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INFLUENCE OF SOME AGRICULTURAL PRACTICES ON SEED YIELD OF COMMON BEAN (*Phaseolus vulgaris*, L.)

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ABSTRACT

Seeds of legumes are extremely important crop plants which are widely cultivated in Egypt. Climate changes are the most important challenge facing agriculture today. Two field experiments were conducted at the Horticulture Research Farm Elbaramon during 2010 and 2011 seasons to determine the effect of different seeding dates and the plant distribution system on growth, yield and quality of common bean (*Phaseolas vulgaris* L. cv. Nebraska). The treatments were three sowing dates 20 Feb., 10 and 30 March and four plant distribution systems, *i.e*., 5 and 10 cm plant spacing on one or both sides of the row. The plant length, number of leaves, number of branches, the grain yield, number of seeds per pod, dry weight of seeds per pod, 100 seeds weight, biological yield, harvest index and chemical analysis of bean seed were affected significantly by sowing dates and the plant distribution system. The highest values of all these characters were recorded on 10 March and the lowest values of them were recorded on 30 March. Among four plant distribution system highest value of seed yield was obtained in 5 cm plant spacing on two sides and the lowest value was measured in 10 cm on one side. Further, sowing common bean seeds on 10 March with 5 cm on two sides had the best results for seed yields under the same conditions.

Keywords: common bean, sowing time, plant distribution system

INTRODUCTION

Common bean (*Phaseolus vulgaris* L.), is the most important legume worldwide for direct human consumption. According to the statistic of Ministry of agriculture of Egypt 2011 the area devoted for dry seed yield was about 21033 feddans produced about 29634 ton/fed, with an average yield 1.336 tons/fed.

Due to rapid population growth, it's essential to explore the economic feasibility of pulse crops. Pulses are an excellent source of plant protein and good substitute of animal protein, so known as poor man´s meat in the developing world. Sowing date is one of the important cultural practices that results in the greatest differences in growth and yield of grain legumes.

Climate change and population growth are the two most important challenges faced by agriculture today. Inter governmental panel on climate change (IPCC) reported that global surface temperature has increased 0.74t 0.18˚c from 1905 to 2005 due to the environmental greenhouse effects (IPCC, 2007a). Moreover, climate model projected reported that surface temperature is likely to rise between 1.4 and 5.8 ˚c during 21st century

(IPCC, 2007b). Thus, the impact of this type of climate change will probably lead to decline the crop productivity (Mc-Carthy *et al*., 2001).

On the other hand, continued greenhouse gas emissions at above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those 20th century. The problem of global warming is becoming a fast that should be taken seriously into consideration. The regional climate change affects agricultural activities. Consequently, sowing date is one of the most important factors have a paramount effect on dry common bean development, growth and biological yield (Compant *et al*., 2010).

The optimum sowing date varies according to the planted cultivar. The sowing time of crop is a critical factor in determining the environmental conditions at planting, anthesis, pod filling and drying. Therefore, sowing date can be important in determining the success of the crop and in maximizing seed yield (Dapoah *et al*., 2000).

Early sowing can result in high grain yields if it enables the crop to escape the hot summer weather that can hinder reproductive development (Hall, 1992), while late sowing fetches lesser grain yield due to short growing seasons and ultimately lesser accumulation of photosynthesis products (Quresh and Rahim, 1987). Plant density is another important factor determines growth, development and yield (Khalil *et al*., 2011).

Earlier studies have shown that sowing methods are an important factor affecting yield of grain legumes.(BlackShow *et al*., 1999) contributed plant density gave rise to variances in bean yield related to photosynthetically activated radiation uptake during growth seasons by a canopy. At high densities, plants are competing with other plants to uptake CO_2, water, light and nutrients. Moreover high density led to different stresses on plant. This stress has affected crop yield and quality and plant lodging. High density induced more shading and reducing in photosynthesis and finally increasing flower and pod drop-off during reproductive stages. (Leech and Rainbow 1998) Grain yield is affected by competition to produce maximum grain yield. Plant distribution is very important and plant pattern affected positively the distributing sunlight among plants. The main role of planting pattern on plant growth is due to differences in distributing and dispersion energy and light quality which induced radiation uptake (Oreutt 2000).

The main aim of this experiment was to investigate the suitable sowing date and plant distribution system on common bean yield and yield components in the Delta region of Egypt.

MATERIALS AND METHODS

Two field experiments were conducted at the Horticulture Research farm of El-Baramoon, Dakahlia Governorate, Egypt during 2010 and 2011 seasons.

Meterological data (weekly temperature C°) of Agricultural Research Center (Mansoura region) during the two growing season of 2010 and 2011 were recorded in Fig. 1 and Fig. 2 respectively

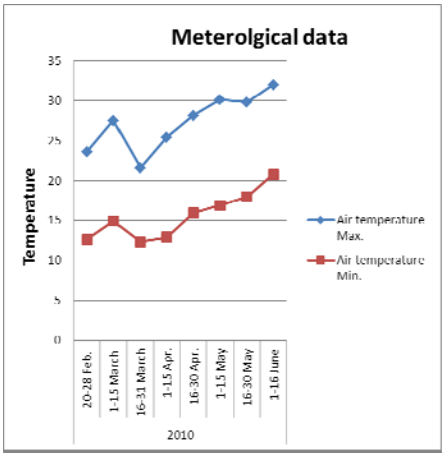

Fig1:Monthly means of Maximum and Minimum temperatures during 2010 season at experimental region.

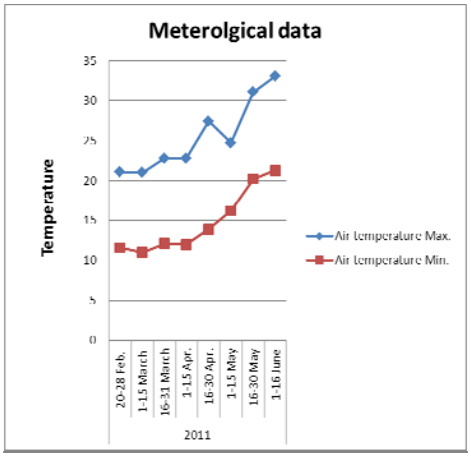

Fig2: Monthly means of Maximum and Minimum temperatures during 2011 season at experimental region

The experiment was conducted as split plot as (RCBD) in three replications. The main plot were three sowing dates (20 Feb, 10 and 30 Mar) and sub plots were devoted to the four plant distribution systems *i.e.*, 5 and 10 cm plant spacing on one and two sides of the ridge. Each plot contained four rows of 5 m length and 70 cm width. The normal cultural practices, *i.e.*, irrigation, fertilization and pest control were followed according to recommendation of Ministry of Agriculture. Plant growth critenria were recorded after 60 days from sowing.Random samples of plants were taken from each experimental plot to assess the vegetative growth parameters. The data recorded were: plant height (cm), number of leaves, number of branches, fresh weight per plant, dry weight per plant, biological yield and harvest index. At seed maturity stage, plants were harvested, taken to a shady place for drying them then dry seeds were manually extracted and the following data were recorded:

1- Weight of seeds /plant (g).
2- Weight of seeds / plot (kg).
3- Weight of seeds /fed. (Kg).
4- 100 seed weight (g).
5- Bilogicall yield (kg/fed) = (grain yield + dry weight)
6- Harvest index = ((grain yield) / (grain yield + dry weight)) × 100

At harvesting time, samples of seeds were oven dried and kept for **chemical analysis:**

- Total N content was determind in the digested dry seeds according to (Pregl 1945) using micro kieldahl apparatus.

- Phosphorus content was estimated cdorimetrically according to the method descriped by (Murphy and Riely 1962) as modified by (John 1970).
- Potassium content was measured by flame photometer according to the methods of (Brown and Lilleland 1946).
- Total carbohydrates were determined in dry powder material of seeds according to (Dubois *et al*., 1965).
- Total suger contents were assayed in dry seeds and estimated calorimetrically according to the method described by (Dubois *et al.,* 1965).

Protein percentage was calculated by multiplying the N value by 6.25

The data were analyzed by using M STAT-C software. The Duncans multiple range test was used to compare the means at 5 % of significant (Steel and Grabau, 1997).

RESULTS AND DISCUSSION

Vegetative growth parameters:

The presented data in Table (1) show that sowing common bean seeds on 10 March significantly increased all studied vegetative growth parameters as compared with those sown on 20 Feb. and 30 March, during the two seasons of study. Such increments in studied vegetative characters during mid sowing date (10 March) may be due to suitable and prevalent meterological factors especially temperature (Fig 1 and 2). These results are in agreement with those obtained by (Amer 2004) and (Ibrahim *et al*., 2012) on snap bean and (Mousa *et al.,* 2010) on common bean who found that plant growth was significantly affected by the different sowing dates.

It is evident from the data in Table (1) that the growth parameters of bean plants were significantly influenced by the plant distribution system in both seasons. The highest values of these traits were obtained with 10 cm on one side, followed by 10 cm at two sides and 5 cm on one side and then 5 cm at the two sides in both seasons. These results might be due to the high population densities and the competition between individual plants for the available nutrients in the surrounding media which affect their growth rate. These results coincide with those obtained by (Eftekhar *et al*., 2012).

The interaction between sowing dates and plant distribution system had significant effects on vegetative growth parameters in both seasons Table (1). Data indicate that the highest values of vegetative growth parameters were recorded using the treatment of second sowing date with 10 cm on one side (A2B2) in comparison with other treatments. These pronounced positive effects on the vegetative growth parameters of common bean plants, may be attributed to the fact that plants under greater spacing had a lower competition, therefore, efficient usage of water and nutrients was increased, particularly, at the second sowing date (10 March), and in turn, enhanced vegetative growth parameters.

Table (1): Effect of sowing date (A) and the plant distribution system (B) as well as their interaction on vegetative growth characters of common bean plants during 2010-2011 seasons

Parameters / Treatments		Plant length (cm)		No. of Leaves /plant		No. of Branches/plant		Fresh Weight/ Plant (g)		Dry weight /plant (g)	
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
A	20 Feb (A1)	40.92 b	41.40 b	10.22 b	10.72 b	4.32 b	4.87 b	44.40 b	46.59 b	8.51 b	8.56 b
	10 Mar (A2)	45.04 a	45.78 a	11.36 a	12.13 a	4.72 a	4.97 a	46.42 a	46.79 a	9.60 a	9.72 a
	30 Mar (A3)	39.82 c	39.17 c	8.43 c	9.00 c	4.13 c	4.29 c	41.91 c	42.24 c	8.14 c	8.30 c
B	5cm one side (B1)	39.87 c	40.39 c	9.48 c	10.22 c	4.21 c	4.49 c	40.97 c	42.15 c	8.02 c	8.30 c
	10cm one side (B2)	45.38 a	45.53 a	11.28 a	11.79 a	4.78 a	5.36 a	50.94 a	52.54 a	10.03 a	10.19 a
	5cm two sides (B3)	38.58 d	38.48 d	8.96 d	9.73 d	4.05 d	4.31 d	39.72 d	40.15 d	7.77 d	7.93 d
	10cm two sides (B4)	43.87 b	44.08 b	10.28 b	10.73 b	4.53 b	4.68 b	45.34 b	45.98 b	9.18 c	9.01 b
AB	A1 B1	39.61 i	39.87 i	9.75 f	10.37 e	4.10 h	4.69 f	40.08 h	41.47 h	7.59 i	8.10 g
	A1 B2	38.08 k	38.69 j	9.40 g	10.17 f	3.97 i	4.45 g	39.11 i	40.14 k	7.40 j	7.45 i
	A1 B3	48.82 b	49.11 b	11.50 b	12.38 b	4.80 b	4.86 de	47.49 c	48.36 c	9.56 c	9.62 c
	A1 B4	42.42e	42.82 d	10.51 e	10.78 d	4.50 e	4.83 e	46.03 d	46.87 d	9.29 d	8.75 f
	A2 B1	41.43 f	42.64 e	10.88 d	11.63 c	4.60 d	4.90 d	42.46 e	44.56 f	8.84 f	8.92 e
	A2 B2	49.83 a	50.28 a	13.21 a	13.62 a	5.18 a	5.51 a	54.26 a	57.88 a	11.41 a	11.56 a
	A2 B3	43.55 c	44.23 c	11.22 c	11.54 c	4.73 c	5.38 b	52.39 b	53.10 b	9.77 b	9.92 b
	A2 B4	40.10 h	41.10 g	9.86 f	10.90 d	4.31 g	4.733 f	41.46 f	41.13 i	8.61 h	8.79 ef
	A3 B1	38.58 j	38.66 j	7.83 i	8.65 h	3.93 i	3.88 i	40.37 g	40.43 j	7.64 i	7.89 h
	A3 B2	37.56 L	35.66 k	7.63 j	8.11 i	3.86 j	3.75 j	38.59 j	39.19 L	7.31 k	7.56 i
	A3 B3	42.76 d	42.08 f	9.41 g	10.20 f	4.42 f	5.18 c	46.17 d	46.63 e	8.92 e	9.09 d
	A3 B4	40.38 g	40.30 h	8.84 h	9.04 g	4.30 g	4.36 h	42.51 e	42.72 g	8.70 g	8.67 f

Chemical content:

The data listed in Table (2) reveal that sowing dates had significant effects on chemical content in seed. Maximum values were attained by the second sowing date (10 March) while minimum values were recorded in the third sowing date (30 March).

The obtained results were true in the two seasons of study. These results are in accordance with those obtained by Amer *et al.,* (2002) and Ibrahim *et al.,* (2012) who found that N, P and K content in bean plants were affected significantly by different sowing dates.

Concerning the effect of plant distribution system on chemical content in seed, the data listed in Table (2) indicate that the highest values of N%, P%, carbohydrate content, total sugar % and protein % were recorded using 5 cm at one side, while the lowest values of these traits were noticed with the treatment of 10 cm at two sides. These results are supported by (Zodape *et al*., 2010) and (Abou El-Yazied *et al*., 2012).

As shown in Table (2) all chemical constituent traits were significantly affected by the interaction between sowing dates and plant distribution system in both seasons. The highest values of N%, P%, carbohydrate content, total sugar % and protein % were obtained from the second sowing date with 5 cm on one side(A2B1), while the lower ones resulted from the third sowing date with 10 cm at the two sides (A3B4) in comparison with other treatments.

Table (2) : Effect of sowing date (A) and the plant distribution system (B) as well as their interaction on chemical content seed of bean plant during 2010-2011 seasons.

Parameters / Treatment		N %		P%		K?%		Carbohydrate g/100g dry seed		Total Sugar (%)		Protein (%)	
		2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
A	20 Feb (A1)	2.84 b	2.89 b	0.48 b	0.52 b	1.37 b	1.51 b	59.05 b	59.59 b	13.66 b	14.16 b	17.76 b	18.07 b
	10 Mar (A2)	3.03 a	3.05 a	0.59 a	0.60 a	1.56 a	1.63 a	60.50 a	61.06 a	14.01 a	14.30 a	18.96 a	19.10 a
	30 Mar (A3)	2.68 c	2.75 c	0.40 c	0.43 c	1.29 c	1.32 c	58.56 c	59.33 c	13.14 c	13.34 c	16.77 c	17.23 c
B	5cm one side (B1)	3.08 a	3.13 a	0.57 a	0.59 a	1.32 c	1.44 c	60.70 a	61.50 a	14.27 a	14.68 a	19.28 a	19.62 a
	10cm one side (B2)	2.94 b	3.02 b	0.52 b	0.55 b	1.24 d	1.33 d	60.21 b	60.88 b	13.82 b	14.17 b	18.37 b	18.87 b
	5cm two sides (B3)	2.77 c	2.80 c	0.45 c	0.47 c	1.58 a	1.65 a	58.77 c	59.26 c	13.44 c	13.63 c	17.31 c	17.53 c
	10cm two sides (B4)	2.61 d	2.64 d	0.43 d	0.45 d	1.48 b	1.53 b	57.78 d	58.35 d	12.89 d	13.26 d	16.36 d	16.52 d
AB	A1 B1	3.05 c	3.09 c	0.56 d	0.60 c	1.20 e	1.43 g	60.65 c	61.26 c	14.25 b	14.94 b	19.03 c	19.33 c
	A1 B2	2.91 d	2.97 d	0.52 e	0.55 de	1.17 ef	1.32 i	59.62 g	60.36 f	14.01 bc	14.57 c	18.18 d	18.56 d
	A1 B3	2.78 e	2.85 f	0.43 g	0.47 g	1.64 a	1.71 b	58.47 i	58.97 h	13.27 d	13.84 g	17.37 e	17.85 f
	A1 B4	2.62 f	2.65 h	0.42 h	0.46 g	1.46 c	1.57 d	57.45 j	57.78 i	13.14 d	13.27 j	16.41 f	16.56 h
	A2 B1	3.30 a	3.34 a	0.65 a	0.67 a	1.54 b	1.62 c	61.48 a	62.03 a	14.82 a	15.16 a	20.62 a	20.9 a
	A2 B2	3.16 b	3.22 b	0.62 b	0.63 b	1.43 c	1.51 e	61.14 b	61.62 b	14.16 b	14.24 d	19.77 b	20.17 b
	A2 B3	2.90 d	2.90 e	0.57 c	0.57 cd	1.67 a	1.77 a	60.58 d	61.07 d	13.79 c	14.04 e	18.17 d	18.16 e
	A2 B4	2.76 e	2.75 g	0.52 e	0.53 ef	1.62 a	1.62 c	58.79 h	59.53 g	13.27 d	13.77 h	17.27 e	17.18 g
	A3 B1	2.90 d	2.98 d	0.49 f	0.51 f	1.22 e	1.28 j	59.97 e	61.20 cd	13.75 c	13.93 f	18.15 d	18.62 d
	A3 B2	2.74 e	2.86 f	0.42 h	0.46 g	1.13 f	1.15 k	59.89 f	60.65 e	13.28 d	13.69 i	17.16 e	17.90 f
	A3 B3	2.62 f	2.65 h	0.35 i	0.38 h	1.44 c	1.47 f	57.27 k	57.76 i	13.28 d	13.02 k	16.39 f	16.58 h
	A3 B4	2.46 g	2.53 i	0.34 j	0.37 h	1.36 d	1.39 h	57.11 L	57.73 i	12.26 e	12.74 L	15.39 g	15.81 i

Seed yield and its components:

The data listed in Table (3) reveal that there are significant differences between the three dates on seed yield and its components in both seasons. Although common bean sown on 20 Feb. had longer time to develop, it gave lower yield than that sown on 10 March Table (3). This can be explained by the prolonged germination of seed under cooler weather conditions after such early sowing; the prolonged germination, in turn, can cause development of a bit weaker plants. Moreover, seed yield and its components were decreased by delaying sowing date from 10 March to 30 March. Such data were in contrast with those obtained by (Mousa *et al*., 2010) who found that common bean plants sown on 25 March had the lowest number of pods per plant, number of seeds per pod and weight of 100 seeds, as well as total dry seed yield compared to 15 Feb. and 5 March.

Concerning the effect of plant distribution system on the seed weight per plant, and 100 seed weight Table (3), it is obvious that it took the same manner of growth parameters as previously mentioned. These results may be ascribed to the excessive vegetative growth with the low plant density treatments Table (2) which normally resulted in a higher photosynthesis rate, and in turn causes desirable fruit characters. These results coincide with those obtained by (Araújo and Teixeira 2008) and (Babaeian *et al*., 2012).

Table (3): Effect of sowing date (A) and the plant distribution system (B) as well as their interaction on total produced dry seed yield and its components of bean plants during 2010-2011 seasons.

Parameters / Treatments		seed weight/plot (kg)		seed yield/ fed (kg)		Biological yield (Kg/fed.)		Harvest index	
		2010	2011	2010	2011	2010	2011	2010	2011
A	20 Feb (A1)	3.09b	3.11 b	884.09 b	889.76 b	7108.33 b	7158.33 b	45.791 b	45.967 b
	10 Mar (A2)	3.39a	3.38a	971.23 a	968.28 a	7953.33 a	7997.66 a	46.855 a	46.893 a
	30 Mar (A3)	2.82c	2.85c	807.05 c	814.48 c	6610.66 c	6703.16 c	45.197 c	45.478 c
B	5cm one side (B1)	2.88c	2.86c	825.35 c	818.24 c	6100.44 c	6186.66 c	46.186 c	46.940 c
	10cm one side (B2)	1.85 d	1.85d	528.92 d	530.00 d	3406.22 d	3442.44 d	34.006 d	34.186 d
	5cm two sides (B3)	4.15a	4.18a	1187.49 a	1196.30 a	12187.55 a	12343.11 a	53.905 a	54.363 a
	10cm two sides (B4)	3.52b	3.56 b	1008.07 b	1018.70 b	7202.22 b	7173.33 b	49.694 b	48.961 b
AB	A1 B1	2.83f	2.83h	810.24 f	810.62 h	5874.66 h	6078.66 g	46.676 f	47.720 e
	A1 B2	1.89h	1.89k	542.25 h	542.44 k	3378.66 k	3389.33 j	34.592 h	34.685 h
	A1 B3	4.15b	4.20b	1186.22 b	1199.90 b	11970.66 b	12141.33 b	52.876 b	53.557 b
	A1 B4	3.49d	3.52e	997.66 d	1006.04 e	7209.33 e	7024.00 e	49.956 c	48.490 d
	A2 B1	3.34e	3.25g	956.14 e	930.23 g	6885.33 f	6826.66 f	48.992 d	48.437 d
	A2 B2	1.97h	1.97j	562.82 h	563.971 j	3692.00 j	3733.33 i	34.791 h	35.038 g
	A2 B3	4.46a	4.48a	1275.36 a	1280.69 a	13594.66 a	13736.00 a	56.019 a	56.175 a
	A2 B4	3.81c	3.84d	1090.61 c	1098.23 d	7641.33 d	7694.66 d	50.133 c	49.956 c
	A3 B1	2.44g	2.49i	709.67 g	713.86 i	5541.33 i	5654.66 h	44.187 g	44.826 f
	A3 B2	1.68i	1.69L	481.69 i	483.59 L	3148.00 L	3204.66 k	32.635 i	32.836 i
	A3 B3	3.85c	3.88c	1100.89 c	1108.51 c	10997.33 c	11152.00 c	52.819 b	53.357 b
	A3 B4	3.27e	3.33f	935.95 e	951.95 f	6756.00 g	6801.33 f	47.695 e	48.274 d

On the other hand, there were significant effects of the plant distribution system on seed weight/ plot, seed yield/ fed., biological yield and harvest index in both seasons as shown in Table (3). However 5 cm at two sides had the highest values followed by 10 cm at two sides and 5 cm at one side, while the lowest values were obtained by using 10 cm on one side in both seasons. These results might be attributed to the greater number of plants in case of closer spacing and heavier plant population, which compensated lower seed weight/ plant, and 100 seed weight Table (3) and consequently, increased seed weight/ plot and seed yield/ fed.. Similar findings were found by Malla Reddy *et al*., (2010) and Kazemi *et al*., (2012).

The interaction between sowing dates and plant distribution system had significant effects on seed yield and its components in both seasons Table (3). The data indicate that the highest values of seed weight/ plot, seed

yield/ fed., biological yield and harvest index were recorded with the second sowing date with 5 cm at two sides(A2B3), while the lowest values were recorded with the third sowing date with 10 cm at one side (A3B2) in comparison with other treatments. On the other hand, the highest values of seed weight/ plant, and 100 seed weight were noticed with the treatment of the second sowing date with 10 cm on one side(A2B2). These results are supported by Babaeian *et al*., (2012).

Table (4):Effect of sowing date (A) and the plant distribution system (B) as well as their interaction on total produced dry seed yield and its components of bean plants during 2010-2011 seasons.

Parameters / Treatments		No. of seeds per pod		seed weight per pod (g)		١٠٠seed weight (g)	
		٢٠١٠	٢٠١١	٢٠١٠	٢٠١١	٢٠١٠	٢٠١١
A	20 Feb (A1)	٣.٨١b	٣.٨٧b	١.٩٢ b	١.٩٦ b	٥١.٤٢ a	٥١.٠٧ b
	10 Mar (A2)	٤.٣٨a	٤.٥٧a	٢.٢٧ a	٢.٣٦ a	٥١.٦٩ a	٥١.٩٤ a
	30 Mar(A3)	٣.٤١c	٣.٤٧c	١.٦٥ c	١.٦٨ c	٤٨.٣٥ b	٤٨.٣٦ c
B	٥ cm one side (B1)	٣.٢١d	٣.٤٤d	١.٥٨ d	١.٦١ d	٤٩.٣٠ c	٤٧.٣٠ c
	١٠ cm one side (B2)	٣.٨٢c	٣.٩٠c	١.٩٤ c	٢.٠١ c	٥١.٤٧ a	٥١.٣٣ b
	٥ cm two sides (B3)	٤.٠٤b	٤.١١b	٢.٠٧ b	٢.١٤ b	٥١.١١ a	٥٢.٥٥ a
	١٠ cm two sides (B4)	٤.٤٠a	٤.٤٣a	٢.٢٠ a	٢.٢٦ a	٥٠.٠٦ b	٥٠.٦٥ b
AB	A1 B1	٣.١٠j	٣.١٣k	١.٦٥ hi	١.٦٦ i	٥٣.٢٣ a	٥٢.٨٦ bc
	A1 B2	٣.٦٨g	٣.٨٤h	١.٨٨ f	١.٩٦ f	٥٣.٥٠ a	٥١.١٦ c
	A1 B3	٤.٠٠e	٤.٠٦f	٢.٠٣ e	٢.٠٧ e	٥٠.٨٦ bc	٥١.٣٠ c
	A1 B4	٤.٤٧d	٤.٤٣d	٢.١٣ d	٢.١٧ d	٤٨.١ ef	٤٨.٩٦ de
	A2 B1	٣.٥١h	٤.١٣e	١.٦٩ gh	١.٧٣ h	٤٨.٠٣ ef	٤١.٨ g
	A2 B2	٤.٥٣c	٤.٥٣c	٢.٣٢ c	٢.٤١ c	٥١.٢٦ b	٥٣.٣٣ b
	A2 B3	٤.٦٣b	٤.٧٠b	٢.٤٦ b	٢.٥٨ b	٥٣.١٦ a	٥٧.٠٣ a
	A2 B4	٤.٨٦a	٤.٩٣a	٢.٦٤ a	٢.٧٤ a	٥٤.٣٠ a	٥٥.٦٠ a
	A3 B1	٣.٠٣k	٣.٠٥L	١.٤١ j	١.٤٤ j	٤٦.٦٣ g	٤٧.٢٣ f
	A3 B2	٣.٢٦i	٣.٣٣j	١.٦٢ i	١.٦٥ i	٤٩.٦٦ cd	٤٩.٥٠ d
	A3 B3	٣.٥٠h	٣.٥٧i	١.٧٣ g	١.٧٦ h	٤٩.٣٠ de	٤٩.٣٣ d
	A3 B4	٣.٨٧f	٣.٩٤g	١.٨٥ f	١.٨٧ g	٤٧.٨٠ fg	٤٧.٤٠ ef

In order to obtain high seed yield and quality of dry bean C.V. Nebraska, seeds cauld be sown on 10th of March with 5 cm distance between plants on two side of the ridge.

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تاثير بعض المعاملات الزراعية على انتاج تقاوى الفاصوليا.

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أجريت تجربتان حقليتان خلال الموسمين ٢٠١٠ ، ٢٠١١ بالمحطة البحثية بالبرامون – محافظة الدقهلية – مصر . وذلك لدراسة تأثير ميعاد الزراعة (٢٠ فبراير ، ١٠ ،٣٠ مارس) وطريقة توزيع النباتات (٥سم ، ١٠ سم على ريشة واحدة ، ٥ سم ، ١٠ سم على ريشتين) والتوليفات بينهما على النمو والتركيب الكيماوى ومحصول وصفات الجودة لنباتات الفاصوليا صنف نبراسكا بطريقة القطع المنشقة .

وكانت النتائج كالاتى:-

١- أدت الزراعة فى ميعاد ١٠ مارس الى زيادة معنوية فى قياسات النمو الخضرى متمثلاً فى طول النبات وعدد الاوراق وعدد الأفرع والوزن الطازج والجاف للنبات وكذلك بعض المكونات الكيميائية للبذور وهى النيتروجين الكلى والفوسفور والبوتاسيوم والمواد الكربوهيدراتية والسكريات الكلية والبروتين بالاضافة الى دليل الحصاد والمحصول البيولوجي و كمية المحصول ومكوناتة مقارنة بالميعاد المبكر والمتأخر فى كلا الموسمين.

٢- أظهرت طريقة توزيع النباتات (٥ سم على ريشة واحدة) زيادة معنوية بالنسبة نسبة النيتروجين الكلى والكربوهيدرات والسكريات الكلية والبروتين فى البذور بينما كانت الزيادة معنوية فى طريقة توزيع النباتات (١٠ سم على ريشة واحدة) بالنسبة لعدد الأوراق وعدد الأفرع والوزن الطازج والجاف للنبات وكذلك نسبة الفوسفور والبوتاسيوم فى البذور بالاضافة الى محصول البذور فى النبات وذلك فى كلا الموسمين . فى حين أظهرت طريقة الزراعة (٥سم على ريشتى الخط) زيادة معنوية بالنسبة لدليل الحصاد والمحصول البيولوجي لمحصول الوحدة التجريبية ومحصول الفدان مقارنة بطرق التوزيع الاخرى وفى كلا الموسمين . كما ادت الزراعة بطريقة (١٠ سم على ريشتى الخط) الى زيادة معنوية فى كلاً من عدد ووزن البذور فى القرن بالاضافة الى وزن ١٠٠ بذرة فى كلا الموسمين.

٣- أدت زراعة النباتات فى الميعاد ١٠ مارس وطريقة توزيع النباتات ٥ سم على ريشتى الخط إلى افضل القيم فى طول النبات وكمية المحصول البذرى للفدان و المحصول البيولوجي و دليل الحصاد كلا الموسمين.

و لهذا توصى الدراسة بزراعة نباتات الفاصوليا صنف نبراسكا فى العاشر مارس بطريقة توزيع النباتات ٥سم على ريشتى الخط للحصول على أعلى محصول وجودة من البذور الجافة.