

## Farklı Mürdümük (*Lathyrus sativus* L.) Genotiplerine Ait Tohumların Bazı Fiziksel ve Fizyolojik Özelliklerinin Belirlenmesi

### Determination of Some Physical and Physiological Properties of Seeds of Different Grass Pea (*Lathyrus sativus* L.) Genotypes

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### Özet

Mürdümük (*Lathyrus sativus* L.), Türkiye’de doğal yayılış gösteren, toprak özelliklerini iyileştiren ve hayvansal üretim için kıymetli bir kaba yem kaynağı olarak değerlendirilen bir üründür. Bu çalışma, 2019-2020 yılları arasında Bingöl Üniversitesi laboratuvarlarında gerçekleştirilmiştir. Çalışmada, yirmi dört farklı mürdümük genotipine ait tohumların bazı fiziksel (şekil-boyut, yüzey alan, izdüşüm alanı, ortalama aritmetik çap, bin tane ağırlığı) ve fizyolojik (çimlenme oranı ve zamanı) özellikleri belirlenmiş, sonuçlar istatistiki olarak dörder tekrarlı olacak şekilde tesadüf parselleri deneme desenine göre değerlendirilmiştir. Elde edilen verilere göre, tüm mürdümük genotiplerinin kısa ve oval bir tohum yapısına sahip olduğu, ortalama uzunluk değerlerinin 6.010 mm, genişlik değerlerinin 5.369 mm, yüzey alan değerlerinin 28.773 mm<sup>2</sup>, izdüşüm alan değerlerinin 25.830 mm<sup>2</sup>, aritmetik çap değerlerinin 5.690 mm ve bin dane ağırlıklarınının 126.688 g olduğu belirlenmiştir. Tüm mürdümük genotiplerinin 0.508-0.538 gün içerisinde %85-100 oranında çimlendiği saptanmıştır.

**Anahtar Kelimeler:** Mürdümük, *Lathyrus sativus*, Genotip, Yem bitkisi, Tohum özellikleri

### Abstract

Grass pea (*Lathyrus sativus*) is naturally growing crop in Turkey and it is considered as a valuable fodder resource to improve the soil properties and livestock farming. This study was carried out in the laboratories of Bingol University between 2019-2020. In the study, some physical (shape-size, surface area, projection area, average arithmetic diameter, thousand

grain weight) and physiological (germination rate and time) characteristics of the seeds belonging to twenty-four different genotypes of grass pea were determined, and the results were evaluated according to the randomized blocks experimental design with four repetitions. According to the data obtained, all grass pea genotypes have a short and oval seed structure, with an average length of 6.010 mm, average width of 5.369 mm, a surface area of 28.773 mm<sup>2</sup>, a projection area of 25.830 mm<sup>2</sup>, an arithmetic diameter of 5.690 mm and a thousand grain weight of 126.688 g. It was determined that all grass pea genotypes germinated at a rate of 85-100% within 0.508-0.538 days.

**Keywords:** Grass pea, *Lathyrus sativus*, Genotype, Fodder crop, Seed characteristics

## 1. Introduction

Grass pea (*Lathyrus*), which belongs to the *Vicieae* tribe of legume family (*Fabaceae/Leguminosea*) is a large genus with 15 parts and 187 species or subspecies (Özdemir, 2016). It has 160 species, either annual or perennial (Plitmann et al., 1995). It is reported that there are 71 taxa belonging to approximately 61 species of grass pea in our country's flora (Özdemir, 2016), 18 of which have endemic properties (Davis, 1970).

Grass pea farming first started in the Balkans in the early Neolithic ages in around 6000 BC, and it has been used as nutrition for people since then (Aslan, 2018), and it has been revealed in the archaeobotanical findings that this has encouraged the development of native legume varieties. In fact, according to these studies, this plant may be the first cultivated crop in Europe (Kislev, 1989). In addition, it is stated that the homeland of this crop could be the region between Asia, the Caucasus and the Caspian Sea and Northern India (Gençkan, 1983).

It is recognized and consumed as peas in many countries such as India, Bangladesh, Nepal, Iraq, Afghanistan, Eastern Europe. Despite its high protein content, its consumption should be limited due to  $\beta$ -ODAP, which is a neurotoxic compound (Sethi et al., 2021). It also has a neurotoxic effect due to substances such as ODAP ( $\beta$ -N-oxalyl-L- $\alpha$ ,  $\beta$ -diamoniopropionic acid) or  $\beta$ -N-oxalamio-L-alanine and  $\beta$ -oxalyl amino alanine (BOAA). Therefore, it is necessary to pay attention to its use (Urga et al., 1995; Kökten and Bakoglu, 2011; Singh and Rao, 2013; Khandare et al., 2018; Bala et al, 2020) and usually, the production of varieties containing proportionally smaller amount of this compound is preferred. Other than that, the grass pea is a rich legume containing 6.69% albumin, 1.5% prolamine, 13.3% globulin, 3.8% gluteline and 18.2-34.6% protein and minerals such as zinc, iron, calcium, phosphorus, magnesium and copper (Lambein et al., 2019; Buta et al., 2020; Sethi et al., 2021). It also contains 58% carbohydrates and 31% protein based on the dry weight of its seeds (Bala et al., 2020).

Grass pea is considered to be one of the important gene resources with its structure resistant to insects and pests which can survive in harsh climatic conditions (drought-excess rainfall) due to its highly developed adaptation ability (Hoque et al., 1996; Vaz Patto et al, 2006; Brunet et al., 2008). It can also be grown in regions with an annual rainfall of about 250 mm or less. Since it can be continued to be cultivated under the water, it can be preferred as the second produce for alternation, especially in paddy farmlands (Kumar, 1997; Başaran et al., 2007). The leaf stems of the plant, which has a pile root structure, are quite long and wide-winged. Although its flowers are usually white, they can also be pink or bluish (Gençkan, 1983). It needs a germination temperature of about 2-3°C, but as the temperature drops below 0°C, it

can be damaged, however, it can be grown in loamy, moderately humid, and calcium rich soils (Özdemir, 2016).

The grass pea (*Lathyrus sativus*) shows a natural spread in our country (Özdemir et al., 2020). This crop is commonly encountered in vegetation studies, especially in spontaneous pastures (Seydoşoğlu and Kökten, 2019). In general, *lathyrus* species are used as green-dry grass, as feedstuff, grain feed for livestock around the world; it can also be grown as a green fertilizer to improve soil properties and as edible legumes and vegetables for human consumption (Özdemir et al., 2020). On the other hand, mixed plantation applications (*leguminosae graminae*) are being practiced more and more in order to get the most yield from the unit area to meet the nutritional requirements for livestock. (Kökten, 1998) According to the results obtained after the cultivation of mixtures created by mixing in different proportions, the rates that will provide the most benefit for livestock breeding are determined.

In the study, some physical (shape-size, surface area, projection area, average arithmetic diameter, thousand grain weight) and physiological (germination rate and time) characteristics of the seeds belonging to twenty-four different genotypes of grass pea were tried to be revealed. Thanks to these characteristics, it is aimed to prevent the problems that may be encountered during machine planting of this crop. In addition, in the sowing process to be made by mixing with wheat seeds, it is aimed to match the seed sizes to each other and to be able to make the correct adjustments on the machine accordingly. On the other hand, it is aimed to help researchers by bringing together the inventories required for cultivation of seeds with different genotypes.

## 2. Material and Method

This study was carried out in the laboratories belonging to Bingol University's Faculty of Agriculture, Biosystem Engineering Department, Field Crops Department and Food, Agriculture and Livestock Vocational School Crop and Livestock Production Department and Ege University's Faculty of Agriculture, Agricultural Machinery and Technologies Engineering departments between 2019 and 2020. In this study, some physical and physiological characteristics of seeds belonging to 24 different grass pea (*Lathyrus sativus*) genotypes were determined via the following methods.

The length (mm), width (mm) and thickness (mm) data, which are accepted as basic characteristics for each seed grain vary depending on climate, geography, soil properties (pH, salinity, drought, etc.) (Dumanoğlu et al., 2021). Therefore, this data is required for the studies on seeds. According to the researches, as stated by Yağcıoğlu (2015), the seeds are examined according to their geometric characteristics (long-medium-short) and shapes (round-oval-long) (Table 1). According to the predetermined shape-size data of the seeds, the appropriate tools, machines and systems are selected for agricultural processes and infrastructure is created for cultivation studies in line with these methods.

In this study, shape-size characteristics of seeds belonging to various grass pea genotypes were determined with a stereo microscope (Nikon SMZ 745T). 100 seeds from each genotype were sampled randomly and these seeds were examined separately (Dumanoğlu and Geren, 2020).

**Table 1.** Classification of seeds according to their geometric characteristics and shapes (Yağcıoğlu, 2015)

| Seeds according to their geometric characteristics | Grain width/Grain length (b/a) (mm) | Seeds according to their shapes | Length (a), Width (b), Thickness (c) (mm) |
|--|-------------------------------------|---------------------------------|---|
| Long   | < 0.6                               | Round                           | $a \approx b \approx c$                   |
| Medium   | 0.6 – 0.7                           | Oval                            | $a/3 < b \approx c$                       |
| Short  | > 0.7                               | Long                            | $c < b < a/3$                             |

After determining the values of shape-size characteristics for each of the seeds belonging to twenty-four different grass pea genotypes, the following equations were used to determine the projection area (mm<sup>2</sup>) and mean arithmetic diameter (mm) values of the seeds using this data (Mohsenin, 1970; Alayunt, 2000, Kara, 2012). The projection area is calculated in order to equations the measured surface area values of the seeds over the seed length and width.

Projection area:

$$A: (\pi * L * W)/4 \tag{1}$$

L : Seed length (mm)

W : Seed width (mm)

A: Projection area (mm<sup>2</sup>)

$\pi$  : 3.14

Mean Arithmetic Diameter:

$$D: (L + W)/2 \tag{2}$$

D: Mean arithmetic diameter of the seed (mm)

L: Seed length (mm)

W: Seed width (mm)

After randomly sampling the seeds of twenty-four different grass pea genotypes examined in the study, thousands grain weight were performed with three repetitions were completed on Radwag AS 220.R2 analytical scale (with a sensitivity of 0.0001 g).

In the study, the germination time (days) and ratio (%) of seeds of twenty-four different grass pea (*Lathyrus sativus*) genotypes were tried to be determined. For this purpose, the seeds selected from random samples from each genotype were planted in petri dishes under controlled conditions with four repetitions in 3 days (20-25°C, 60% humidity, dark

environment,) in a MEMMERT brand incubator according to ISTA (2007) rules. Seeds were monitored daily.

### Statistical analysis

In this study, some physical (shape-size, surface area, projection area, mean arithmetic diameter, thousand grain weight) and physiological (germination rate and time) characteristics of seeds belonging to twenty-four different grass pea (*Lathyrus sativus* L.) genotypes were tried to be determined. The seeds were evaluated according to the randomized blocks experimental design with four repetitions and the data obtained were evaluated statistically using the SPSS V.22 software. First, the difference of seeds was determined at  $p < 0.05$  level via a One-Way ANOVA test; and the values obtained were tested with TUKEY. The weights of a thousand grains belonging to genotypes were obtained from the dissertation prepared by Özdemir (2016) (analyzed with DUNCAN statistical method at  $p < 0.01$  significance level).

### 3. Results and Discussion

In this study, seeds obtained from twenty-four different grass pea (*Lathyrus sativus*) genotypes were examined. According to the results obtained, it was determined that the physical characteristics difference between genotypes was statistically significant. In general, it was found that the average length values of genotypes were 6.010 mm, width values were 5.369 mm, surface area values were 28.773 mm<sup>2</sup>, projection area values were 25.830 mm<sup>2</sup> and arithmetic diameter values were 5.690 mm. In addition, among all genotypes, Coloratus and Leucotetragonus obtained the highest values and the Ela genotype obtained the lowest values (Table 2).

The length, width and form of seeds belonging to different grass pea genotypes coincide with the characteristics (6-8 mm, 5 mm respectively) specified by Gençkan (1983). The seed surface can be red, yellow gray-white or darker in color and spotted (white or black in color). According to the data obtained as a result of the study, it was found that all grass pea genotypes have a short and oval shape.

**Table 2.** Some physical characteristics of grass pea genotypes.

| No | Name of genotype | Length (mm)          |       | Width (mm)          |       | Surface area (mm <sup>2</sup> ) |       | Projection area (mm <sup>2</sup> ) |       | Mean Arithmetic Diameter (mm) |       |
|----|------------------|----------------------|-------|---------------------|-------|---------------------------------|-------|------------------------------------|-------|-------------------------------|-------|
|    |                  | Avg.                 | Stdv. | Avg.                | Stdv. | Avg.                            | Stdv. | Avg.                               | Stdv. | Avg.                          | Stdv. |
| 1  | 452              | 6.637 <sup>bcd</sup> | 0.717 | 5.940 <sup>cd</sup> | 0.636 | 35.210 <sup>cd</sup>            | 6.480 | 31.126 <sup>cd</sup>               | 6.223 | 6.298 <sup>cd</sup>           | 0.648 |
| 2  | 481              | 6.912 <sup>ab</sup>  | 0.707 | 6.323 <sup>ab</sup> | 0.642 | 36.701 <sup>abc</sup>           | 6.906 | 34.550 <sup>ab</sup>               | 6.431 | 6.618 <sup>ab</sup>           | 0.619 |
| 3  | 504              | 5.342 <sup>ij</sup>  | 0.587 | 4.836 <sup>g</sup>  | 0.561 | 23.157 <sup>ijk</sup>           | 4.814 | 20.456 <sup>h</sup>                | 4.314 | 5.089 <sup>hi</sup>           | 0.527 |
| 4  | 508              | 5.356 <sup>ij</sup>  | 0.698 | 4.673 <sup>g</sup>  | 0.572 | 22.443 <sup>k</sup>             | 5.042 | 19.864 <sup>h</sup>                | 4.681 | 5.014 <sup>hi</sup>           | 0.586 |
| 5  | 520              | 5.408 <sup>ij</sup>  | 0.629 | 4.789 <sup>g</sup>  | 0.551 | 22.342 <sup>k</sup>             | 4.922 | 20.477 <sup>h</sup>                | 4.305 | 5.099 <sup>hi</sup>           | 0.519 |
| 6  | 522              | 5.410 <sup>ij</sup>  | 0.678 | 4.760 <sup>g</sup>  | 0.702 | 23.010 <sup>jk</sup>            | 5.794 | 20.482 <sup>h</sup>                | 5.633 | 5.085 <sup>hi</sup>           | 0.641 |

|    |                  |                          |              |                          |              |                            |              |                           |              |                          |              |
|----|------------------|--------------------------|--------------|--------------------------|--------------|----------------------------|--------------|---------------------------|--------------|--------------------------|--------------|
| 7  | 528              | 5.453 <sup>ij</sup>      | 0.664        | 4.877 <sup>g</sup>       | 0.501        | 24.016 <sup>ijk</sup>      | 5.127        | 21.061 <sup>h</sup>       | 4.480        | 5.165 <sup>i</sup>       | 0.540        |
| 8  | 531              | 5.391 <sup>ij</sup>      | 0.519        | 4.843 <sup>g</sup>       | 0.544        | 23.480 <sup>ijk</sup>      | 4.605        | 20.644 <sup>h</sup>       | 3.928        | 5.117 <sup>i</sup>       | 0.486        |
| 9  | 553              | 6.713 <sup>bc</sup>      | 0.763        | 6.050 <sup>bc</sup>      | 0.770        | 35.488 <sup>bcd</sup>      | 7.473        | 32.254 <sup>bc</sup>      | 7.548        | 6.381 <sup>bc</sup>      | 0.731        |
| 10 | Adiyaman pop.    | 5.409 <sup>ij</sup>      | 0.663        | 4.865 <sup>g</sup>       | 0.513        | 23.092 <sup>jk</sup>       | 4.684        | 20.827 <sup>h</sup>       | 4.265        | 5.137 <sup>i</sup>       | 0.532        |
| 11 | <b>Coloratus</b> | <b>7.195<sup>a</sup></b> | 0.865        | <b>6.508<sup>a</sup></b> | 0.706        | <b>40.019<sup>a</sup></b>  | 7.834        | <b>37.098<sup>a</sup></b> | 7.834        | <b>6.851<sup>a</sup></b> | 0.729        |
| 12 | <b>Ela</b>       | <b>5.177<sup>j</sup></b> | 0.684        | <b>4.640<sup>g</sup></b> | 0.621        | <b>21.287<sup>k</sup></b>  | 5.516        | <b>19.111<sup>h</sup></b> | 4.842        | <b>4.908<sup>j</sup></b> | 0.614        |
| 13 | Elazığ pop.      | 5.255 <sup>ij</sup>      | 0.587        | 4.659 <sup>g</sup>       | 0.458        | 21.280 <sup>k</sup>        | 4.151        | 19.348 <sup>h</sup>       | 3.707        | 4.957 <sup>hi</sup>      | 0.473        |
| 14 | Eren             | 6.588 <sup>bcd</sup>     | 0.710        | 5.894 <sup>cd</sup>      | 0.634        | 33.856 <sup>cde</sup>      | 6.044        | 30.729 <sup>cde</sup>     | 6.191        | 6.241 <sup>cd</sup>      | 0.622        |
| 15 | Gürbüz           | 6.091 <sup>fg</sup>      | 0.650        | 5.435 <sup>ef</sup>      | 0.640        | 28.805 <sup>fgh</sup>      | 5.308        | 26.221 <sup>fg</sup>      | 5.508        | 5.763 <sup>efg</sup>     | 0.589        |
| 16 | Hat-1            | 6.519 <sup>cde</sup>     | 0.679        | 5.840 <sup>cd</sup>      | 0.691        | 33.174 <sup>cdef</sup>     | 5.560        | 30.170 <sup>cde</sup>     | 6.331        | 6.180 <sup>cd</sup>      | 0.646        |
| 17 | Hat-6            | 5.895 <sup>g</sup>       | 0.558        | 5.239 <sup>f</sup>       | 0.542        | 27.660 <sup>ghi</sup>      | 4.737        | 24.411 <sup>g</sup>       | 4.378        | 5.567 <sup>fg</sup>      | 0.506        |
| 18 | Hat-12           | 6.368 <sup>def</sup>     | 0.608        | 5.675 <sup>de</sup>      | 0.512        | 31.989 <sup>defg</sup>     | 4.401        | 28.513 <sup>ef</sup>      | 4.724        | 6.021 <sup>de</sup>      | 0.502        |
| 19 | Hat-17           | 5.969 <sup>g</sup>       | 0.641        | 5.223 <sup>f</sup>       | 0.560        | 27.212 <sup>hij</sup>      | 5.437        | 24.639 <sup>g</sup>       | 4.749        | 5.596 <sup>fg</sup>      | 0.538        |
| 20 | Hat-18           | 6.356 <sup>def</sup>     | 0.556        | 5.738 <sup>de</sup>      | 0.521        | 34.667 <sup>cde</sup>      | 4.688        | 28.775 <sup>def</sup>     | 4.626        | 6.047 <sup>de</sup>      | 0.488        |
| 21 | Hat-19           | 6.188 <sup>efg</sup>     | 0.564        | 5.487 <sup>ef</sup>      | 0.551        | 30.562 <sup>efgh</sup>     | 5.281        | 26.818 <sup>fg</sup>      | 4.735        | 5.838 <sup>ef</sup>      | 0.511        |
| 22 | İflis491         | 5.855 <sup>gh</sup>      | 0.613        | 5.215 <sup>f</sup>       | 0.606        | 27.412 <sup>hij</sup>      | 5.259        | 24.135 <sup>g</sup>       | 4.822        | 5.535 <sup>g</sup>       | 0.542        |
| 23 | Leucotetragonus  | <b>7.206<sup>a</sup></b> | 0.705        | <b>6.474<sup>a</sup></b> | 0.715        | <b>39.930<sup>ab</sup></b> | 6.743        | <b>36.866<sup>a</sup></b> | 6.871        | <b>6.840<sup>a</sup></b> | 0.638        |
| 24 | Mardin pop.      | 5.536 <sup>h</sup>       | 0.641        | 4.883 <sup>g</sup>       | 0.606        | 23.769 <sup>ijk</sup>      | 5.086        | 21.347 <sup>h</sup>       | 4.818        | 5.210 <sup>h</sup>       | 0.588        |
|    | <b>Avg.</b>      | <b>6.010</b>             | <b>0.654</b> | <b>5.369</b>             | <b>0.598</b> | <b>28.773</b>              | <b>5.496</b> | <b>25.830</b>             | <b>5.248</b> | <b>5.690</b>             | <b>0.576</b> |

When we examine the thousand grain weights (g) of seeds belonging to various grass pea genotypes (Table 3), it was determined that the lightest genotype belongs to the Elazığ population (99.830 g) and the heaviest genotype belongs to Coloratusa (172.070 g) (Özdemir, 2016).

Germination time (days) and germination percentages (%) of seeds belonging to twenty-four different grass pea (*Lathyrus sativus*) genotypes were examined under controlled conditions according to ISTA (2007) rules. Although germination times were close to each other, the fastest germinated genotype was the Gürbüz variety (0.508 days), while the slowest germinating one was the Ela variety (0.536 days) (Table 3). On the other hand, when we examine the germination rates of seeds that hatch in almost half a day; it has been determined that all genotypes had over 85% germination ability, and almost all seeds (100%) were germinated (Table 3).

**Table 3.** Germination time / rate and one thousand grain weight of grass pea genotypes

| No | Name of genotype | Thousand grain weight (g) | Germination Time (days) | Germination Rate (%) |
|----|------------------|---------------------------|-------------------------|----------------------|
| 1  | 452              | 143.970                   | 0.517                   | 100                  |
| 2  | 481              | 137.170                   | 0.512                   | 100                  |
| 3  | 504              | 111.170                   | 0.531                   | 99                   |
| 4  | 508              | 103.130                   | 0.518                   | 96                   |
| 5  | 520              | 110.700                   | 0.513                   | 100                  |
| 6  | 522              | 103.170                   | 0.517                   | 96                   |
| 7  | 528              | 107.000                   | 0.512                   | 100                  |
| 8  | 531              | 117.730                   | 0.517                   | 100                  |
| 9  | 553              | 132.630                   | 0.515                   | 87                   |
| 10 | Adıyaman pop.    | 114.300                   | 0.511                   | 96                   |
| 11 | <b>Coloratus</b> | <b>172.070</b>            | <b>0.508</b>            | 94                   |
| 12 | <b>Ela</b>       | 105.530                   | <b>0.536</b>            | 100                  |
| 13 | Elazığ pop.      | 99.830                    | 0.516                   | 100                  |
| 14 | Eren             | 138.970                   | 0.511                   | 100                  |
| 15 | Gürbüz           | 127.930                   | 0.510                   | 100                  |
| 16 | Hat-1            | 139.900                   | 0.518                   | 100                  |
| 17 | Hat-6            | 121.630                   | 0.532                   | 100                  |
| 18 | Hat-12           | 146.200                   | 0.517                   | 100                  |
| 19 | Hat-17           | 129.210                   | 0.523                   | 100                  |
| 20 | Hat-18           | 143.130                   | 0.523                   | 99                   |
| 21 | Hat-19           | 135.400                   | 0.520                   | 99                   |
| 22 | İflis-491        | 126.330                   | 0.523                   | 100                  |
| 23 | Leucotetragonus  | 155.170                   | 0.524                   | 99                   |
| 24 | Mardin pop.      | 118.230                   | 0.524                   | 99                   |

#### 4. Conclusion

Grass pea (*Lathyrus sativus*) is a valuable herbal resource that has been cultivated since the early Neolithic ages around 6000 BC. In this study, seeds from twenty-four different genotypes of the grass pea crop, which were evaluated in different ways, were examined. The characteristics of seeds are used to prevent crop losses experienced especially during agricultural production (such as plantation, harvesting, product processing). The selection of the suitable sowing machine to be used in production or the settings of the sowing order in the existing sowing machine, the selection of the appropriate sieve during the separation of the seeds taken from the harvested plants, and the separation of the seeds according to their sizes during the product processing phase and the processing of the seeds according to the requirements are the main issues to be taken into consideration. In addition, since the seeds to be used must have a germination rate of approximately 70% and above in order for herbal products to provide economic returns to the producer, the climatic and environmental conditions that differ according to the region where the product is grown, especially the length of days become important. Therefore, it is important to determine how long would it take for the seeds to hatch. On the other hand, seeds are evaluated according to their general characteristics in breeding studies, and such studies are diversified by taking into account the conditions that are considered superior or weak.

In the study, some physical (shape-size, surface area, projection area, average arithmetic diameter, thousand grain weight) and physiological (germination rate and time) characteristics of the seeds belonging to twenty-four different genotypes of grass pea were tried to be revealed. It was revealed that the seeds belonging to twenty-four different grass pea genotypes generally have a short and oval seed structure, and the Coloratus and Leucotetragonus varieties stand out in terms of length, width, surface area, projection area, average arithmetic diameter values compared to other varieties. All grass pea genotypes are found to have a 85-100% germination rate, but the fastest germinating variety was Coloratus, and the slowest germinating one was the Ela variety. In terms of thousand grain weights, Coloratus and Leucotetragonus varieties were found to be the heaviest.

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