aimed at increasing grain size (Table 1). In this study on peanut genotypes, the relationships between the yield and quality characteristics of nine different genotypes were examined using correlation analysis. As seen in the correlation table, there are significant relationships between yield and other quality parameters. A positive and statistically very significant ($r$ = 0.5179**) relationship was found between yield and the first-quality pod ratio (FiQuPoRa). This indicates that an increase in yield is associated with an increase in the first-quality pod ratio. It is understood that high-yielding genotypes tend to produce high-quality products. A negative and statistically very significant ($r$ =-0.4935**) relationship was found between yield and the second-quality pod ratio (SeQuPoRa). This result indicates that as yield increases, the second-quality pod ratio decreases. Positive and statistically significant ($r$ = 0.6101** and $r$ = 0.5938**, respectively) relationships were also identified between yield and hundred pod weight (OHuPoWe) and hundred seed weight (OHuSeWe). This indicates that genotypes with higher pod and seed weights generally have higher yields. A negative but statistically insignificant relationship ($r$ =-0.3626) was found between yield and shelling ratio (SeRA). A very strong, negative, and statistically significant relationship ($r$ =-0.9547**) was identified between the first-quality pod ratio (FiQuPoRa) and the second-quality pod ratio (SeQuPoRa). This result indicates that as the first-quality pod ratio increases, the second-quality pod ratio decreases significantly. There are positive but statistically insignificant relationships (*r* = 0.3677 and *r* = 0.3432, respectively) between the first-quality pod ratio and the hundred-pod weight (OHuPoWe) and the hundred-seed weight (OHuSeWe). A negative but statistically insignificant relationship (*r* =-0.3093) was found between the first-quality pod ratio and the shelling ratio (SeRA). There are negative and statistically significant relationships between the second-quality pod ratio (SeQuPoRa) and the face pod weight (OHuPoWe) and face seed weight (OHuSeWe) (*r* =-0.4234* and *r* =-0.3897*, respectively). This result indicates that as pod and seed weight increase, the second-quality pod ratio decreases. A positive but statistically insignificant (*r* = 0.3118) relationship was found between the second-quality pod ratio and the shelling ratio (SeRA). There is a very strong, positive, and high correlation (*r* = 0.9886) between hundred pod weight (OHuPoWe) and hundred seed weight (OHuSeWe). This indicates that genotypes with higher pod weight also have higher seed weight. A negative but statistically insignificant (*r* =-0.3314) relationship was found between hundred pod weight and shelling ratio (SeRA). A negative but statistically insignificant (*r* =-0.1923) relationship was also found between hundred seed weight (OHuSeWe) and shelling ratio (SeRA). These correlation analysis results provide important information that should be considered when determining selection criteria in peanut breeding programs. In particular, the positive relationship between yield and first-quality pod ratio indicates that selection can be made in the same direction for both traits. Additionally, the strong positive relationships between yield and hundred-pod weight and hundred-seed weight are important for indirect selection. Selecting genotypes with high pod and seed weight may indirectly contribute to increased yield. The very strong negative relationship between the first-quality pod ratio and the second-quality pod ratio indicates that these two traits are alternatives to each other and that selection for the first-quality pod ratio will automatically reduce the second-quality pod ratio. A very strong positive relationship has been identified between hundred pod weight and hundred seed weight (Table 2). Şahin et al. (2023) found positive relationships between pod yield and hundred pod weight and hundred seed weight in their study. This result is consistent with our findings.

**Table 2. Correlation coefficients among agromorphological traits of peanut genotypes**

| | Yield | FiQuPoRa | SeQuPoRa | OHuPoWe | OHuSeWe | SeRa |
|---|---|---|---|---|---|---|
| **Yield** | 1,0000 | 0,5179** | -0,4935** | 0,6101** | 0,5938** | -0,3626 |
| **FiQuPoRa** | | 1,0000 | -0,9547** | 0,3677 | 0,3432 | -0,3093 |
| **SeQuPoRa** | | | 1,0000 | -0,4234* | -0,3897* | 0,3118 |
| **OHuPoWe** | | | | 1,0000 | 0,9886 | -0,3314 |
| **OHuSeWe** | | | | | 1,0000 | -0,1923 |
| **SeRa** | | | | | | 1,0000 |

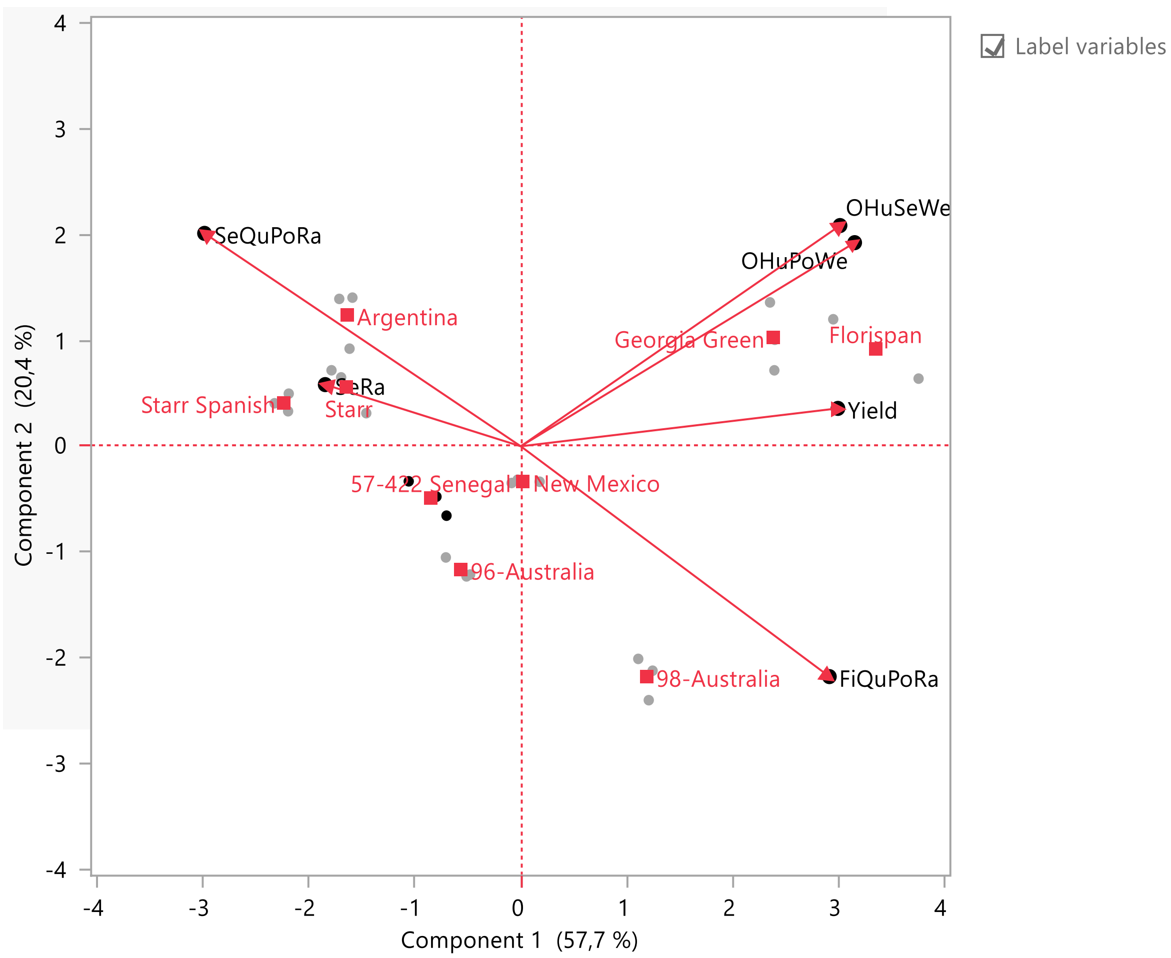


**Figure 1.** **Biplot between PC1 and PC2 for agro-morphological traits of peanut genotypes**

This study on peanut genotypes presents the principal component analysis (PCA) graph of the parameters and genotypes examined. This graph visualizes the relationships in a multidimensional data set on a two-dimensional plane, making the relationships between genotypes and traits more understandable. In the graph, the first component (Component 1) explains 57.7% of the total variation, while the second component

(Component 2) explains 20.4%. Together, these two components account for approximately 78.1% of the total variation in the dataset. The relationships between traits and genotypes in the graph can be interpreted as follows: Yield, OHuPoWe (hundred pod weight), and OHuSeWe (hundred seed weight) parameters are located on the right side of the graph and close to each other. This indicates strong positive correlations between these three traits. As seen in the correlation table, there are significant positive relationships between yield and face pod weight ($r$ = 0.6101**) and face seed weight ($r$ = 0.5938**). The FiQuPoRa (first-quality pod ratio) parameter is located in the lower right part of the graph. This parameter is in the same direction as the yield and seed weight parameters but at a more distant position. This indicates that there are positive but weaker relationships between the first-quality pod ratio and the yield and seed weight parameters. The SeQuPoRa (second-quality pod ratio) parameter is located in the upper left part of the graph and directly opposite FiQuPoRa. This indicates a strong negative relationship between these two parameters. As seen in the correlation table, there is a very strong negative correlation ($r$ =-0.9547**) between these two parameters. The SeRa (shelling ratio) parameter is located on the left side of the graph and opposite the yield parameter. This indicates a negative relationship between shelling ratio and yield. A negative relationship ($r$ =-0.3626) was also detected between these two parameters in the correlation table. When evaluated in terms of genotypes: The Georgia Green and Florispan genotypes are located on the right side of the graph and close to the yield, hundred pod weight, and hundred seed weight parameters. This indicates that these two genotypes have high yield and seed weight values. The 98-Australia genotype is located on the lower right side of the graph and close to the FiQuPoRa parameter. This indicates that this genotype has a high first-quality pod ratio. The Argentina genotype is located on the upper left side of the graph and close to the SeQuPoRa parameter. This indicates that this genotype has a high second-quality pod ratio. The Starr and Starr Spanish genotypes are located on the left side of the graph and close to the SeRa parameter. This indicates that these genotypes have a high shelling ratio. The 96-Australia genotype is located at the bottom of the graph and in a separate position from the other genotypes. This indicates that this genotype has a different profile from the other genotypes in terms of the parameters examined. The 57-422 Senegal and New Mexico genotypes are located near the center of the graph. This indicates that these genotypes have average values in terms of the parameters examined. This PCA graph visually illustrates the differences and similarities between peanut genotypes and the relationships between their characteristics. As seen in the graph, there are significant differences between genotypes, and these differences provide important information for selecting suitable genotypes according to different cultivation objectives. In terms of yield and seed weight, Georgia Green and Florispan stand out, while 98-Australia leads in terms of first-quality pod ratio, and Starr and Starr Spanish in terms of shelling ratio.

## CONCLUSION

In this study, the performance of nine different peanut genotypes was evaluated in terms of agronomic and quality parameters. The results obtained revealed statistically significant differences among the genotypes examined in all parameters. In terms of yield, the Georgia Green genotype (408.50 kg $da^{-1}$) showed significantly superior performance compared to other genotypes. This genotype was followed by Florispan (383.00 kg $da^{-1}$) and New Mexico (379.07 kg $da^{-1}$). The high yield potential of Georgia Green, its high percentage of first-quality fruit, high number of fruits per plant, high seed weight, and moderate shellingratio indicate that this genotype performs well. When evaluated in terms of quality parameters, the 98-Australia genotype stood out with the highest first-quality pod ratio (66.63%) and the lowest second-quality pod ratio (32.22%). The Florispan genotype was significantly superior to other genotypes in terms of hundred pod weight (190.89 g) and hundred seed weight (111.28 g). In terms of shelling ratio, the 96-Australia (64.85%), Georgia Green (63.89%), and Starr Spanish (63.81%) genotypes showed the highest values. Correlation analysis results revealed positive and significant relationships between yield and first-quality pod ratio ($r$ = 0.5179**), hundred pod weight ($r$ = 0.6101**), and hundred seed weight ($r$ = 0.5938**). This indicates that high-yielding genotypes tend to produce higher-quality products. A negative relationship ($r$ =-0.9547**) was determined between the first-quality pod ratio and the second-quality pod ratio. The positive relationship between hundred pod weight and hundred seed weight (r = 0.9886) suggests that these two traits are genetically linked. Principal component analysis (PCA) revealed that the examined traits explained 78.1% of the total variation and that genotypes were distinctly grouped according to different traits. The Georgia Green and Florispan genotypes stood out in terms of yield and seed weight, the 98-Australia genotype in terms of first-quality pod ratio, the Argentina genotype in terms of second-quality pod ratio, and the Starr and Starr Spanish genotypes in terms of shelling ratio. These research results provide important information for the selection of suitable genotypes according to different cultivation objectives. When evaluated in terms of yield, Georgia Green and Florispan stand out, while 98-Australia and Georgia Green are preferred for quality. Additionally, breeding studies between 98-Australia, which has a high first-quality pod ratio, and Georgia Green, which has a high yield value, could contribute to the development of new varieties with superior traits in both yield and quality. The distinct superiority of Florispan in terms of pod and seed weight indicates that this genotype can be used as a valuable genetic resource in breeding programs aimed at increasing grain size. In conclusion, this study has provided important data that will serve as a basis for variety selection and breeding programs suitable for regional conditions by revealing the performance of peanut genotypes in terms of agronomic and quality parameters.

**Conflict of Interest Statement:** The authors declare that they have no conflict of interest.

**Summary of Researcher Contribution Declaration:** The authors declare that they have contributed equally to the article.

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