

DETERMINATION OF YIELD AND YIELD CHARACTERISTICS OF SOME DRY BEANS (*Phaseolus Vulgaris* L.) VARIETIES AND ONE LOCAL AHLAT POPULATION IN THE VAN-GEVAS ECOLOGICAL CONDITIONS

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ABSTRACT

In this study, it was aimed to determine the yield and yield components of some dry bean (Phaseolus vulgaris L.) varieties and 1 Ahlat local population in Van-Gevaş ecological conditions. For this purpose, a total of 11 different dry bean types including Adabeyazı, Şeker-98, Gökşun, Karaman, Rib-Weighing, Zülbiye and Yunus-90, Göynük-98, Topçu and Akman-98 beans and 1 local bean population obtained from the Van Lake basin were analyzed. The study has been established as randomized block design trial with three replications. At the end of the trial; plant size 40.42-56.74 cm, number of branches 6.42-7.14 number/branch, number of seeds 6.31-7.84 number/plant, number of seeds per pod 4.26-6.82 number/pods, number of seeds per plant 21.92-35.32 number/plant, one hundred seed weight 39.90-50,30 g, seed yield of per plant 8.83-17.77 gr/plant and decare seed yield 273.93-350.89 kg/da measurements were determined.

Keywords: Dry beans, Yield, Yield components.

1. INTRODUCTION

Today, malnutrition and starvation are among the most important problems, and cereals are seen as very important nutrients because of the cost of animal-derived foods and the inclusion of some of the amino acids in them. Located in edible beans (*Phaseolus vulgaris* L.) should both have quite an important place in agriculture in Turkey and in the world are produced in our country is quite widely. Because of the protein, vitamins and minerals it contains, canned, dry and freshly consumed beans constitute one of the basic consumption items (Şehirali, 1988).

Beans originating from South and Central America, the world's largest plantation area with edible nuts. Adapted to warm and temperate climates. It is important both for human nutrition and for its ability to bind free nitrogen in the air to the soil. There are many varieties and lines of beans, which are the most cultivated edible legume plants in the world (Şehirali, 1988). Turkey in the region is the most efficient and the most acreage in terms of edible beans legume production efficiency Interior space is Anatolia. Central Anatolia Region is followed by Eastern Anatolia Region (Anonymous, 2017a). Beans are not only nourished by human beings, but also indirectly in their agricultural and livestock fields. The roots of the bean plant, which is included in the legume family, have nodule name punches. Thanks to these nodules, nodose bacteria utilize the free nitrogen of the air through the bacteria (*Rhizobium phaseoli*), which provides nitrogen enrichment of the soil (Şehirali, 1988). Through nodosity bacteria, the bean plant fixes 3-5 kg of pure nitrogen during a growing season in a field of cultivated field.

In our country, a total of 24.3 million hectares of agricultural land, 790 thousand hectares of edible grain crops are planted, approximately 1 million 160 thousand tons are produced. Edible grains are in the third place after beans,

chickpeas and lentils with about 90 thousand hectares in terms of planting area in legumes. The production amount is 239 thousand tons and the yield is 266 kg (Anonymous, 2017b). Chick peas, beans and lentils constitute 95% of total legume production. 40% of the production is chickpeas (470 thousand tons), 34% is red lentils (400 thousand tons) and 21% is dried beans (239 thousand tons) (Anonymous, 2017b). In 2016, the production area of beans in Van was 804.943 and production was 106.083 tons and the yield of the pot was 134 kg (Anonymous, 2016).

It is an undeniable fact that in today's days when there is no opportunity to increase arable land, the increases in crop production can be achieved with increases in unit area yield. One of the most effective ways to increase unit area yield is to raise high yield varieties that are ecologically appropriate. As in other cultivated plants, it is of utmost importance to use the varieties suitable for ecological conditions in addition to other cultural applications in increasing the yield obtained from the unit area. Van is located in the Eastern Anatolia Region and bean cultivation is actively carried out in the district of Gevaş, one of the 12 districts. Regional ecology is quite convenient for bean agriculture (Sun, 2011). For this reason, in this study conducted under the conditions of Van-Gevaş, it was aimed to determine the most suitable varieties for the regional conditions by determining the yield potentials and some yield characteristics of the local population with the bean varieties registered for dry grain production.

2. MATERIALS AND METHOD

As material, Sugar-98 obtained from Sakarya Agricultural Research Institute, Şeker-98 obtained from Erzurum Agricultural Research Institute, Yunus-90, Göynük-98 obtained from Gökşun, Karaman, Rib-Weighing, Zülbiye and Eskişehir Agricultural Research Institute obtained from Samsun Agricultural Research Institute (Yunus-90, Artillery, Karaman,

Adabayazı, Göynük-98, Akman-98, Zülbiye, Göksun, Ahlat, Şeker-98) and Van Lake basins supplied with a total of 10 bean species (Rib-Weighing) population line was used.

As a preliminary preparation on the trial field, after the deep version process with the tractor is done, the seed bed is prepared by dilution process through the cultivator. The draws opened with the October marker were made manually on May 15, 2017. Anchor processing has been applied three times in order to disintegrate the slip layer formed in the soil and to clean the soil from the weed. The beans were watered seven times. The harvesting process was harvested by hand between 15-25 September 2017. The harvested plants were measured, counted and blended, and the averages were taken.

This study was conducted to determine the effects of yield and yield characteristics of some bean (*Phaseolus vulgaris* L.) varieties in the Van ecological conditions and the local Ahlat population in 2017. It was carried out in the agricultural conditions in the field of farmland in Gevaş province, 40 km away from Van, . The terrestrial climate prevails in the Gevaş district of Van. The site of the study site is sandy-loamy-clay and has a slightly alkaline character (pH = 7.5). The soil of the test area was found to be poor in organic matter (2.1%), rich in soluble potassium (52.6 kg / da) but insufficient in phosphorus (2.3 kg / da). In addition, the salt content of the study site is 0.38% and the lime content is 8% (Anonymous 2017c).

The research was established in 3 replications. The parcels are in dimensions of 5.0 m × 1.75 m = 8.75 m². The experiment consists of 33 plots. Each parcel consists of 5 rows and the distance between rows is set to 35 cm. The pre-sowing

plot of the 15 kg DAP fertilizer was given uniformly in the experimental field. Varieties were randomly distributed to the parcels. At the harvest time, 0.50 cm from the beginning of the parcel and all the plants in the rows beside the parcel were excluded from observation and all observations were taken from 4 m × 1.05 m = 4.20 m².

It has been determined that the yield and yield components of the varieties such as Göksun, Artillery, Karaman, Rib-Weighing, Zülbiye, Yunus-90, Göynük-98, Adabayazı, Şeker-98, Akman-98 and Local populations will be trained in Van ecological conditions. In this research, plant height, number of branches / plant, number of beans per plant / number of beans per plant / number of seeds per plant // da and yield and yield criteria. (Bremner 1965, Ceyhan 2003, Gülümser 1981, Kacar 1972). Statistical analyzes were performed using CoStat v.6.4 statistical program to determine the differences between the varieties in the study of the yield and yield components of some dry bean varieties tested in Van-Gevaş conditions. The LSD multiple comparison test was used to compare the averages.

3. FINDINGS AND DISCUSSION

3.1. Plant Length (cm)

Variance analysis was applied to determine whether plant varieties differ according to plant height. The result of the applied variance analysis is given in Table 1. Statistically, the difference between varieties and blocks in terms of plant length was found to be significant at 1% level.

Table 1: Variance analysis results of bean varieties and local population plant height

Variation Sources	Degree of Freedom	Sum of Squares	Squares Average	F Value
Variety	10	876.709	87.670	7.884**
Block	2	61.234	30.617	2.753**
Error	20	222.392	11.119	
Total	32	1160.336		

**significant at 1% level of P. *significant at 5% level of P.

The mean results for plant lengths and the resulting LSD multiple comparison groups are given in Table 2. The plant length varies between 40.42-56.74 cm; it was observed that the

plant was the longest Yunus-90 variety while the shortest variety was Rib-Weighing variety.

Table 2: Average plant height(cm) of bean varieties and local populations

No	Variety	Plant length (cm)
1	Yunus-90	56.74 a
2	Karaman	54.42 ab
3	Akman-98	49.61 bc
4	Şeker-98	52.52 ab
5	Göynük-98	45.23 cd
6	Ahlat popülasyonu	45.74 cd
7	Adabayazı	45.66 cd
8	Topçu	52.23 ab
9	Rib-Weighing	40.42 d

10	Zülbiye	41.22 d
11	Göksun	52.29 ab
LSD (% 5)	5.679	

* Values for the same group of letters are significant relative to LSD 1%.

According to Table 2, the highest plant height (Yunus-90) and the lowest plant height varieties (Zülbiye and Rib-Weighing) were observed to form different groups. The plant height averages were 31.65-47.10 cm (Azkan and Yürür, 1987), 31.48-81.71 cm (Bozoğlu, 1995), 35.2-45.98 cm (Senturk and Önder, 1996), 44.85-133.78 cm (Düzdemir, 1998) (Ansarsal et al., 2000), 49.9-154.9 cm (Düzdemir and Akdağ, 2001), 24.55-72.28 cm (Pekşen, 2005), 17.7-103.0 cm (Pekşen and Gülümser, 2005), 20 (Ceyhan et al., 2009), 24.55-72.28 cm (Pekşen, 2012), 25.44-68.89 cm (Varankaya and Ceyhan, 2012), 40.0-251.6 cm (Zirek, 2015), 24.93-43.80 cm (Baran, 2016), 53.3-110.5 cm (Aydoğan, 2017), 32.1-44.3 cm (Girgel et al., 2018). In our study, the plant height values are in agreement with some of the

previous studies, while others are different. The main reasons for this difference are thought to be due to climatic conditions, soil structure, elevation, hereditary predispositions, cultural practices and ecological characteristics (Bildirici et al., 2006), (Ashgari and Vojdani, 1997).

3.2. Number of plant branches

Variance analysis was used to determine whether the plant varieties differed by branch number. The result of the applied variance analysis is given in Table 3 and it is observed that the plant varieties do not differ according to the branch numbers. Statistically, the difference between the blocks in terms of number of branches in the plant was found to be 1%.

Table 3: Variance analysis results of bean varieties and local populations

Variation Sources	Degree of Freedom	Sum of Squares	Squares Average	F Value
Variety	10	1.175	0.117	0.918
Block	2	1.966	0.983	7.678**
Error	20	2.560	0.128	
Total	32	5.702		

**significant at 1% level of P. *significant at 5% level of P.

The mean results of branch numbers of plant varieties and the results of multiple LSD groups are given in Table 4. The number of branches in the plant ranged from 6.42 to 7.13 per

plant. The highest value was found in the Ahlat population and the lowest value in the plant was found in the Zülbiye variety among the plant varieties.

Table 4: Average number of branches(number / plant) in bean cultivars and in the local population

No	Variety	Branch number in the plant
1	Yunus-90	6.74
2	Karaman	6.82
3	Akman-98	6.61
4	Şeker-98	6.73
5	Göynük-98	6.43
6	Ahlat popülasyonu	7.13
7	Adabeyazı	6.61
8	Topçu	6.61
9	Rib-Weighing	6.80
10	Zülbiye	6.42
11	Göksun	6.82
LSD	0.609	

* Values for the same group of letters are significant relative to LSD 1%.

According to the research result, number of branches in the plant is given in Table 4. Among the plant varieties, it was observed that the highest (Ahlat population 7.13 / plant) and the lowest number of branches (Zülbiye 6.42 / plant) were observed.

The average number of branches per plant was 7.4-9.0 (Özçelik and Gülümser, 1988), 4.02-5.05 (Şentürk and Önder, 1996), 6.58 (Önder and Sade, 1996) and 6.3-10.2 (Anlarsal et al.), 5.2-11.9 (Ceyhan et al., 2009), 1.44-4.89 (Varankaya and

Ceyhan, 2012), 2.23-5.90 (Zirek, 2015), Baran, 2016), 2.87-4.80 (Aydoğan, 2017). It is believed that the results of our study are not similar to some of the previous studies due to their different environmental conditions (Elkoca and Kantar, 2004), being in different genetic structure, being in different maturation groups and differently affected by different environmental conditions.

3.3. Number of grain per pod

Variance analysis was applied to determine whether the

plant varieties differed by the number of grains. The result of the variance analysis applied is given in Table 5 and the difference according to the number of grains in the plant variety is found to be 1%. The difference between the blocks according to the number of grains was found to be 5%.

Table 5: Variance analysis results of bean varieties and grain numbers in local population

Variation Sources	Degree of Freedom	Sum of Squares	Squares Average	F Value
Variety	10	18.252	1.825	9.550**
Block	2	2.230	1.115	5.836*
Error	20	3.822	0.191	
Total	32	1160.336		

**significant at 1% level of P. *significant at 5% level of P.

The mean results of the number of grains per plant and the resulting LSD multiple comparison groups are given in Table 6. The average grain number of the legume varied between 4.26-6.82 / leg. While the Karaman variety with the highest number of grain was the highest among the plant varieties, the lowest varieties were obtained from the Adabayazi variety (Table 6).

Table 6: Average number of grain per pod in bean variety and local population

No	Variety	Number of grain per pod
1	Yunus-90	6.11ab
2	Karaman	6.82a
3	Akman-98	5.72bc
4	Şeker-98	5.93b
5	Göynük-98	5.03cde
6	Ahlat popülasyonu	5.53bcd
7	Adabayazi	4.26e
8	Topçu	4.85de
9	Rib-Weighing	4.73e
10	Zülbiye	6.22ab
11	Göksun	6.13ab
LSD	39.693	

* Values for the same group of letters are significant relative to LSD 1%.

According to the results of the research, the highest number of grain numbers in Karaman (6.85) was found among the plant varieties found in Table 6, and the lowest number of arable seeds was obtained from the varieties of Adabaşazi (4.26) and Rib-weighing (4.73). In the studies done on beans, the average number of grain in bran was 2.40-4.65 (Azkan and Yürür, 1987), 3.05-5.60 (Senturk and Önder, 1996), 2.67 (Önder ve Sade, 1996), 1.86-4.53 (Düzdemir, 1998), 2.3-6.4 (Pekşen and Gülümser, 2005), 1-9 (Sözen, 2006), 3.24-6.06 (Pekşen, 2012) and 3.27-6.13 (Aydoğan, 2017). In our study, the number of grain in the bark is in accordance with some of the studies done in the range, but there are differences in some parts. The main reasons for this are environmental factors such as the variety or genotype used (Perea et al., 2006), soil differentiation, amount of water in the soil.

3.4. Number of pods per plant

Variance analysis was applied to determine whether plant varieties differ according to the number of pods. The result of the applied variance analysis is given in Table 7. As a result of applied variance analysis, plant variety does not differ according to number of pods. Bloto was found to be significant at 1% level compared to the number of pods.

Table 7: Results of variance analysis of bean species and number of pods in local population

Variation Sources	Degree of Freedom	Sum of Squares	Squares Average	F Value
Variety	10	4.98	0.498	1.907
Block	2	10.398	5.199	19.912 **

Error	20	5.221	0.261	
Total	32	20.6		

**significant at 1% level of P. *significant at 5% level of P.

The mean results for the number of pods of plant per plant varied between 6.31-7.84 (units / plant). The highest varieties and the results of multiple LSD groups are given in number of pods was observed in the Ahlat line, while the lowest Table 8. When the results were evaluated, the number of pods value was observed in the range of Rib-Weighing.

Table 8: Average number of pods per species in bean cultivars and local populations

No	Variety	Number of pods per plant
1	Yunus-90	7.13
2	Karaman	6.81
3	Akman-98	6.50
4	Şeker-98	7.03
5	Göynük-98	6.73
6	Ahlat popülasyonu	7.84
7	Adabeyazı	7.43
8	Topçu	7.22
9	Rib-Weighing	6.31
10	Zülbiye	7.02
11	Göksun	6.91
LSD	0.870	

* Values for the same group of letters are significant relative to LSD 1%.

According to the results of the study, in Table 8, the number of beans in the plant was found to be 7.48 in the Ahlat population, and the number of beans in the plant was found to be 6.31 in the Rib-Weighing. The average number of pods per plant per plant in studies on beans was 13.55-22.45 (Azkan and Yürür, 1987), 16.32-86.28 (Zeytun, 1987), 8.3-12.2 (Özçelik and Gülümser, 1988), 13.75-22.33 (Şentürk and Önder, 1996), 13.50 (Önder and Sade, 1996), 4-29 (Balkaya, 1999), 11.4-18.0 (Anlarsal et al., 2000), 8.6-26.2 (Düzdemir and Akdağ, 2001), 4.5-25.8 (Pekşen and Gülümser, 2005), 1-163 (Sözen, 2006), 12.3-32.0 (Ceyhan et al., 2009), 4-14 (Yılmaz et al., 2011) (Zirek, 2015), 9.97-21.50 (Baran, 2016) and 8.4-18.4 (Aydoğan, 2017), respectively, in the study period), 10.0-24.1 (Girgel et al., 2018). The number of seedlings obtained in our study does not

comply with some of the studies which are compatible with some of the studies. The main reasons for this are; the varieties or genotypes used can be seen as environmental factors such as temperature, different maintenance techniques applied, soil differentiation, amount of water in the soil.

3.5. Grain Yield in Crops

Variance analysis was applied to determine whether the plant varieties differed according to grain yield in the plant. The result of applied variance analysis is given in Table 9 and as a result of the applied variance analysis, the difference between seeds and plant varieties according to grain yield is found to be 1%.

Table 9: Variance analysis results of bean cultivars and local population yield of plants

Variation Sources	Degree of Freedom	Sum of Squares	Squares Average	F Value
Variety	10	191.199	19.119	10.637**
Block	2	36.888	18.444	10.261**
Error	20	35.947	1.797	
Total	32	264.035		

**significant at 1% level of P. *significant at 5% level of P.

The average results of plant yields of plant varieties and the results of LSD multiple comparison groups are given in Table 10. Average plant yield per plant; 8.83-17.77 changes per

plant. Among the plant varieties, it was determined that the plant yield was the highest of Yunus-90 while the plant yield was the lowest and Zülbiye variety.

Table 10: Grain yield (g / plant) in bean varieties and local populations

No	Variety	Grain yield in crops
1	Yunus-90	17.77a

2	Karaman	13.09bc
3	Akman-98	9.82cd
4	Şeker-98	14.04b
5	Göynük-98	13.44b
6	Ahlat popülasyonu	9.60cd
7	Adabeyazı	11.13bcd
8	Topçu	12.13bcd
9	Rib-Weighing	11.80bcd
10	Zülbiye	8.83d
11	Göksun	10.69bcd
LSD	2.283	

* Values for the same group of letters are significant relative to LSD 1%.

According to the results of the research, the average of the plotted group and the group of the same letter do not differ, so the highest and lowest seed yield varieties (Yunus-90 and Zülbiye) were found to be different groups. In the studies done, the average yield of grains in the plant was determined as 15.00-28.2 g (Azkan ve Yürür, 1987), 4.56-14.90 g (Pekşen, 2012). It is thought that the difference in the yield values of the seeds is due to the different types of seeds used, the temperature and the ecological factors.

3.6. Face Grain Weight

Variance analysis was applied to determine whether the plant varieties differ according to the weight of a thousand grains. The result of the variance analysis is given in Table 11. According to the result of the variance analysis applied, the difference according to the weight of one hundred plants among the plant varieties was found to be 1%.

Table 11: Results of variance analysis of bean varieties and hundreds of weight in the local population

Variation Sources	Degree of Freedom	Sum of Squares	Squares Average	F Value
Variety	10	39261.420	3926.142	7.228**
Block	2	866.601	433.300	0.797
Error	20	10862.724	543.136	
Total	32	50990.747		

**significant at 1% level of P. *significant at 5% level of P.

The mean results of the plant varieties for one hundred weights and the resulting LSD multiple comparison groups are given in Table 12. Varieties in terms of weight of a thousand; It ranged between 399.03-503.08 g. The maximum number of plant species was observed in the Rib-Weighing range, while the lowest value was obtained from the Göksun variety.

Table 12: Variety of beans and a hundred averages in the local population (g)

No	Variety	One hundred weight
1	Yunus-90	49.32 ab
2	Karaman	41.04 efg
3	Akman-98	42.43 defg
4	Şeker-98	47.63 abc
5	Göynük-98	27.39 bcde
6	Ahlat popülasyonu	46.26 abcd
7	Adabeyazı	44.45 cdef
8	Topçu	40.21 fg
9	Rib-Weighing	50.30 a
10	Zülbiye	42.36 defg
11	Göksun	39.90 g
LSD	39.693	49.32 ab

* Values for the same group of letters are significant relative to LSD 1%.

The average weight of one hundred weight in the 1995), 16.83-43.83 g (Senturk and Leader, 1996), 40.33 g studies done is 15.41-53.69 g (Azkan ve Yürür, 1987), 34.50- (Onder and Sade, 1996), 19.01-13.50 g (Düzdemir, 1998), 45.30 g (Özçelik ve Gülümser, 1988), 15.95-52.09 g (Bozoğlu, 17.78-52.88 g (Pekşen, 2005), 16.2-80.6 g (Sözen, 2006), 21.80-

46.71 g et al., 2009), 53.1 g (Babagil et al., 2011), 25.92-46.90 g (Varankaya and Ceyhan, 2012), 17.78-52.88 g (Pekşen, 2012), 20.53-42.13 g (Zirek, 2015), 27.60-62.10 g (Zirek, 2015), one hundred and two 42.2-60.3 g (Aydoğan, 2017), 39.37-54.55 g (Girgel et al., 2018). It may be different due to the characteristics of a hundred grains, it is predicted that the seeds will have a low seed weight due to early ripening of the plants in hot periods and adverse maintenance conditions. Because of this reason, it is considered that the values of one hundred weight obtained in our study are partly similar to those of previous

studies, because the varieties used are different.

3.7. Number of Grain in the Plant

Variance analysis was applied to determine whether the plant varieties differ according to the number of plant grains. The result of the variance analysis is given in Table 13. As a result of the variance analysis applied, the difference according to the number of grains of blocks and plant varieties is found to be about 5%.

Table 13: Variance analysis results of bean varieties and number of grains in the local population

Variation Sources	Degree of Freedom	Sum of Squares	Squares Average	F Value
Variety	10	516.472	51.647	3.015*
Block	2	195.556	97.778	5.709*
Error	20	342.529	17.126	
Total	32	1054.558		

**significant at 1% level of P. *significant at 5% level of P.

The mean results of the plant variety counts of plant seeds and the results of the LSD multiple comparison groups are given in Table 14. Average number of seeds per plant; Ranged from 21.92 to 35.32 plants / plant; It is observed that the Göksun variety has the highest number of seeds whereas Adabeyaz variety has the lowest number of seeds.

Table 14: Average number of seeds per plant of bean varieties and the local population (number seeds / plant)

No	Variety	Number of seeds per plant
1	Yunus-90	29.34 abcd
2	Karaman	33.32 ab
3	Akman-98	29.65 abcd
4	Şeker-98	25.93 bcd
5	Göynük-98	25.35 bcd
6	Ahlat popülasyonu	28.83 abcd
7	Adabeyazı	21.92 d
8	Topçu	30.36 abc
9	Rib-Weighing	22.81 cd
10	Zülbiye	30.63 abc
11	Göksun	35.32 a
LSD	7.048	

* Values for the same group of letters are significant relative to LSD 5%.

In the studies on yield and yield characteristics in bean paste, the average number of grains per plant was 16.32-86.28 in Zeytun (1987), 25.7-38.8 in Ozelik and Gülümser in 1988, 11.03-65.88 in Düzdemir, 1998, 25.2-47.5 in Anlarsal et al., 2000), 9.2-78.0 (Pekşen and Gülümser, 2005), 21.78-63.44 (Varankaya and Ceyhan, 2012), 32.10-96.86 (Zirek, 2015), 29.87-72.20 as the number of seeds in the plant. It is estimated that several environmental and genetic factors may be responsible for not complying with some of the observations made in the number of seeds obtained in the observations made.

3.8. Decanter grain yield

Variance analysis was applied to determine whether the plant varieties differ according to the yield. The applied variance analysis result is given in Table 15. While the variance analysis showed no difference according to the yield of decanter grain, the difference according to grain yield of plant varieties was found to be 1%.

Table 15: Variance analysis results of bean varieties and yields in the local population

Variation Sources	Degree of Freedom	Sum of Squares	Squares Average	F Value
Variety	10	14537.660	1453.766	9.415 **
Block	2	833.914	416.957	2.700
Error	20	3088.172	154.408	

Total	32	18459.747		
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The average results of the yields of the plant varieties / da. It was observed that the highest value of the decanter yield and the results of the LSD multiple comparison groups are given was obtained from the artillery variety (350.89 kg / da) while the in Table 16. Extraction values of the decanter; 273.93-350.89 kg lowest value was found in Göynük-98 (273.93 kg / da).

Table 16: Yield averages (kg / da) of bean varieties and local populations

No	Variety	Decanter grain yield
1	Yunus-90	350.63 a
2	Karaman	320.75 bcd
3	Akman-98	317.58 bcd
4	Şeker-98	321.94 bcd
5	Göynük-98	273.93 e
6	Ahlat popülasyonu	329.15 abc
7	Adabeyazı	333.28 ab
8	Topçu	350.89 b
9	Rib-Weighing	301.99 d
10	Zülbiye	308.54 cd
11	Göksun	309.75 bcd
LSD	7.048	

* Values for the same group of letters are significant relative to LSD 1%.

In the studies done, the average of the yield of the decal is from 86.00-121.00 kg / da in the first year, 76.00-110.00 kg / da in the first year, 197.4-311.6 kg / da (1987) and 115- 226 kg / da (Ozcelik and Gülümser, 1988) kg / da, (Mishra and Dash, 1991), 162.7-237.7 kg / da (Bozoğlu, 1995), 231 kg / da (Önder ve Sade, 1996), 65.70-244.80 kg / da (Düzdemir, 1998) (Stress, 2006), 111.2-299.4 kg / da (Anlarsal et al., 2000), 73.4-205.9 kg / (Düzdemir and Akdag, 2001), 231.62 kg / (Ceyhan et al., 2009), 136.6 kg / da (Babagil et al., 2011), 145.6-512.1 kg / da (Sun, 2011), 186.03-231.62 kg / (Baran, 2016), 92.9-285.0 kg / da (Aydoğan, 2017), 128.3 (Gillard et al., 2012), 593.1-912.7 kg / - 194.3 kg (Girgel et al., 2018). It is seen that the grain yield results obtained in the work done are similar to some of the above studies, but not similar. The main reasons for this are; environmental conditions, different cultural practices and hereditary differences (Elkoca and Çınar, 2015).

4. CONCLUSIONS AND RECOMMENDATIONS

According to the results of the research; number of pods per plant 6.31-7.84 pcs / plant, number of pods per plant 4.26-6.82 pcs / plant, yield of seeds in plant 8.83-17.77 g / plant, yield of seeds 273.93-350.89 kg / da, weight of seeds 39.90-50.30 g, number of plants was 21.92-35.32 plants per plant, number of branches was 6.42-7.14 plants per plant, and plant height was 40.42-56.74 cm. Artillery and Yunus-90 varieties have the highest yield values with 350.89 kg / da and 350.63 kg / da, respectively, while Göynük-98 varieties have the lowest value with 273.93 kg / da. According to our findings, it is seen that Yunus-90 and Artillery varieties have the highest value in terms of giving grain. It can be recommended to cultivate the region. However, in order to make a healthier decision, it is necessary to support this research with detailed studies based on many environmental and agricultural applications.

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