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Performance of Five Okra Cultivars Sown on Different Dates under Assiut Environmental Conditions

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Abstract

A field experiment was conducted to evaluate the response of okra sowing date and variety on growth and yield at the Experimental Farm of Faculty of Agriculture, Assiut University, Assiut, Egypt, during 2011 and 2012seasons. Two sowing dates i.e. April 15 and May 15 and five varieties i.e. BaladyAssiut, BaladyQena, Emerald, Golden Coast and PusaSawani were studied. From the results it was noticed that the fruit number and fruit yield significantly affected by sowing date and variety. In case of sowing on 15thApril, the heighest fruits yield was (8.577 and 8.146 ton/feddan) in both seasons. However 15th May sowing date produced the lowest fruits yield (4.227 and 4.005ton/ feddan). PusaSawani cv produced the highest yield of okra in two sowing dates (12.341, 6.632 and 11.904, 6.365 ton/feddan) in both seasons, respectively. Determination of optimum sowing date is considered an important to have optimum yields. Results shown that varities, Golden Coast and PusaSawani produced higher fruits yield on 15th May than BaladyQena cv sown on 15th April. The interaction between varieties and sowing date was significant in both seasons for plant height, number and weight of green pods/plant and total green yield/fed.

Keywords*: Okra Cultivars, optimum yield, Sowing Date, Vegetative Growth.*

Introduction

Okra (*Abelmoschus esculentus* L. Moench) is an annual summer vegetable crop that belongs to the Malvaceae Family. In Egypt, as well as, many countries of the world, okra is consumed as immature pods (fresh, canned, frozen and dry states). The pods are nutritious and delicious vegetable fairly rich in vitamins and minerals. In West Africa, leaves, buds and flowers of okra are also consumed. Fresh okra fruit contains 2.1 g protein, 0.2 g fat, 8 g carbohydrate, 36 calories, 1.7 g fiber, 175.2 mg minerals, 232.7 mg vitamin and 88 ml of water per 100 g of edible portion (Berry *et al*., 1988).

Okra is cultivated throughout Egypt but its average yield harshly declines when grown later in the season (May). The cultivated area of okra during 2012 was about 13410 feddan and produced nearly 74917 tons with an average of 5.586 ton/fed. (Agricultural Statistics, Economic Affair Sector, 2012).

Increasing production and improving quality is the primary interest of okra growers. In this connection, finding heavy yielding varieties and growing on suitable sowing date are the major factors affecting okra production. Evaluation studies of okra varieties were carried out by several authors (Jordan-Molero, 1986; Alok and Nandi 1990). Farag and Damarany (1994) reported that, it is possible to raise yield and quality of okra by means of variety introductions. As regard to effect of sowing date on okra plants, it has been widely agreed that the early planting increased plant height, yield and yield component

(Gupta *et al.,* 1982; Shrestha, 1983; Sharif *et al.,* 2003; Alfredo and Arturo 1999).

Different cultivars require different climatic condition as well as different sowing time and a good cultivars sown at improper time give poor yield. Therefore proper and suitable date of sowing is critical to increase the production of crop. The present investigation was carried out to exploit suitable sowing date and variety combination for production of okra in Assiut.

Materials and Methods

The present study was carried out in the Vegetable Research Farm, Faculty of Agriculture, Assiut University, Assiut, Egypt, in summer growing seasons of 2011 and 2012. The soil of experiment site was clay. The experiment included 10 treatments which were the factorial combinations of five okra varieties i.e (BaladyAssiut, BaladyQena, Emerald, Golden Coast and PusaSawani produced by Misr hytech seed international Co., and two sowing date i.e. April 15 and May 15.

The experiment was a split-plot arrangement in a randomized complete block design with three replicates. Planting dates were distributed randomly in the main plots, while varieties in the sub plots. Planting was done at 30 cm spacings on the nouthern side of the ridge. Three ridges (70 cm apart and 3.5 m long) were included in each plot.

Thinning was done 15 days after planting, leaving the strongest and healthiest single plant/hill. All recommended agricultural practices for commercial okra production were followed. Immature (green) pods were picked at two days intervals.

The following data were collected:

1-Plant height in cm was measured from the soil surface to the terminal bud of the main stem at the end of the picking season.

2- Number of branches/plant counted at the end of the picking season.

3- Number of days to 50% flowering i.e., when 50% of the plants were in blooming stage.

4- Green pod length (cm).

5-Average weight of green pod (g).

6-Number of green pods/plant, (total edible pods that picked/plant during the whole growing season).

7-Weight of green pods/ plant (g).

8-Total yield of green pods (ton/fed.), weight of all edible pods that picked all over the growing season.

Data of this study were subjected to analysis of variance according to Snedecor and Cochran (1980). Means of varieties and sowing dates were compared using the Least Significant Difference Test (LSD) at 0.05 level of probability.

Results and Discussion

Results of the two seasons showed significant differences between the five varieties of okra under study for all measured traits. Jordan-Molero (1986) and, Alok and Nandi (1990) and others reported considerable variation among okra varieties. Performance of the okra varieties indicated that cv “PusaSawani” was the tallest and gave more number of branches/plant. On the other hand, Emerald cv produced longer green pods, higher number and weight of green pods/plant and high total yield of green pods per fed. Farag and Damarany (1994) observed that, the

"Blondy" variety gave the heigher number of pods/plant, yield of small pods, large pods and total pods yield compared to El-Balady variety. However, El-Balady gave the greater plant height and number of branches per plant than Blondy.

Results of the two season's show that the earlier sowing date (15 April) hastened flowering and produced more branches/plant, larger number of green pods/plant and heavier green pods weight per plant. This may be due to hastened growth. These results are in agreement with the finding of several investigators (Singh *et al.* 1986; Hussain *et al*, 2006; Shrestha, 1983; Ayoub and Afra, 2014). They showed that, sowing date of okra affect yield. Ahmed (2007) reported that the effect of sowing date on growth and yield depends mainly on the prevailing environmental conditions especially temperature and relative humidity. Perkins *et al.* (1952) suggested that environmental factors could explain the delicate balance between vegetative growth and reproductive growth in okra. Pundarkia *et al*. (1972), in India, showed that the maximum temperature and sun shine hours affected okra initial growth and flower production. Several studies showed that sowing date significantly affected crop growth and flowering which was mainly attributed to influences of temperature (Yadev and Dhankhar, 1999; Incalaterra *et al*., 2000; Sharif *et al.* 2003; Chattopadhyay *et al.* 2011 and Ossom *et al*. 2011). Farag and Damarany (1994) reported that short okra plants were produced on late sowing in August and September and this was attributed to low temperature. However early sowing in July gave the tallest plants. Results obtained by Ekwu and Nwokwu (2012) indicated that all the yield components and yields of okra were significantly affected by sowing date.

The interaction between variety and sowing date was significant in the two seasons for plant height, number of green pods/plant, weight of green pods/plant and total yield of green pods per fed. Fatokun *et al.*, (1978) reported that the magnitude of okra fruit yield increase as a result of earlier sowing date. The higher yield was shown by early maturing cultivar "PusaSawani" than the medium maturing cultivar "Ibk-2".

From the results we deduce that the performance of PusaSawani and Golden coast cultivars that sown on 15th May is superior to BaladyQena that sown on 15th April. So, we can delay sowing date for such cultviars to 15th May and this gives a flexable use of land.

Conclusion

Optimum sowing date clearly is an important to optimize okra yields. Vigorous vegetative growth and high fruit yield were noticed in April compared to May sowing dates under Assiut conditions. Under the conditions of this study, it can be concluded that the highest total green pods yield/fed., of the okra varieties, was obtained from PusaSawani and Golden coast. We recommend sowing PusaSawani and Golden coast if to delay beyond April planting date.

Table 1. Plant height (cm), number of branches per plant, and number of days to 50% flowering for five okra cultivars as affected by different planting dates during 2011 and 2012 summer seasons under Assiut Conditions[1]

Planting date (A)	15 April	15 May	Mean	15 April	15 May	Mean
	2011			2012		
Cultivar(B)	A- Plant height(cm)					
BaladyAssiut	174.3b[2]	149.5a	161.9	167.6b	146.6b	157.1
BaladyQena	164.7c	151.7a	158.2	160.4c	150.9a	155.7
Emerald	90.2d	77.7c	83.9	86.3d	65.9d	76.1
Golden Coast	159.9c	127.8b	143.9	158.4c	121.7c	140.0
PusaSawani	193.7a	153.9a	173.8	190.9a	147.5b	169.2
Mean	156.5	132.1	144.3	152.7	126.5	139.6
$LSD_{0.05}$[3]	6.2			1.8		
	B- Number of branches per plant					
BaladyAssiut	2.6b[2]	1.8d	2.2	2.5b	1.7d	2.1
BaladyQena	3.3a	2.6b	2.9	3.1a	2.4b	2.8
Emerald	2.4b	2.1c	2.3	2.2c	2.0c	2.1
Golden Coast	3.4a	3.1a	3.3	3.2a	3.0a	3.1
PusaSawani	1.8c	1.7d	1.8	1.9d	1.7d	1.8
Mean	2.7	2.3	2.5	2.6	2.1	2.4
$LSD_{0.05}$[3]	0.1			0.1		
	C- Number of days to 50% flowering					
BaladyAssiut	58.0 c [2]	71.0c	64.5	57.7c	70.7c	64.2
BaladyQena	60.0 d	72.7cd	66.3	59.7d	71.5cd	65.6
Emerald	51.0a	47.0b	49.0	49.7a	46.6b	48.2
Golden Coast	55.3b	73.7d	64.5	54.7b	72.6d	63.7
PusaSawani	50.3a	44.7a	47.5	49.0a	42.4a	45.7
Mean	54.9	61.8	58.4	54.2	60.8	57.5
$LSD_{0.05}$[3]	**1.2**			**0.8**		

[1] variance of cultivars x sowing date x year interaction was significant.

[2] means within column followed by same letter(s) are not significantly different at 0.05 level of probability .

[3] to compare planting dates under same cultivar.

Table 2. Green pod length(cm), average weight of green pod(g)and number of green pods/plant for five okra cultivars as affected by different planting dates during 2011 and 2012 summer seasons under Assiut Conditions[1]

Planting date (A)	15 April	15 May	Mean	15 April	15 May	Mean
	2011			2012		
Cultivar(B)	A- Green pod length(cm)					
BaladyAssiut	4.2d[2]	3.5c	3.9	3.8d	3.2c	3.5
BaladyQena	3.7e	3.1d	3.4	3.5e	3.1c	3.3
Emerald	6.8b	6.4a	6.6	6.6b	6.2a	6.4
Golden Coast	6.5c	6.0b	6.3	6.1c	5.7b	5.9
PusaSawani	7.7a	6.4a	7.1	7.2a	6.2a	6.7
Mean	5.8	5.1	5.4	5.4	4.9	5.2
$LSD_{0.05}$[3]	0.1			0.1		
	B- Average weight of green pod(g)					
BaladyAssiut	5.70e[2]	5.34e	5.52	5.92e	5.43e	5.67
BaladyQena	6.10d	5.71d	5.91	6.31d	5.93d	6.12
Emerald	9.90b	9.39b	9.64	10.69b	9.69b	10.19
Golden Coast	10.70a	10.33a	10.51	10.95a	11.00a	10.98
PusaSawani	8.90c	8.63c	8.76	9.21c	8.82c	9.02
Mean	8.26	7.88	8.07	8.61	8.18	8.40
$LSD_{0.05}$[3]	0.03			0.01		
	C- Number of green pods/plant					
BaladyAssiut	60.3b[2]	17.8d	39.0	50.9b	14.2e	32.6
BaladyQena	42.7c	17.7d	30.2	41.8c	17.2d	29.5
Emerald	36.7d	21.9c	29.3	32.7e	20.6c	26.7
Golden Coast	43.3c	26.4b	34.8	40.7d	23.5b	32.1
PusaSawani	65.9a	36.6a	51.3	62.6a	34.0a	48.3
Mean	49.8	24.1	36.9	45.7	21.9	33.8
$LSD_{0.05}$[3]	**2.4**			**0.7**		

[1] variance of cultivars x sowing date x year interaction was significant.

[2]means within column followed by same letter(s) are not significantly different at 0.05 level of probability.

[3]to compare planting dates under same cultivar.

Table 3. Weight of green pods/plant(g) and total yield of green pods(tons/ feddan) for five okra cultivars as affected by different planting dates during 2011 and 2012 summer seasons under Assiut Conditions[1]

Planting date (A)	15 April	15 May	Mean	15 April	15 May	Mean
	2011			2012		
Cultivar(B)	A- weight of green pods/plant(g)					
BaladyAssiut	343.9c[2]	94.9d	219.4	300.9d	77.3e	189.1
BaladyQena	260.3d	101.4d	180.8	263.4e	102.2d	182.8
Emerald	363.0c	205.3c	284.2	349.6c	199.5c	274.6
Golden Coast	462.9b	272.2b	367.6	445.8b	258.5b	352.2
PusaSawani	586.2a	316.3a	451.2	576.7a	299.7a	438.2
Mean	403.3	198.0	300.6	387.3	187.5	287.4
$LSD_{0.05}$[3]	18.5			5.1		
	B- Total yield of green pods(tons/ feddan)					
BaladyAssiut	7.394c[2]	1.893d	4.643	6.553d	1.585e	4.069
BaladyQena	5.683d	2.328d	4.006	5.637e	2.190d	3.913
Emerald	7.577c	4.447c	6.012	7.302c	4.248c	5.775
Golden Coast	9.888b	5.837b	7.863	9.333b	5.636b	7.484
PusaSawani	12.341a	6.632a	9.487	11.904a	6.365a	9.135
Mean	8.577	4.227	6.402	8.146	4.005	6.075
$LSD_{0.05}$[3]	**0.332**			**0.070**		

[1]variance of cultivars x time of sowing x year interaction was significant.
[2]means within column followed by same letter(s) are not significantly different at 0.05 level of probability .
[3]to compare planting dates under same cultivar.

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سلوك ٥ أصناف من البامیا المنزرعة فی مواعید مختلفة تحت ظروف أسیوط

شرین یعقوب عطا الله

قسم الخضر – كلیة الزراعة – جامعة أسیوط

الملخص

اجریت دراسة لتقییم استجابة تأثیر میعاد الزراعة والصنف على النمو والمحصول للبامیا فی المزرعة البحثیة بكلیة الزراعة جامعة أسیوط خلال موسمی ٢٠١١و ٢٠١٢ .

تمت الزراعة فی میعادین وهما: ١٥ ابریل،١٥ مایو. واستخدمت ٥ اصناف وهم بلدی اسیوط، بلدی قنا، امیرالد،جولدن كوست، بوزاسوانی. واستخدم تصمیم الاحواض المنشقة فی القطاعات كاملة العشوائیة مع ثلاث مكررات.

اشارت النتائج الی انه:كان لكل من میعاد الزراعة والصنف تأثیر معنوی على عدد الثمار والمحصول. وبالنسبة لزراعة ١٥ ابریل اعطت اعلی محصول (٨,١٤٦،٨,٥٧٧ طن /للفدان) فی الموسمین. واعطت زراعة ١٥ مایو اقل محصول (٤,٠٠٥،٤,٢٢٧ طن /للفدان) فی الموسمین على التوالی.

اعطی الصنف بوزاسوانی اعلی محصول فی میعادی الزراعة (١٢،٣٤١،٦،٦٣٢ & ١١،٩٠٤،٦،٣٦٥ طن/للفدان) فی الموسمین.

اعطی الصنفان بوزاسوانی وجولدن كوست اعلی محصول فی میعاد الزراعة ١٥ مایو عن الصنف بلدی قنا المنزرع فی ١٥ ابریل. كان التفاعل بین الاصناف ومواعید الزراعة ایضا معنوی فی الموسمین بالنسبة لكل من صفة طول النبات، عدد ووزن القرون للنبات والمحصول الكلی للفدان.