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Determination Of Some Morphological And Phenological Characteristics Of Local Dry Bean (*Phaseolus vulgaris* L.) Genotypes

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Abstract
It is extremely crucial that botanic gene resources are recorded and preserved in developing new species. Even though the materials are collected in a single city, there can emerge numerous variations to be observed among them. Detecting these variations is highly important for breeding studies. In this study, local dry bean genotypes have been collected from the city center of Giresun and other provinces in order to use on breeding studies for various purposes. It has been aimed that some morphological and phenological properties can be identified in the genotypes collected. Material collection took place in 2010, and field studies of the materials were conducted under the ecological conditions of Şebinkarahisar-Giresun in 2011 The experiment was arranged in complete randomize blocks design with three replication. In the study, 28 local dry bean genotypes, which were collected from the city center and other provinces of Giresun, were used. In the study 6 genotypes are determinate and 22 genotypes are indeterminate. The seed length of the genotypes varied from 0.59 to 1.93 cm and seed width ranged from 0.40 to 1.01 cm. It has been reported that their germination duration was 13.33- 25 days; flowering duration was 30.33- 88.67 days and vegetation duration was 133.67- 147.33 days. The data acquired will facilitate material picking for the researchers and help them choose proper starting materials for their breeding program.
Keywords: Dry bean, Plant breeding, Morphological, Phenological

Introductıon

Edible legumes, which comprise the main herbal protein source in our diets, are significant for the world and our country. They are the number two seed products in terms of production and area of cultivation after cereals in field crops cultivation. Especially in developing countries like Turkey, the importance of this plant group has been better realized due to the reduced cultivation stemming from reasons like droughts and etc. in the recent years. (Adak et al., 2010).

Though animal proteins are more suitable for human nutrition than herbal proteins, there is the need for food that completes the food biologically in places not adequate animal protein is provided. Edible legumes are very convenient in this sense. (Çiftçi and Adak, 2009).

As well as being rich in nutrition, they have also positive effects on the land they are cultivated on. Their feature of bonding free nitrogen in the air to the soil is increasing the importance of these plants in today's world when the recognition of environmentalism and sustainable agriculture is on the rise.

Dry beans are among those plants that have been more recently introduced to Turkey; they are of foreign origins like corns, sunflowers, potatoes, tobacco, tomatoes and groundnuts and their financial significance is high. Dry beans, which are rich in minerals, vitamins and protein (%18-31.6), have a considerable role in human nutrition (Şehirali 1988).

One of the regions with the highest bean cultivation rates in our country is the Black Sea Region. In the region, the bean has 13 thousand ha cultivation land and 15 thousand tons of production. Average yield is 120kg/da. In Giresun, 1060 ha of land is used for bean cultivation and 175 tons of crops are obtained (Anonymous 2013). One of the most remarkable goals of the studies made on the dry bean is to increase the yield. Increasing the yield per unit area depends on determining and cultivating the species that suit the cultural applications and ecological conditions (Pekşen 2005). Besides the positive effects of new species on the yield, they also have a significant downside like causing the local countryside species to be discontinued or degenerated. This is because, the local countryside species are unique resources, which will be referred to in future studies, and their potentials in some aspects haven't been enlightened yet (Akgün et al., 1998).

In almost every part of our country, local bean genotypes are available (Şehirali 1988). Easter Black Sea Region has bean populations that have adapted to the conditions of the region. These local genotypes provide resources for biodiversity. For this reason, local dry bean genotypes collected in Giresun and its provinces were used as materials and their morphological and phenological qualities have been tried to describe.

Materıal And Method

On the experiment, 28 local dry bean genotypes, which were collected from the local market places and its provinces, have been used. The material collection was done between April and May, 2010. The average temperature requirement of beans, which are cultivated in many countries, in their development and flowering periods, is 20-25 ^{o}C (Şehirali 1979). In the long years beans vegetation, the average rain amount is 158,5 mm, temperature is 17.14 ^{o}C and humidity is %56.24. In 2011 when the experiment was set, the total amount of rain was 182.4 mm, average temperature was 17.04 ^{o}C and average humidity was %57.12 during the cultivation period. In 2011, when the trial was conducted, the average temperature was appropriate for bean cultivation. For a good level of yield, 300- 400 mm total water is required during vegetation (Azkan 1999).

Beans can be cultivated in a wide range of soil types from lightly sandy soil to heavily clayed soil types. They are sensitive to high alkali conditions. The Ph is recommended to be between 6.0-6.8. The soil texture is of clayed-loamy form, it has the feature of alkali reaction (pH = 7.85), and it is rich in organic substances and phosphorus. The soil qualities of our testing area are consistent with the soil requirements of beans.

The experiment was arranged in complete randomize blocks design with three replication. On the trial, the width of the lines was 50cm, the distance between lines was 10cm, and the length of the lines was 3 m. The lines were opened in a way to give each genotype 3 lines. The planting was done by hand in 5-6 cm depth. Parcel area was measured as (1.5 m x 3m) 4.5 m^2. On the trial field, Ammonium Nitrate and Triple Super Phosphate fertilizers were applied in a pattern of 4.0 kg pure nitrogen, 6 kg P_2O_5 per decare (Şehirali, 1998). The harvest was done in September, when the legumes grew 80% yellow. Once the harvested plants were dried enough, they were blended by hand.

On the study; growth type, seed width, seed length, germination duration, flowering day and vegetation time were observed.

The data obtained from the experiment for the basic statistics (mean, standard error, minimum and maximum values) is used SPSS 15.0 package program.

Results And Dıscussıon

Of the 28 genotypes studied on the research, 6 are determinate and 22 are indeterminate type (Table 1). Determinate types grow earlier than indeterminate types and they are more suitable for automated agriculture. However, highest unit per decare yield is achieved through indeterminate type.

Seed lengths ranged between 0.59-1.93 cm. The longest seed was measured on G16 genotype and shortest was in G20 (Table 2). On a related study the seed length was reported as 0.86-1.55 cm by Güvenç and Güngör (1996). These values are compatible with our study. Seed width ranged between 0.40-1.01 with lowest being G2 and highest G13 genotypes. On a related study the seed width was reported as 0.46-0.67 cm by Güvenç and Güngör (1996). Higher values were observed on our study.

Although seed length and width are genetic qualities that vary from plant to plant, they can also be modified by the cultivation techniques and the diversity of the cultural processes applied. It is considered that the higher values of seed width on our study than the values in the literature can be the result of genetic properties.

The shortest germination duration was on G21 genotype by 13.33 days and the longest one was on G1 genotype by 25.00 days (Table 3). Other studies conducted, the germination time was reported as 8.3-19.7 days by Deniz (2008) and 13-16 days by Dumlu (2009). The results obtained are compatible with some of the data in the literature and incompatible with some. This incompatibility is assumed to have stemmed from the differences of the earth structure and climate of the testing area and the genetic material.

The shortest flowering time was reported on G1 genotype as 30.33 days; and the longest flowering time was reported on G15 genotype as 88.67 days (Table 2). Genchev (1995) states that increasing daytime and high temperature shortens the time required for flower bud formation on beans. The hereditary forms of the plants, maintenance and environmental factors have considerable effects on the earliness, which is one of the most important aims of plant breeding. Earliness is essentially a quantitative characteristic.

Table 1. Observations on the growth type, vining tendency and plant coloring of the dry bean genotypes used on the experiment.

Registry Number	Gathering Location	Growth Type	Vine Tendency	Plant Coloring
G1	Alucra	Determinate	Significant	Medium
G2	Alucra	İndeterminate	Significant	None
G3	Bulancak	Determinate	Light	Medium
G4	Bulancak	Determinate	None	None
G5	Çamoluk	İndeterminate	Significant	Medium
G6	Çamoluk	Determinate	Medium	Medium
G7	Çanakçı	İndeterminate	Significant	None
G8	Dereli	İndeterminate	Significant	Medium
G9	Dereli	İndeterminate	Significant	None
G10	Doğankent	İndeterminate	Significant	None
G11	Doğankent	İndeterminate	Significant	None
G12	Espiye	İndeterminate	Significant	Medium
G13	Espiye	İndeterminate	Medium	Medium
G14	Eynesil	İndeterminate	Significant	None
G15	Eynesil	İndeterminate	Medium	None
G16	Görele	İndeterminate	Significant	None
G17	Görele	İndeterminate	Medium	None
G18	Güce	İndeterminate	Significant	None
G19	Keşap	İndeterminate	Significant	None
G20	Keşap	Determinate	None	Medium
G21	Merkez	İndeterminate	Significant	Common
G22	Merkez	İndeterminate	Significant	None
G23	Piraziz	İndeterminate	Medium	None
G24	Ş.Karahisar	İndeterminate	Significant	None
G25	Ş.karahisar	Determinate	Light	None
G26	Tirebolu	İndeterminate	Medium	None
G27	Yağlıdere	İndeterminate	Significant	Medium
G28	Yağlıdere	İndeterminate	Significant	Medium

Table 2. Data on the seed length and seed width; mean, standard error (±), minimum and maximum values.

		Seed Length	Seed Width			Seed Length	Seed Width
G1	**Mean**	0.98±0.02	0.41±0.01	**G15**	**Mean**	1.40±0.01	1.00±0.01
	Min.	0.80	0.30		**Min.**	1.30	0.90
	Max.	1.30	0.50		**Max.**	1.50	1.10
G2	**Mean**	0.95±0.02	**0.40±0.01**	**G16**	**Mean**	**1.93±0.04**	0.99±0.01
	Min.	0.80	0.30		**Min.**	0.80	0.90
	Max.	0.90	0.50		**Max.**	2.20	1.10
G3	**Mean**	0.99±0.01	0.48±0.01	**G17**	**Mean**	1.08±0.01	0.90±0.01
	Min.	0.90	0.40		**Min.**	1.00	0.80
	Max.	1.10	0.60		**Max.**	1.20	1.10
G4	**Mean**	0.95±0.01	0.74±0.01	**G18**	**Mean**	0.78±0.01	0.40±0.01
	Min.	0.90	0.60		**Min.**	0.70	0.30
	Max.	1.00	0.90		**Max.**	0.90	0.50
G5	**Mean**	1.09±0.01	0.66±0.01	**G19**	**Mean**	0.75±0.01	0.45±0.01
	Min.	1.00	0.60		**Min.**	0.60	0.40
	Max.	1.20	0.80		**Max.**	0.90	0.50
G6	**Mean**	1.12±0.01	0.75±0.01	**G20**	**Mean**	**0.59±0.01**	0.50±0.01
	Min.	1.00	0.60		**Min.**	0.40	0.40
	Max.	1.30	0.90		**Max.**	0.70	0.60
G7	**Mean**	1.07±0.01	0.74±0.01	**G21**	**Mean**	1.64±0.01	0.49±0.01
	Min.	1.00	0.70		**Min.**	1.50	0.40
	Max.	1.20	0.80		**Max.**	1.80	0.60
G8	**Mean**	1.07±0.01	0.73±0.01	**G22**	**Mean**	1.51±0.01	0.46±0.01
	Min.	1.00	0.70		**Min.**	1.40	0.40
	Max.	1.20	0.80		**Max.**	1.60	0.60
G9	**Mean**	1.11±0.01	0.96±0.01	**G23**	**Mean**	1.52±0.01	0.61±0.01
	Min.	1.00	0.80		**Min.**	1.40	0.50
	Max.	1.30	1.10		**Max.**	1.60	0.70
G10	**Mean**	1.25±0.01	0.45±0.01	**G24**	**Mean**	1.32±0.01	0.44±0.01
	Min.	1.20	0.40		**Min.**	1.30	0.30
	Max.	1.30	0.50		**Max.**	1.40	0.50
G11	**Mean**	1.74±0.05	0.74±0.05	**G25**	**Mean**	1.16±0.01	0.45±0.01
	Min.	1.60	0.70		**Min.**	1.00	0.40
	Max.	1.80	0.80		**Max.**	1.30	0.50
G12	**Mean**	1.15±0.016	0.75±0.01	**G26**	**Mean**	1.65±0.01	0.60±0.01
	Min.	1.00	0.70		**Min.**	1.40	0.50
	Max.	1.30	0.80		**Max.**	1.80	0.70
G13	**Mean**	1.38±0,01	**1.01±0,01**	**G27**	**Mean**	0.99±0.01	0.64±0.01
	Min.	1.20	0.90		**Min.**	0.90	0.50
	Max.	1.50	1.10		**Max.**	1.10	0.70
G14	**Mean**	1.16±0.01	0.79±0.01	**G28**	**Mean**	1.14±0.01	0.78±0.01
	Min.	1.10	0.70		**Min.**	1.00	0.70
	Max.	1.20	0.90		**Max.**	1.30	0.90

Table 3 Data on the germination time, flowering time, vegetation time; mean, standard error (±), minimum and maximum values

		Germination Time	Flowering Time	Vegetation time			Germination Time	Flowering Time	Vegetation time
G1	Mean	**25.00±1.52**	**30.33±2.33**	145.00±1.52	G15	Mean	24.66±1.66	**88.66±3.28**	145.66±1.45
	Min.	23	26	143		Min.	23	84	143
	Max.	28	34	148		Max.	28	95	14
G2	Mean.	15.66±2.06	38.33±7.05	145.66±1.20	G16	Mean	15.00±1.00	79.33±0.33	145.66±1.20
	Min.	11	25	144		Min.	13	79	144
	Max.	20	49	148		Max.	16	80	148
G3	Mean.	19.00±2.08	41.66±3.33	144.66±1.76	G17	Mean	20.00±1.73	74.00±1.15	145.66±1.20
	Min.	16	35	142		Min.	17	72	144
	Max.	23	45	148		Max.	23	76	148
G4	Mean.	21.66±4.09	47.00±5.19	142.00±4.16	G18	Mean	16.66±3.17	69.00±4.35	144.33±0.88
	Min.	14	38	134		Min.	13	61	143
	Max.	28	56	148		Max.	23	76	146
G5	Mean.	15.33±0.66	59.33±0.88	146.33±0.88	G19	Mean	20.66±2.33	69.33±6.06	146.66±1.33
	Min.	14	58	145		Min.	16	59	144
	Max.	16	61	148		Max.	23	80	148
G6	Mean.	19.66±2.02	45.66±2.40	145.33±1.33	G20	Mean	17.33±0.33	78.66±10.97	**133.66±0.33**
	Min.	16	41	144		Min.	17	60	133
	Max.	23	49	148		Max.	18	98	134
G7	Mean.	19.33±3.66	50.33±5.33	146.00±1.15	G21	Mean	**13.33±0.33**	82.00±2.88	145.33±0.66
	Min.	12	45	144		Min.	13	77	144
	Max.	23	61	148		Max.	14	87	146
G8	Mean.	18.66±2.66	68.66±5.36	145.33±1.33	G22	Mean	14.33±0.33	79.00±1.15	145.33±0.66
	Min.	16	58	144		Min.	14	77	144
	Max.	24	75	148		Max.	15	81	146
G9	Mean.	17.00±0.57	69.33±0.66	146.33±0.88	G23	Mean	20.00±1.73	88.00±6.08	145.66±1.20
	Min.	16	68	148		Min.	17	77	144
	Max.	18	70	148		Max.	23	98	148
G10	Mean.	16.33±0.33	75.00±5.03	146.00±1.00	G24	Mean	16.33±0.33	72.33±6.69	146.00±1.15
	Min.	16	65	145		Min.	16	59	144
	Max.	17	81	148		Max.	17	80	148
G11	Mean.	18.66±2.18	67.00±2.51	146.00±1.15	G25	Mean	23.33±0.33	82.33±2.33	145.66±1.20
	Min.	16	64	144		Min.	23	80	144
	Max.	23	72	148		Max.	24	87	148
G12	Mean	21.66±1.33	73.00±0.57	145.66±1.20	G26	Mean	18.33±2.60	75.33±3.17	145.66±1.20
	Min.	19	72	144		Min.	14	70	144
	Max.	23	74	148		Max.	23	81	148
G13	Mean	18.66±2.18	68.66±8.74	146.00±1.15	G27	Mean	18.33±2.60	69.66±5.36	146.00±1.15
	Min.	16	58	144		Min.	14	59	144
	Max.	23	86	148		Max.	23	76	148
G14	Mean	17.33±0.33	80.00±7.63	144.66±1.76	G28	Mean	17.66±2.72	76.66±8.64	**147.33±0.66**
	Min.	17	70	142		Min.	14	60	146
	Max.	18	95	148		Max.	23	89	148

The results obtained are partially consistent with the results of Meza et al. (2013) as 31-51 days, Deniz (2008) as 38-69 days and Fırtına (2006) as 32-42 days. On our research, different flowering times were reported for different genotypes. This is assumed to be caused by types and the genetic structures of the genotypes.

The shortest vegetation time was reported on G20 genotype as 133.67 days; and the longest vegetation time was reported on G28 genotype as 147,33 days (Table 2). Güneş (2011) reported the vegetation time of beans as 99-135 days, Dursun (1999) reported 138-167 days, and Deniz (2008) reported 114-137 days. We can say the difference between our findings on vegetation times and those in the related studies is caused by the types and genetic properties of the genotypes and environmental factors.

On their study, which they conducted for two years in Çukurova with the aims of demonstrating seed yield and certain properties about the yield and determining bean types that are suitable for dry seed production, Anlarsal et al. (1998) reported seed yields as 57.4-119.6 kg/da on bush forms and 16.5-97.5 kg/da on vine forms. Important positive relations were defined in each year between field unit seed yield and the weight of 100 seeds on bush forms; and between seed yield and total number legumes, the number of seeds per plant and seed weight per plant on vine forms.

Güvenç and Güngör (1996) have reported seed width as 0.46-0.67 cm, seed length as 0.86-1.55 cm on their study**.** Akdağ and Düzdemir reported seed width as 0.62-1.19 cm and seed length as 0.92-1.94 cm on their study which was conducted on 56 dry bean genotypes.

The time between seed plantation and the day 50% of the plant is visible above on the ground is known as Germination Duration. The germination time is affected by the genetic structure of the plant as well as differing in accordance with the characteristics of the climate. On their studies, the germination time was reported as 8.3-19.7 days by Deniz (2008) and 13-16 days by Dumlu (2009).

The flowering duration of beans is shorter in bush forms than vine forms. Genchev (1995) states that increasing daytime and high temperature shortens the time required for flower bud formation on beans. Flowering duration days have been reported as 31-51 days by Meza et al. (2013), 38-69 days by Deniz (2008) and as 32-42 days by Fırtına (2006).

Beans are classified as early or late by their time of cultivation. Earliness is a desired feature in cultivation. On earliness, which is one of the important goals targeted in plant breeding, the genetic structure of the plant, temperature and daytime length have considerable effects.). Güneş (2011) reported the vegetation time of beans as 99-135 days, Dursun (1999) reported 138-167 days, and Deniz (2008) reported 114-137 days.

Conclusıon

On this research local bean genotypes were collected from the provinces of Giresun. The 28 local genotypes collected are highly important in terms of sustaining biodiversity in the region and preserving our natural resources. These genotypes can be grouped according to their aims of use and utilized for species development; or they can be included in crossbreeding programs as parents. The findings obtained will help choosing proper materials for breeding and provide convenience for studies in this field.

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