

INVESTIGATION OF SOME FORAGE PEAS (*Pisum arvense* L.) IN TERMS OF SEED YIELD UNDER KAYSERİ CONDITIONS

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ABSTRACT. Forage pea is an annual forage legume with wide adaptability and its seed, silage, and hay are used as animal feed. The aim of the study was to determine the seed yield of five cultivars of forage pea (Arda, Ateş, Taşkent, Töre and Özkaynak) cultivated for winter in Kayseri conditions. Field trials were performed during 2022-2023 growing season. The experiments were conducted to randomized block design with three replications. According to the results, the examined characteristics among the varieties (seed yield, pods per plant, seeds per pod and 1000 seed weight) were statistically significant. The highest seed yield was obtained from the Arda variety with 204 kg/da, followed by Taşkent, Ateş, Töre and Özkaynak cultivars with 190, 185, 166 and 155 kg/da, respectively. The number of pods per plant and the number of seeds per pod varied between 6.33-13 pod/plant and 3.43-5.10 seed/pod with the highest being Arda and the lowest being Özkaynak. In terms of thousand seed weight, the highest value was obtained from the Özkaynak variety with 151 g, and the lowest value was obtained from the Ateş variety with 88.30 g. In conclusion, in terms of seed yield, Arda and Taşkent cultivars are recommended in Kayseri ecological conditions.

Keywords: *Pisum arvense* L, seed yield, 1000 seed weight

INTRODUCTION

Forage pea (*Pisum arvense* L.) is an annual cool season forage crops belonging to the Fabaceae family [1, 2]. Forage pea can be planted alone or a mixture with cereals for seed production, hay production, pasture, silage, and green manure [3, 4] and can also be included in various crop rotation systems. It has a strong tap root system and can fix nitrogen by establishing symbiosis with *Rhizobium* bacteria [4]. For this reason, it is very suitable crop in crop rotation systems [5]. It is also used as a green manure. Pea grains have %21-25 protein content, rich in amino acids and have high lysine and tryptophan, which are less abundant in cereal grain [6]. And also, pea seeds have high nutritional value with respect to starch, dietary fibre and micronutrients [7]. These makes peas a key ingredient in livestock feed mixtures [6].

One of the biggest inputs of animal production is the need for feed. The demand for animal products is increasing day by day due to the increasing population in our world and in our country. Concentrate feeds have an important place in animal nutrition. Forage pea seeds are high-quality concentrated feed sources [17] and are used in rations by mixing with various seeds. Forage pea, which has many superior features, has been one of the species that forage plant breeders have worked on most in recent years [11].

In Türkiye, forage pea planting areas have increased in recent years and as of 2022, the planting area has reached 258,867 da [8]. There are many forage pea varieties that are registered in Turkey. It is seen that forage peas' importance and use are increasing in Türkiye [9]. As a result of these intensive breeding studies, many new forage pea varieties have been developed and offered to the service of producers. [10]. The aim of the study is to compare five different

forage pea varieties (Arda, Ateş, Özkaynak, Taşkent and Töre) in Kayseri conditions in terms of seed yield and yield components.

MATERIALS AND METHODS

Plant Material

In this study, the investigation incorporated cultivars that have been officially registered in Turkey, namely Arda, Taşkent, Ateş, Özkaynak, and Töre. The selection of these specific cultivars serves as a critical aspect of the experimental design, as registered varieties undergo a rigorous evaluation and validation process, ensuring their distinct characteristics and suitability for cultivation within the Turkish agricultural context.

Study Area

The study was carried out in the trial area of Erciyes University Agricultural Research and Application Center in 2022/2023 growing season (Fig 1). The climate data of the research area for 2022 and 2023 (October-May) and long-term average are given in Table 1. Considering the soil properties, in the period when the study was conducted, the texture class of the soil was sandy loam, low organic matter content, moderately alkaline, slightly salty, low lime content and high phosphorus content (Table 2).



Fig. 1. Field area (38.715492, 35.546205)

Experimental Design

The cultivars were planted in 3 repetitions with a randomized complete block design on October 10, 2022. A parcel area was as 12 m², consisting of 10 rows spaced 30 cm. Three kg/da N and 7 kg/da P₂O₅ were applied to soil before sowing. The number of seed per m² was 110 seed. After the seeding, the trial area was watered with sprinkler irrigation systems and plants were watered when they needed water. Weed control was carried out twice during the growing period. When the plants reached maturity, 50 cm from the beginning of the plot and two rows

from the edges were removed as edge effect, and measurements were made on the remaining part. Harvests were made by mowing them from the soil level with the help of a sickle when the majority of the pods were fully mature [11] (Fig 2).

Statistical Analysis

Obtained data were evaluated using the JMP (13.2.0) statistical package program according to the randomized block trial design. Significance among cultivars were compared according to the Tukey multiple comparison test.



Fig. 2. Forage pea emergence and flowering period

Table 1. Climate data in experience field

Years	Climate Data	Mounths							
		10	11	12	01	02	03	04	05
2022/2023	Monthly Average Temperature (°C)	13.0	8.4	4.0	1.3	-1.4	6.56	9.5	13.4
	Monthly Maximum Temperature (°C)	19.9	14.3	7.7	6.8	3.7	11.5	15	19.8
	Monthly Minimum Temperature (°C)	4.9	1.6	0.4	-2.3	-5.3	2.4	4.7	7.3
	Monthly Average Relative Humidity (%)	37.4	45.0	61.8	63.3	68.4	67.6	64.5	62.1
	Monthly Total Precipitation (mm)	17.9	13.4	16.9	0.08	0.1	0.7	1.2	0.6
Long years average	Monthly Average Temperature (°C)	11.9	5.5	0.7	-1.6	0.3	4.9	10.6	15.0
	Monthly Maximum Temperature (°C)	20.5	13.1	6.5	4.2	6.3	11.5	17.7	22.5
	Monthly Minimum Temperature (°C)	3.6	-0.9	-4.4	-6.8	-5.1	-1.3	3.1	6.8
	Monthly Total Precipitation (mm)	27.5	31.9	37.3	36.2	36.3	43.1	52.1	51.8

Table 2. Soil characteristics of the study area

Clay (%)	Plate (%)	Sand (%)	Texture class	Ph	EC mmhos/cm	Organic matter (%)	P ₂ O ₅ (kg/ da)	Lime (%)
14.50	9.79	75.71	Sandy loam	7.97	0.184	0.77	6.17	1.60

RESULTS AND DISCUSSION

Seed yield and some seed yield components of the five forage pea cultivars used in the research (seed yield, pods per plant, seed per pod and 1000 seed weights) are summarized in the Table 3. According to the results obtained; the difference among cultivars in terms of seed yield, seeds per plant and 1000 seed weight was significant at 1% level and pods per plant at 5% level.

When the seed yields of five different forage pea cultivar are compared under Kayseri conditions, the highest seed yield was obtained from the Arda cultivar with 204 kg/da and the seed yields of Taşkent, Ateş, Töre ve Özkaynak cultivars was 190,185,166 and 155 kg/ da, respectively (Table 3). In previous studies, seed yields of some forage pea genotypes were determined between 1.5-2.21 t/ha under Erzurum ecological conditions by [12]; 62.1-242.0 kg/ha under Konya ecological conditions by [13]; and 33.8-180.2 kg/ha under Bingöl ecological conditions by [14]. Present findings on seed yield comply with earlier studies.

Table 3. Means seed yield and seed yield components in forage pea

Varieties	Seed yield (kg/da)	Pods per plant	Seeds per pod	1000 seed weight (g)
Arda	204.33 a	13.00 a	5.10 a	111.70 b
Ateş	185.33 b	8.33 b	4.13 bc	88.30 d
Taşkent	190.00 ab	9.66 ab	4.03 bc	95.20 bc
Töre	166.33 c	7.66 b	4.30 b	103.50 bc
Özkaynak	155.33 c	6.33 c	3.43 c	151.00 a
Means	170.26	8.99	4.20	109.94
	Cultivar **	Cultivar *	Cultivar **	Cultivar **

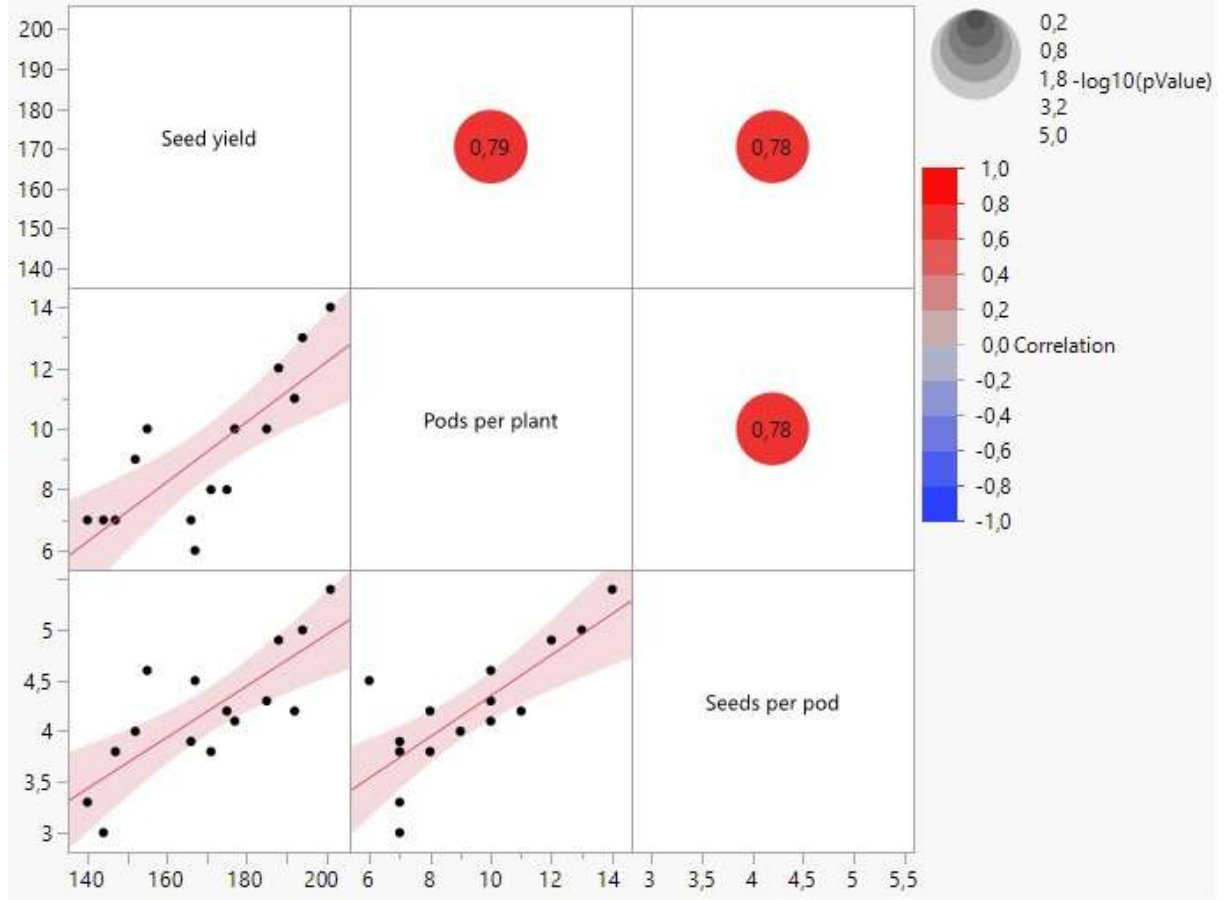
* $p < 0.5$, ** $p < 0.01$

The number of pods per plant is closely related to seed yield [4, 15]. When the number of pods per plant was evaluated, significant differences were observed among varieties. Number of pods was 13 in the Arda cultivar, and 9.66 in Taşkent, 8.33 in Ateş, 7.66 in Töre and 6.33 in Özkaynak, respectively. When other studies were examined, the number of pods per plant varied between 7.4 and 25.1 [3,4,12, 13]. It has been reported by different researchers that many factors such as pea genotypes, sowing season, climatic factors, sowing time and location affect the number of pods in the plant [3,4,12, 13, 15].

When the number of seed per pod in forage peas was examined, the highest number of seed per pod was 5.10 in the Arda cultivar, followed by Töre with 4.30, Ateş, with 4.13, Taşkent with 4.03, and Özkaynak with 3.43. Other studies have found that the number of seed per pod varies similarly between 1.90 and 7.90 in different varieties [3, 13, 16].

The highest 1000 seed weight was determined as 151 g in Özkaynak cultivar, and it was determined 111.7 g in the Arda, 103.5 g Töre, 95.2 g Taşkent and 88.3 g Ateş cultivars. Keskin et al [3] determined 1000 seed weight of Özkaynak and Taşkent pea cultivars as 96.6-132.8 and 85.2-118.8 g in year x cultivar x sowing time interaction, respectively. Kadioğlu et al. [11] determined 1000 seed weight as 198.4, 185 and 199.3 g in Taşkent, Töre and Özkaynak

varieties, respectively. The differences obtained in terms of 1000 seed weight may be due to the ecological conditions under which the trials were conducted [11]



* The scatterplot matrix and the circles consisting of the correlations and r values are given.

Fig 3. Scatterplot matrix and correlation of the parameters examined

When the correlation values on the analyzed parameters were examined [18], a positive relationship was found between seed yield and the pods per plant and seeds per pod (Fig 3). Ozaktan et al. reported that they found similar results in their study [19].

CONCLUSION

This study aimed to determine the seed yield and yield characteristics of some forage pea cultivars at Kayseri ecological conditions for winter sowing. As a result of the study, the cultivar that gave the best results in the region in terms of seed yield was Arda cultivar with 204 kg/da followed by Taşkent with 190 kg/da. It was determined that the Özkaynak cultivar had the highest 1000 seed weight. Considering toseed yield values at one year experiment, Arda and Taşkent cultivar can be recommended for Kayseri conditions. However, it is important to conduct the experiment in different regions of Kayseri in different years in terms of cultivar selection.

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