The Comparison Of Some Cowpea Populations According To Their Growth, Yield and Seed Quality

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Abstract : This research has been carried out in Canakkale-Turkey in order to determine the growth, yield and seed quality of 31 cowpea populations which were collected from Agean and Marmara Coastal Region. Research has been laid out in randomized block design with three replication. Emergence rate, days to flowering and harvest, pod length, pod weight, pod number, 100 seed weight, fresh pod yield (kg/da), seed yield (kg/da), standart germination tests, cold test and accelerated ageing have been determined. According to the test results, second population gave the highest seed yield 26.95 g/plant (84.20 kg/da). For fresh pod weight 30rd population has the highest yield with 277.84 g.

Keywords: Cowpea, yield, seed quality

Introduction

Insufficient agricultural products for earth's growing population put significant nutrition problems down on the agenda. Especially, apart from danger of starvation in underdeveloped countries, in also developing countries problems of malnutrition threatens people's health on a large scale. On a balanced and regular diet program, a person needs 70 gr protein daily. Arora (1963), emphasizes that the legumes which contains qualified and highly proportioned proteins (%17-32) is an important source to supply the deficit. Fresh seeds of cowpea contain %4.5-5.0 protein (Terra 1966). Cowpea is a significant legume plant in Asia, South Europe, Middle and South America and in the United States. For it has the capacity of linking nitrogen on even poor lands which have resistance to drought, it can be grown together with many tuber plants and grains. Today, cowpeas are produced in 63 country all over the world (Singh et al.1997). World cowpea harvested area is establish as 11806648 ha and 5389235 tonne. production (Anonymous, 2010). Cultural methods and choice of appropriate type comes first among the factors which affect the yield of cowpea. Mostly, local landraces are used in production. In spite of this, there has been no important steps to determine the features of landraces and apply for registration. After studying this field and determining the features of landraces, as Pandey and Torrie mentioned (1973), determining the elements which can be criterion for yield in different genotypes is important in order to pay new cultivars. The adaptation of cowpea was studied in Turkey-Samsun under the ecological circumstances. In this study, it was found out that the most important factors which affect the time of emergence are the features of seed and cultivar, the heat of soil and its dumpness. It was also determined that the cultivars emerged between 7 or 12 days (Gülümser et. al., 1989). Quinn (1999), claims that for Indiana, the appropriate cultivars can be sown on June, after sowing, cultivars grow in 60 days and in between 90-100 days it turns into a mature pod harvest. The researcher emphasizes that cowpea isn't resistant to dump conditions and it can't be grown in undrained grounds. Vural et. al. (2000) mentioned that depending on growing conditions, almost 700-1000 kg/da fresh cowpeas can be harvested. They also emphasized that ecological conditions highly affects the fertility of cowpeas. Tomer and Verma (1989), on their study with cowpea cultivars, divided cultivars into 3 groups as heavy, light and medium according to seed weight and determined that heavy seeds when compared to the other groups show superior features in seed yield.

Today, most of the producers use modern cultivars for their superior yield characteristics. In spite of the negatives like loss of soil or heavily used chemicals which were caused by conventional agriculture , some environmental friendly production systems emerged. (Aksoy and Altındişli, 2001). Those agriculture systems advice and urge the use of local cultivars and populations. In Aegean and Marmara regions, cowpea is consumed very much. In this study, yield, quality, morphological and physiological features of different populations from those regions were studied. The most important aim is to get prep-findings related to production of a cultivar which can be planted on Aegean and Marmara regions and which can be consumed as fresh or as a short term dry legumes.

Material and Method

In this research, 31 cowpea populations; 9 from Çanakkale, 1 from Muğla and 21 from Menemen Agricultural Research institute, were used as plant material. In the experiment ,features like the shape , greatness, color of every grain were taken into consideration. The seeds out of the type were throwed away and similar seeds were chosen as material , and were numbered.

During the research year, the average temperatures on May, June, July,August and September, were 17.8, 22.4, 25.9, 25.6, 21.2 °C. When temperatures were observed, it was seen that the province of Çanakkale has a warm climate. The session in which the summer products are grown without taking any risk is the period about 140 days between June and September. The experiment was set as three replication in accordance with randomized block design. Every population was located in a parcel. Populations were planted in two lines, 80 cm line distance and 40 cm above the lines. The largeness of parcel was 32m². Five plant for fresh pod harvest and 5 plant for dry harvest were chosen randomly from every population, they were marked and the measurements were made over those plants. In June 10, planting took place on the holes which were digged before. Throughout the experiment, irrigation took place for 6 times. On the land of experiment, only 5 ton manure was used. Fungucide and insectiside applied against to (**Callosobruchus maculatus**) and fungal diseases.

The experiment was carried out on 31 cowpea totally. The features of experimented populations is shown at Table -1.

Pop.	Seed Weight (g)	Seed Colour	Hilum Colour	Seed Shape Index (Length/Diameter)	Seed Origin
Pop 1*	0,142	Black	Black	1,76	Çan /Ç.Kale
Pop 2	0,237	Black sprinkled	Black	1,57	Bayramiç/Ç.Kale
Pop 3	0,158	Brown sprinkled	Brown	1,27	Çan /Ç.Kale
Pop 4	0,216	Dark Brown	Brown	1,43	Ezine /Ç.Kale
Pop 5	0,187	Light Brown	Brown	1,28	Yenice /Ç.Kale
Pop 6	0,256	Cream	Yellow	1,49	Ayvacık/Ç.Kale
Pop 7	0,250	Cream	Black	1,46	Kepez /Ç.Kale
Pop 8	0,215	Black	Black	1,35	Ezine /Ç.Kale
Pop 9	0,255	Dark Brown	Balck	1,31	Saraycık Ç.Kale
Pop 10	0,260	Cream	Brown	1,46	Muğla
Pop 11	0,266	Cream	Black	1,43	TR-43810
Pop 12	0,219	Cream	Black	1,34	TR-49625
Pop 13	0,219	Dark Brown	Brown	1,18	TR-38179
Pop 14	0,175	Cream	Cream	1,50	TR-49617
Pop 15	0,170	Cream	Black	1,18	TR-38157
Pop 16*	0,244	Dark Brown	Dark Brown	1,58	TR-54581
Pop 17	0,162	Cream	Black	1,29	TR-47716
Pop 18	0,213	Light Brown	Brown	1,25	TR-39081
Pop 19	0,129	Cream	Cream	1,51	TR-28021
Pop 20	0,225	Light Brown	Brown	1,23	TR-43785
Pop 21	0,165	Dark Brown	Brown	1,26	TR-38948
Pop 22	0,159	Cream	Black	1,32	TR-35487
Pop 23	0,218	Cream	Black	1,26	TR-43866

Pop 24*	0,175	Black-Brown	Black-Brown	1,78	TR-49626
Pop 25	0,170	Cream	Cream	1,63	TR-49619
Pop 26	0,148	Cream	Balck	1,48	TR-49620
Pop 27	0,258	Cream	Black	1,41	TR-49623
Pop 28*	0,249	Purple-Black	Purple-Black	1,54	TR-49618
Pop 29	0,158	Cream	Brown	1,41	TR-39080
Pop 30	0,277	Cream	Black	1,40	TR-49627
Pop 31	0,223	Cream	Black	1,51	TR-49621

*vining cowpea types

Table 1. The place from which used cowpea populations were obtained , and some features of seeds.

The features taken into considerations and the methods of research in are as below:

the emergence rate (%)(calculating the rate of percentage of sowed seeds that emerges in 7 days
the number of days to blooming,
the number of days to fresh harvest,
pod lenght (selecting randomly 3 units from harvested population in each harvest ,then measuring the length of these 3 units by the help of digital caliper compass as centimeter)
pod diameter (selecting randomly 3 units from harvested population in each harvest, then measuring the diameters of these 3 units by the help of digital caliper compass as milimeter)
Number of pods (g/plant)
Yield per plant (g/plant)
Seed yield (g/plant)
In addition to these parameters some germination tests performed with the harvested seeds

Standard germination test: Germination test was done 25 °C with three replication from each population which 50 seeds at each replication.(ISTA,1985)

A thousand seed weight: Counting five groups ,each one includes 100 units of seeds that gotten from dry harvest in each population then they were weighted in precision scales, the average of this weight was taken and multiplicated by 10.

Accelerated Aging: After taking 75 seeds initial weights from every population (with 3 replicate), then placed in covered plastic pot (upon strand) which includes 100ml pure water and put in incubator at 45 °C. The seeds were taken out of the incubator in 2.-4.-6.days and put in room temperature and humidity for 24 hours. Then the seeds were germinated between the germination papers in incubator at 25 °C and the seeds that were normally germinated were counted and their rates were determined .

Cold test: 30 seeds that were selected randomly from each population were placed between germination papers as 3 replicate then were placed in incubator at 10 °C. At the end of the fifth day they were taken to the incubator of 25 °C and after two days the seeds that germinated normally were counted .The statistical analysis of data that belongs to the examined features in experiment was made by using MSTAT-C statistic packet programme. The differences which belongs to the averages were determined according to 0,01 importance level.

Research Findings

Data of the results are shown in Table 2. The emergence rate showed a change between 12%-100% in populations and the best emerging rate as 100% was gotten from 3rd population. The worst one as 12.20% was observed in 22th and 29th populations. The averages about the number of the days to be fresh pod harvest showed changes between the days 57-77.33; the highest average as 77.33 days was in 23rd population and the lowest ones as 57th days were in 5.,8.,9.,10.,12.,20.,26.,27.,29.and 30.populations ;the differences amongs the population averages show importance in P=0.01 level. From the point of length of pod, the population averages show a change between 388.11-133.52 mm. The highest values were obtained from the vining types.

Pod diameter changed between 6.98-7.54 mm and the highest result obtained from 6th population while the lowest from the 11th. In terms of pod number per plant the values change between 18.67-70.50. The highest values obtained from 14th and 27th populations with 70.50 and 67.60 respectively where the lowest values from 1st and 23rd with 18.47 and 22.13. Pod yield per plant shows a range between 82.46 - 277.84 g and the best yield obtained from 30th (277.84 g/plant), 9th (265.67 g/plant), 28th (262.36 g/plant),

27th ((256.42 g/plant), 14th (252.83 g/plant) and 2nd (243.79 g/plant) populations whereas the lowest one from 23rd (82.46 g).

In terms of seed yield the average values changes between 8.39-26.95 g and it's found important at P=0.01 level. When the highest value is maintained from the second population with 26.95 g, it's followed by the eleventh population with 25.93 g, the ninth population with 25.84 g, the thirtieth population with 25.00 g, twelfth population with 24.54 g, the twenty-seventh population with 24.20 g and the twenty-eighth population 23.84 g. Additionally, the lowest value is obtained from the twenty-third population with 8.39 g. The values of standard germination (normal seedlings) rates show in the sixteenth population 66%, in the twenty-eighth population 71%, in the first and twenty-fourth population 78% and the rest of populations provide a germination over 80%. The average values of a thousand seed number differ 129.07-277.49 g and the highest value is observed in the twenty-ninth population with 277.49 g, also the lowest value is found in the eighteenth population with 129.07 g.

In the second day germination of accelerated aging test, the differences between the F test is found significant in the level of P=0.01. The averages differ 38.67-94.67 % and the highest average is maintained in the third population with the 94.67 and the lowest average is from twenty-eighth population with 38.67%. The difference of fourth-day germination rate changes with 12% and 76%, the highest average in the third population with %76 and in the fifth population with 74.67%. On the other hand, the lowest average is observed in the twenty-eighth population with 12%. In the sixth day, the difference between the F Test and the growing test is %0.01-%56, the highest average is from third and fifth population with %56 and the lowest average is observed in the twenty-fourth population with %0.01. The proportion of the cold test differs 15.55-91.11%, the highest proportion is maintained from the thirteenth population with 91.11% and the lowest proportion is maintained from the fourteenth population with %24.44 and from twenty-seventh population with %15.56.

Discussion

The aspect of emergence, in the results of test, the third population is the highest one with %100. Emergence ratio of the populations which are picked up from the villages directly is over %74.00 and particularly, it is interesting that the low proportion of the other seeds from Menemen Araştırma Enstitüsü. In these populations, being high proportion of germination in standard germination test in lab conditions, signs that the negativities of emergence during the process of storing seeds. Its necessary to renew the seeds which are stored in gen sources once in 5 years. The lowest proportions of emerging are observed in the twenty-second and twenty-ninth population with %12.20. As a kind of characteristic, germination is related with both genotype and environmental conditions of. The heat and the humidity are the two of the most important factors for germination of seeds. If one of these factors gets away from optimum, it effects the germination badly. When the need of soil humidity is nearly same for types for germination of seeds, the necessary heat changes for each. Gül (1996), observes that in the soil with the same proportion of humidity when the bean seeds normally germinate, the cowpea never germinate. The accelerated aging and the cold tests, are tests that to find out before the performance of emergence ratio of seeds in field.

Among these tests, accelerated aging tests and emergence ratio is found correlative . However, it should be repeated these tests for uprightness and coherence. When the first blooming is observed, the third population is the earliest one with 46.67 days and the latest ones are seventh and twenty-eighth populations with 55.00 days. Jadhav et. al (1991), explains after an observing in India, the processes of types to bloom are changeable from 38.8 days to 55.3 days. Olediran (1990), showed that planting between March,1 and April,30; the blooming of the cowpeas decrease from 95 days to 49 days with connected to increasing heat until blooming. It is possible to say that the number of days affects the first blooming how it can be earlier but there is no effect to yield. It is explained by Altınbaş and Sepetoğlu (1993), that the process which composes vegetation until blooming and they say that the process until the first harvest have little and unimportant effect to the yield.

As the number of days to the first harvest, the latest population is twenty-third with 77.33 days and this is followed by fifteenth population with 72.00 days. To the first harvest as the earliest ones are fifth, eighth, ninth, tenth, twelfth, twentieth, twenty-sixth, twenty-seventh and thirtieth with 57 days. The differences among populations according to findings are in Bornova conditions, by Ceylan and Sepetoğlu (1983), the changing of the vegetation process and it shows similar observations with Jathav at al (1991),

saying that the shortest vegetation differs from 56.3 days to 75.5 days. In terms of pod length, the firs population is located in the first group with 338.11 mm; the sixteenth population with 229.98 and the twentyfourth population with 208.170 follow it. While it is taken into account that these populations are vining types, it is possible that the number of pod for each plant is lower compared to the other populations. While the first population (vining) with 7.41 g is in the first group in the point of the weight of single pod as in the case of pod length, the nineth population with the sixteenth and the twentyfourth population as the other vining populations are located in the following group. While it is observed that there is an important and positive relation between the single pod weight and the pod length, it is determined that there is an important and negative relation between the number of pod for each plant. It is possible to say that the pod weights especially in the vining populations are much more than the others; howewer the number of pod declines. In terms of pod number per plant, the thiertieth population gets the highest the number with 70.5 and the lowest pod numbers are got by the first population with 18.67, the twentythird population with 22.13 and the sixteenth population with 26.73. Altınbaş and Sepetoğlu (1993), emphasize in their study that the element which has the most positive direct effect is the number of pods in terms of yield. The thiertieth population with 277.849 gets the highest value in the point of yield per plant plant and the nineth population follows it with 265.67 g. The lowest value is got from the twentythird population with 82.46. The values that are found differ 129.07-277.499 for the thousand seed weight. The lowest value is taken from the eighteenth population while the highest values are got from the twentynineth population with 277.49 g, the eleventh population with 266.46 g, the tenth population with 260.14 g, the twentysixth population with 258.31 and the sixth population 256.18 g.

Dixit and Dubey (1984) emphasize that thousand seed weight does not contribute to the yield. On the other hand Altınbaş and Sepetoğlu (1993), state that there are negative and important correlations between the thousand seed weight and the pod per plant.According to the results which the researchers get from the path analysis, the found results match with the findings which are in the aspect that the number of pod per plant is the element contributing more to the yield. The highest production of seed weight for each plant is got from the second population with 26.941 g while the lowest one is got from twentythird population with 8.399 g. The highest production of seed to decare is alike got from the second population with 84.20 kg while the lowest one is got from the twentythird population with 26.22 kg. According to the accelarated test result, the highest performance is obtained from the third population in the second day and the lowest performance is got from the twentyeighth. The results of fourth day are the same. In the sixth day, the third and fifth populations have given the highest germination rates while the twentyeighth and twentyfourth populations have given the lowest germination rates. It's seen that the first, the sixteenth, the twentyfourth and the twentyeighth have the lowest germination rate when the Standard germination rates are examined. According to the cold test results, the highest germination rate is observed in the thirteenth population, the lowest germination rate is observed in the fourteenth and the twentyseventh populations. In spite of the fact that the results at hand are not connected with standard germination and growing test results, it must be considered that the cowpea populations are taken from the reigons which have very different climate and altitude. It can be said that among the populations; the third and the fifth populations have higher strength relatively than the others when the positive correlation between the growing test and emergence rate are taken into account. As a result, it can be stated that it can be studied on the thiertieth population amongt the others, interms of the highest fresh pod yield . On the other hand; second population in which the highest seed yield obtained, and second , nineth, thiertieth and the eleventh populations in the point of production components can be evaluate for thre further studies. In the condition that, especially the "*Vigna unguiculata* L. Walp" which is a species with short vegatation is used as a second crop for the late summer months, while it can be claimed that the seventeenth, the eleventh and the third populations can be used in terms of earliness. The first, sixteenth and twentyfourth populations can be used in the point of its harmony to the changing needs because of the fact that the are vining types. It's possible to grow the other vegatable species among the vining populations, to the mix culture vegatable production or to grow it as a border plant for yearly in vegatable garden. So the commercial source can be created by growing the cowpea populations whose production are low together with the other species.

Howewer, it is important that these features have genetic stability as a lot of researchers emphasize. As Altınbaş et. al.. (1999) state that the production between the agronomic and morphologic features which affetct it and knowing that to what extend their greatness is affected by the changes of environment conditions and for determining correctly the feature or the features on which in indirect choice related to the production will be applied, it will be more realistic to determine these features in different conditions.

Pop	Em. Rat.	Days to Bloo.	Days to Fr. Har	Pod Num.	Pod Lgt	Pod Dia.	Pod per Pla.	Frsh Yld . Pl	Seed Yld Pl.	1000 Seed Wg	Ac. Ag. Test	Cold Test
1	83.07 bcd	54.67 ab	58.67 gh	388.11a	388.11a	7.40abc	18.67m	173.59 j-n	17.11l-o	142,01 o	78.67 defg	76.67 a-f
2	82.17 bcd	49.33 f-g	59.33 gh	163.23 def	163.23 def	7.34a-d	59.27bcd	243.79 a-f	26.95a	236,70 ef	85.33 a-e	48.89 hi
3	100.00 a	47.67 g	59.33 gh	145.71 def	145.71 def	7.29a-e	50.37d-i	190.51 h-m	18.37i-n	158,17 mn	94.67 a	63.33 d-h
4	89.97 abc	52.33 a-f	59.33 gh	147.64 def	147.64 def	7.06cde	46.73f-i	190.72 h-m	21.84c-i	216,29 h	92.67 abc	81.11 abc
5	91.10 ab	51.00 c-f	57.00 h	153.90 def	153.90 def	7.26a-e	49.67d-i	205.38 f-k	21.04d-k	187,16 i	93.33 ab	43.33 i
6	85.53 bcd	53.33 a-d	58.67 gh	151.23 def	151.23 def	7.54a	47.33e-i	194.46 g-m	19.30h-m	256,18 bc	84.67 a-f	70.00 b-g
7	74.43 de	55.00 a	67.00 cd	140.25 ef	140.25 ef	7.42ab	54.30d-g	220.95 c-i	22.05c-h	250,45 cd	85.33 a-e	76.67 a-f
8	78.87 cd	50.67 d-g	57.00 h	164.24 def	164.24 def	7.18a-e	44.93f-k	212.45 e-j	20.38f-l	215,22 h	82.67 b-g	81.11 abc
9	81.07 bcd	53.33 a-d	57.00 h	180.10 cd	180.10 cd	7.39abc	53.43d-g	265.67 ab	25.84ab	254,64 cd	76.00 e-h	72.22 b-g
10	57.73 fg	53.33 a-d	57.00 h	140.58 def	140.58 def	7.30a-e	48.47d-i	186.11 i-m	20.00g-l	260,14 bc	81.33 c-g	80.00a-d
11	41.07 hij	51.67 b-f	59.67 gh	138.99 ef	138.99 ef	6.98e	57.82b-e	232.76 b-g	25.93ab	266,46 ab	78.67 d-g	74.44 a-g
12	40.00 hij	54.67 ab	57.00 h	133.52 f	133.52 f	7.01de	65.77abc	220.14 d-i	24.54a-d	219,19 h	81.33 c-g	61.11 e-h
13	40.00 hij	53.33 a-d	58.67 gh	139.85 ef	139.85 ef	7.05cde	54.23d-g	192.33 g-m	19.13h-m	175,08 j	88.00 a-d	91.11 a
14	43.30 hi	53.00 a-e	58.67 gh	136.91 ef	136.91 ef	7.28a-e	67.60ab	252.83 a-e	23.99a-e	170,45 jk	84.00 a-f	24.44 j
15	42.20 hij	53.00 a-e	72.00 b	141.27 def	141.27 def	7.47a	35.23jkl	134.65 no	15.34n-o	243,55 de	82.67 b-g	57.78 ghi
16	41.07 hij	52.00 a-f	70.00 bc	230.00 b	230.00 b	7.08b-e	26.73lm	128.45 o	13.62op	162,43 klm	62.67 ij	78.89 a-d
17	59.97 fg	53.00 a-e	58.67 gh	142.82 def	142.82 def	7.37a-d	42.20h-k	159.74 mno	18.33i-n	213,33 h	82.67 b-g	63.33 d-h
18	64.40 ef	53.67 a-d	62.00 fg	142.34 def	142.34 def	7.34a-d	45.20f-j	165.36 k-o	17.93j-n	129,07 p	78.67 d-g	77.78 a-e
19	31.10 jk	53.33 a-d	69.33 bcd	136.40 ef	136.40 ef	7.34a-e	55.33c-f	202.72 f-l	20.70e-k	224,55 gh	76.00 e-h	77.78 a-e
20	76.63 d	50.00 efg	57.00 h	147.85 def	147.85 def	7.38abc	49.63d-i	189.18 h-m	21.70j-i	165,37 jklm	65.33 hij	82.22 abc
21	64.40 ef	51.67 b-f	60.00 fgh	134.84 ef	134.84 ef	7.30a-e	46.93f-i	157.95 mno	17.67k-n	158,94 lmn	65.33 hij	86.67 ab
22	12.20 l	52.00 a-f	68.33 cd	143.50 def	143.50 def	7.37abc	50.65d-i	228.63 b-h	23.16b-g	218,27 h	76.00 e-h	78.89 a-d
23	32.20 ijk	54.33 ab	77.33 a	136.75 ef	136.75 ef	7.01de	22.13m	82.46 p	8.39r	175,19 j	73.33 f-i	72.22 b-g
24	49.93 gh	52.00 a-f	58.67 gh	208.17 bc	208.17 bc	7.25a-e	34.27kl	187.95 h-m	11.38pr	170,24 jkl	62.67 i-j	47.78 h-i
25	27.73 k	53.67 a-d	60.67 fg	174.01 cde	174.01 cde	7.22a-e	40.37ijk	159.64 mno	16.01mno	147,56 no	76.00 e-h	71.11 b-g
26	33.27 ijk	53.00 a-e	57.00 h	135.51 ef	135.51 ef	7.33a-e	52.57d-h	223.92 b-i	21.37d-j	258,31 bc	72.00 ghi	68.87 c-g
27	37.73 ijk	53.33 a-d	57.00 h	136.37 ef	136.37 ef	7.33a-e	66.33ab	256.42 a-d	24.20a-e	249,34 cd	54.67 j	15.56 j
28	37.73 ijk	55.00 a	63.33 ef	205.74 bc	205.74 bc	7.21a-e	53.53d-g	262.36 abc	23.84a-f	157,53 mn	38.67 k	71.11 b-g
29	12.20 l	54.00 abc	57.00 h	143.67 def	143.67 def	7.38abc	54.70def	220.14 d-i	19.95g-l	277,49 a	80.00 d-g	60.00 f-i
30	35.53 ijk	50.00 efg	57.00 h	145.02 def	145.02 def	7.37abc	70.50a	277.84 a	25.00abc	222,65 gh	81.33 c-g	74.44 a-g
31	35.33 ijk	53.67 a-d	66.33 de	151.25 def	151.25 def	7.31a-e	43.77g-k	161.90 l-o	17.79k-n	231,81 fg	86.67 a-e	78.89 a-d
Ort.	54.27	52.56	60.69	160.64	160.64	7.28	48.67	199.290	21.01	77.46	67.99	67.99
LSD	11.54	3,31	3,63	39.73	39.73	0.36	10,88	19.8	3.57	11.48	17.50	17.50

Em. Rat. (%): emergence rate, Days to Bloo.(day): days to blooming, Days to Fr. Har. (day): days to fresh harvest , Pod Num.(number/plant): pod number per plant Pod Lgt (cm): Pod length, Pod Dia. (mm): pod diameter, Pod per Pla.(number): pod per plant , Frsh Yld . Pl (g/plant): fresh yield per plant, Seed Yld Pl.(g/plant): seed yield per plant, 1000 Seed Wg (g): thousand seed weight, Ac. Ag. Test (%): accelerated aging test, Cold Test (%)

Table 2. Mean values of yield morphological and phenological characteristics and vigour tests results.

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