

Effect of Sowing Dates on the Yield and Seed Production of Okra Cultivars in Mansehra

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ABSTRACT

To monitor the effect of different sowing dates on the yield and seed production of okra cultivars, an experiment was conducted at Agricultural Research Station, Baffa Mansehra during 2014. Six cultivars of okra i.e. Irka, Sabz Pari, Pusa Green, Pusa Sawani, Sarhad Green and Green Star were sown on three different sowing dates with 15 days interval i.e. 15th March, 30th March and 14th April, 2014. Maximum number of pods plant⁻¹ (32.12), pod length (11.12 cm), pod diameter (1.54 cm), pod weight (15.24 gm), plant height (184.28 cm), pod yield (16.24 t ha⁻¹), seed yield (1601.92 kg ha⁻¹) and 1000-seed weight (86.92 gm) were recorded in cultivars, sown on 30th March, 2014. Maximum number of pods plant⁻¹ (32.75), pod length (11.57 cm), pod diameter (1.67 cm), pod weight (16.04 gm), plant height (187.17 cm), pod yield (17.50 t ha⁻¹), seed yield (1735.00 kg ha⁻¹) and 1000-seed weight (89.32 gm) were recorded in cultivar Sabz Pari. Sowing of okra cultivar Sabz Pari on 30th March is recommended for realizing maximum fresh pod and seed yields under the agro-climatic conditions of Mansehra District.

Key words: okra, cultivar, sowing date, pod yield, seed weight.

INTRODUCTION

Okra or Lady's finger (*Abelmoschus esculentus* L.), locally known as Bhindi belongs to the family Malvaceae. It originated in tropical Africa and was also grown in Mediterranean region and its wild forms are found in India. It is now grown in all parts of the tropics and during the summer in the warmer parts of the temperate region (Baloch, 1994). It is a popular summer vegetable in Pakistan and is especially valued for its tender and immature pods, which are rich sources of vitamins, calcium, potassium and other minerals. The marketable size of pods ranges 3 to 5 inches in length and is considered optimum for consumption. Plant growth and yield are both adversely affected if the pods are not harvested when young on regular basis. Hussain et al (2006) studied the response of five okra cultivars i.e. Malav-27, Sabz Pari, Super Green, Pusa Sawani and Punjab Selection under three sowing dates (18th May, 28th May and 8th June, 2005). They found that sowing of okra on 28th May produced the maximum number of pods plant⁻¹ (26.22), fruit length (10.56 cm), fruit diameter (1.46cm), plant height (1.48m) and pod yield (14.57 t ha⁻¹). They also reported that okra cultivar Malav-27 gave the maximum number of pods plant⁻¹ (26.62), fruit length (11.21cm), fruit diameter (1.59 cm), plant height (1.46 m) and pod yield (15.81 t ha⁻¹). Yadav and Dhankhar (2001) studied the effect of 9 different sowing dates (from 5 March to 12 August at 20-day intervals) on okra cv. Varsha Uphar during 1997-98. They found that sowing on 13 June resulted in higher seed yield (17.18 q ha⁻¹) as compared to other sowing dates. Incalcaterra *et al.* (2000) evaluated the effect of two sowing dates (1st and 15th April 1996) on okra cultivated with and without plastic mulch. In mulched plots, the number of pods plant⁻¹ (220) and pod yield (35 t ha⁻¹) were higher as compared to unmulched plots (178 pods per plant⁻¹, and pod yield 24 t ha⁻¹ respectively). They further noted that plant height, number of pods plant⁻¹ and pod yield ha⁻¹ were higher in okra, sown on 1st April as compared to 15th April. Khan (1999) studied the effect of three different sowing dates (10th May, 25th May and 10th June, 1998) on the performance of four okra cultivars i.e. Super Green, Pusa Green, Green Tech and T-13. They observed that sowing of okra on 25th May produced maximum number of fruits plant⁻¹ (68.33), fruit length (8.92 cm), plant height (1.62 m) and 100-seed weight (9.33 gm). They also recorded that maximum fruit length (9.56 cm) and 100-seed weight (9.56 gm) in cultivar T-13. Yadav and Dhankhar (1999) evaluated the effect of 9 different sowing dates (from 5 March to 12 August at 20-day intervals) on okra cv. Varsha Uphar during 1997-98. They found that sowing on 13 June resulted in the highest number of fruits plant⁻¹ (24.13), fruit length (19.11 cm) and fruit girth (1.64 cm). Alok and Nandi (1990) conducted an experiment on the evaluation of seven okra cultivars. They found that the okra cultivar Bhubaneswar-1 gave the highest pod yield (15.5 t ha⁻¹), individual fresh pod weight (20.33 gm) and number of pods plant⁻¹ (13.9). They further noted that okra cv. Pusa Sawani was the tallest (150.5 cm) and had the highest number of pods plant⁻¹ (18.8). Iremiren and Okiy (1986) found that the sowing of okra on 1st April gave the increased pods plant⁻¹, pod length, pod diameter, pod weight and had a longer harvest duration and also reported that the growing response of okra to different sowing dates is not uniform. In NWFP, okra is grown on an area of the 2151 ha with a total production of 19203 tons. (Agri. Stat.

N.W.F.P, 2005-06). It is usually sown from mid of March to mid of May. The average yield of green pods is about 8-10 tons ha⁻¹ (Baloch, 1994), which is very low as compared to other developed countries of the world, where yield could reach as high as 30 t ha⁻¹. (Koay and Chua 1978).

For seed production, the pods are allowed to dry on the plant, harvested periodically to avoid shattering of seed, and sun dried and threshed. The seed is dried to 8 percent moisture and stored in a dry cool place. Under normal storage conditions, seed remains viable for two years or so (Kernick, 1961). Different cultivars require different climatic condition as well as different sowing time and a good cultivar when sown at improper time give poor yield (Tindall, 1983). Therefore, proper date of sowing of a suitable cultivar is critical for enhancing crop productivity.

Generally, the farmers of the Mansehra District are realizing low yields due to many reasons such as, use of primitive cultivars, conventional sowing methods, improper sowing time, imbalanced fertilization, weeds infestation and ignorance of plant protection measures etc. Therefore, present study was undertaken to determine high yielding cultivar(s) as well as the most suitable sowing date to maximize per unit production.

MATERIALS AND METHODS

The experiment was conducted at Agricultural Research Station Baffa Mansehra during growing season 2014. The experiment was laid out in randomized complete block (RCB) design with split plot arrangements. There were two factors in the experiment viz. sowing dates and cultivars. Three sowing dates with 15 days intervals i.e. SD1 = 15th March 2014, SD2 = 30th March 2014 and SD3 = 14th April 2014 were assigned to main plots. Six different okra cultivars i.e. V1 = Irka, V2 = Sabz Pari, V3 = Pusa Green, V4 = Pusa Sawani, V5 = Green Star and V6 = Sarhad Green were assigned to sub-plots.

There were eighteen treatments of different combination and each was replicated three times. Each plot was 9 m² (5 x 1.8m²) having 3 rows, each 5 meter long and 60 cm apart. Plant to plant distance was 20 cm. Before sowing of crop, the land was prepared thoroughly and nitrogen, phosphorus, and potash @ 120–90–60 kg ha⁻¹ was applied in the form of urea, triple super phosphate and potassium sulphate respectively. All phosphorus, potash and ½ nitrogen was applied at the time of sowing while remaining ½ nitrogen was applied at the time of hoeing / earthing up. Sowing was done on ridges by putting three seeds per hill 20 cm apart, on different sowing dates. When the seedlings were 6 cm tall, thinning was done to leave one per hill in order to maintain the required plant population. All the recommended cultural practices were done uniformly in all the treatments. During the course of experiment, the data was recorded on number of pods plant⁻¹, pod length (cm), pod diameter (cm), pod weight (gm), plant height (cm) at maturity, pod yield (t ha⁻¹), seed yield kg ha⁻¹ and 1000-seed weight (gm). The data were statistically analyzed using analysis of variance technique, Least Significant Difference (LSD) test was used to compare the treatment means at 5% level of significance.

RESULTS AND DISCUSSION

Means values of the data recorded on various growth and yield parameters are presented in Table-1. The data revealed that sowing dates and cultivars significantly affected the growth and yield parameters, while their interaction was non-significant.

Number of pods plant⁻¹

The data presented in Table-1, revealed that maximum number of edible pods plant⁻¹ (32.12) were found in okra cultivars sown on 30th March 2014, while minimum number of edible pods plant⁻¹ (29.02) were recorded in cultivars sown on 14th April, 2014. It might be due to the reason that 30th March 2014, sowing had a longer harvest duration of fresh edible pods than 14th April 2014, sowing. These results are in agreement with the findings of Incalcaterra et al (2000) who observed higher number of pods plant⁻¹ (178) in okra, sown on 1st April as compared to 15th April. Similarly Iremiren and Okiy (1986) reported that growing response of okra to different sowing dates is not uniform and found increased pods plant⁻¹ in okra sown on 1st April. Hussain et al (2006) also recorded maximum number of pods plant⁻¹ (26.22) in okra when sown on 28th May. Similarly Yadav and Dhankhar (1999) found that sowing of okra cv. Varsha Uphar on 13 June resulted in the highest number of fruits plant⁻¹ (24.13). Khan (1999) also reported maximum number of fruits plant⁻¹ (68.33) in okra sown on 25th May. By comparing the mean values of okra cultivars with one another, maximum number of pods plant⁻¹ (32.75) were observed in cultivar Sabz Pari, while minimum number of pods plant⁻¹ (27.62) were recorded in cultivar Green Star. These results are in conformity with the findings of Hussain *et al.* (2006) who recorded maximum number of pods plant⁻¹ (26.62) in okra cv. Malav-27. Alok and Nandi (1990) also reported the highest number of pods plant⁻¹ (18.8) in okra cv. Pussa sawani. Variation in number of pods plant⁻¹ might be due to the genetic characteristics of okra cultivars.

Pod length (cm)

The data presented in Table-1 showed that maximum pod length (11.12 cm) was observed in cultivars sown on 30th March, 2014, while minimum pod length (10.34 cm) was found in cultivars sown on 15th March, 2014.

These results are in agreement with the findings of Incalcaterra et al (2000), who noticed maximum pod length in okra, sown on 1st April as compared to 15th April. Similarly Iremiren and Okiy (1986) reported that growing response of okra to different sowing dates is not uniform and found increased pod length in okra sown on 1st April. Hussain *et al.* (2006) also recorded maximum pod length (10.56 cm) in okra sown on 28th May. Similarly Khan (1999) recorded maximum fruit length (8.92 cm) in okra sown on 25th May. Yadav and Dhankhar (1999) also found that sowing of okra on 13 June resulted in the greatest fruit length (19.11 cm). By comparing the mean values of okra cultivars with one another, maximum pod length (11.57 cm) was noted in cultivar Sabz Pari, while minimum pod length (9.69 cm) was recorded in cultivar Green Star. These results are in agreement with the findings of Hussain *et al.* (2006) who recorded maximum pod length (11.21 cm) in okra cv. Malav-27. Khan (1999) also recorded maximum fruit length (9.56 cm) in okra cv. T-13. Variation in pod length might be due to the genetic characteristics of different okra cultivars.

Pod diameter (cm)

The data presented in Table-1, showed that maximum pod diameter (1.54 cm) was noticed in cultivars sown on 30th March 2014, while minimum pod diameter (1.42 cm) was found in cultivars sown on 15th March, 2014. These results are in agreement with the findings of Iremiren and Okiy (1986) who found increased pod diameter in okra sown on 1st April and also reported that growing response of okra to different sowing dates is not uniform. Hussain *et al.* (2006) also recorded maximum fruit diameter (1.46 cm) in okra sown on 28th May. Similarly Yadav and Dhankhar (1999) reported that sowing of okra cv. Varsha Uphar on 13 June resulted in the highest fruit girth (1.64 cm). By comparing the mean values of okra cultivars with one another, maximum pod diameter (1.67 cm) was recorded in cultivar Sabz Pari, while minimum pod diameter (1.32 cm) was noticed in cultivar Green Star. These results are in agreement with the findings of Hussain *et al.* (2006) who recorded maximum fruit diameter (1.59 cm) in okra cv. Malav-27. Variation in pod diameter can be inferred to the genetic characteristics of different okra cultivars.

Pod weight (gm)

The data presented in Table-1, revealed that the highest pod weight (15.24 gm) was recorded in cultivars sown on 30th March 2014, while the lowest pod weight (13.48 gm) was found in cultivars sown on 15th March, 2014. These results obtained are in consonance with the findings of Iremiren and Okiy (1986) who reported that growing response of okra to different sowing dates is not uniform and found increased pod weight in okra sown on 1st April. By comparing the mean values of okra cultivars with one another, the highest pod weight (16.04 gm) was recorded in cultivar Sabz Pari, whereas the lowest pod weight (11.62 gm) was recorded in cultivar Green Star. These results are in agreement with the findings of Alok and Nandi (1990) who reported the highest individual pod weight (20.33 gm) in okra cv. Bhubaneswar-1. Variation in individual pod weight might be due to the genetic potential of different okra cultivars.

Plant height (cm)

The data presented in Table-2, revealed that maximum plant height (184.28 cm) was observed in cultivars sown on 30th March 2014, while minimum plant height (165.18 cm) was noted in cultivars sown on 14th April, 2014. These results are in accordance with the findings of Incalcaterra et al (2000) who reported that plant height was higher in okra, sown on 1st April as compared to 15th April. Hussain et al (2006) also recorded maximum plant height (1.48 m) in okra cultivars sown on 28th May. Similarly Khan (1999) observed maximum plant height (1.62 m) in okra sown on 25th May. By comparing the mean values of okra cultivars with one another, maximum plant height (187.17 cm) was observed in cultivar Sabz Pari, while minimum plant height (159.90 cm) was recorded in cultivar Green Star. These results are in agreement with the findings of Hussain et al (2006) who recorded maximum plant height (1.46 m) in okra cv. Malav-27. Alok and Nandi (1990) also reported the maximum plant height (150.5 cm) in okra cv. Pusa Sawani. Similarly Khan (1999) recorded maximum plant height (1.69 m) in okra cultivar Green Tech. Variation in plant height might be due to the genetic characteristics of okra cultivars coupled with environment.

Pod yield (t ha⁻¹)

The data presented in Table-2, revealed that the highest fresh pod yield (16.24 t ha⁻¹) was realized when okra cultivars were sown on 30th March 2014, while the lowest fresh pod yield (14.09 t ha⁻¹) was obtained when sown on 14th April, 2014. These results are in agreement with the findings of Incalcaterra et al (2000) who recorded highest pod yield (24 t ha⁻¹) in okra, sown on 1st April as compared to 15th April. Hussain et al (2006) also reported that sowing of okra on 28th May resulted in the highest pod yield (14.57 t ha⁻¹). By comparing the mean values of okra cultivars with one another, it was noted that cultivar Sabz Pari gave the highest fresh pod yield (17.50 t ha⁻¹), whereas the lowest fresh pod yield (13.11 t ha⁻¹) was obtained from cultivar Green Star. These results are in agreement with the findings of Hussain et al (2006) who recorded maximum pod yield (15.81 t ha⁻¹) in okra cv. Malav-27. Similarly Alok and Nandi (1990) reported that okra cultivar Bhubaneswar-1

gave the highest pod yield (15.5 t ha^{-1}). Variation in fresh pod yield hectare⁻¹ can be attributed to the genetic potential of various okra cultivars.

Seed yield (kg ha^{-1})

The data presented in Table-2, revealed that the highest seed yield ($1601.92 \text{ kg ha}^{-1}$) was obtained from cultivars sown on 30th March 2014, while the lowest seed yield ($1402.36 \text{ kg ha}^{-1}$) was obtained from okra cultivars sown on 14th April, 2014. Yadav and Dhankhar (2001) also reported that sowing of okra on 13 June resulted in maximum seed yield (17.18 q ha^{-1}) as compared to other sowing dates. By comparing the mean values of okra cultivars with one another, the greatest seed yield ($1735.00 \text{ kg ha}^{-1}$) was realized in cultivar Sabz Pari, while the lowest seed yield ($1301.09 \text{ kg ha}^{-1}$) was observed in cultivar Green Star. Variation in seed yield hectare⁻¹ can be inferred to the genetic potential of various okra cultivars.

1000-seed weight (gm)

The data presented in Table-2, showed that 1000-seed weight (86.92 gm) was maximum in cultivars sown on 30th March, 2014, while minimum (78.63 gm) in cultivars sown on 15th March, 2014. Similarly Khan (1999) recorded maximum 100-seed weight (9.33 gm) in okra sown on 25th May as compared to other sowing dates. By comparing the mean values of okra cultivars with one another, maximum 1000-seed weight (89.32 gm) was recorded in cultivar Sabz Pari, while the minimum 1000-seed weight (73.74 gm) was observed in cultivar Green Star. These results are in agreement with the findings of Khan (1999) who recorded maximum 100-seed weight (9.56 gm) in cultivar T-13 as compared to other cultivars. Variation in 1000-seed weight can be attributed to the genetic potential of various okra cultivars.

REFERENCES

- Agricultural Statistics of NWFP. 2005-06. Department of Agriculture Statistics Govt: of NWFP.
- Alok, N. and A. Nandi. 1990. Performance of some okra varieties in Orissa: Regional Research Station, Orissa Uni of Agric & Tech, G. Udayagiri India. *Envir. And Eco.* 8:1B, 471-473.
- Baloch, A.F. 1994 Vegetable Crops: *In. Horticulture.* National Book Foundation, Islamabad. pp. 529-531.
- Hussain, S., M. Sajid, N. Amin, S. Alam and Z. Iqbal. 2006. Response of okra (*Abelmoschus esculentus*) cultivars to different sowing times. *J. of Agricultural and Biological Sci.* 1(1):1-8.
- Incalcaterra, G., F. Vetrano, P.J. Stoffella, D.J. Cantliffe and G. Damato. 2000. Effect of two sowing dates and plastic mulch on okra production. International Symposium on Timing of Field Prod. *In. Veg. Crop, Bari, Italy, 15-18 October 1997. Acta-Horticulturae.* No.533, 329-336.
- Iremiren, G. O. and D. A. Okiy. 1986. Effect of sowing date on the growth, yield and quality of okra (*Abelmoschus esculentus* (L.) Moench. In Southern Nijeria. *J. of Agri. Sci. U. K.* 106 (1): 21- 26. (CAB: Absts. 056-03393).
- Khan, M. 1999. Response of different cultivars of okra (*Abelmoschus esculentus* L.) to three different sowing dates in the mid hill of Swat Valley. Deptt. Of Hort. NWFP Agril. University Peshawar. M.Sc. Thesis.
- Kernick, M.D. 1961. Vegetable crops. *In: Agriculture and horticultural seeds.* Rome: Food and Agricultural Organization of the United Nations.
- Koay, S.H and S.E Chua, 1978. Effect of fertilizers on vegetative growth and pod production in okra (*Abelmoschus esculentus* L.). *Singapore J. Prio. Ind.,* 6:76-79.
- Tindall, H. D. 1983. Vegetables in the Tropics. *McMillan AVI.* pp. 33, 325-327.
- Yadav, S.K. and B.S. Dhankhar. 2001. Effect of sowing dates and planting geometry on seed production and quality of okra (*Abelmoschus esculentus* (L.) Moench) Indian society of seed technology, seed Research. 29 (2):149-152.
- Yadav, S.K and B.S. Dhankhar. 1999. Performance of Varsha Uphar cultivar of okra (*Abelmoschus esculentus* (L.) Moench) as affected by the sowing dates and planting geometry. Indian society of seed technology, seed Research. 29(1):47-51.

Table-1: Effect of different sowing dates on the growth and yield of various okra cultivars.

Treatments	Number of pods plant ⁻¹	Pod length (cm)	Pod diameter (cm)	Pod weight (gm)
Sowing dates				
SD1 = 15 th March	30.35 ab	10.34 b	1.42 b	13.48 b
SD2 = 30 th March	32.12 a	11.12 a	1.54 a	15.24 a
SD3 = 14 th April	29.02 b	10.59 ab	1.47 b	14.10 b
LSD at 5%	1.92	0.59	0.05	1.04
Cultivars				
V1 = Irka	31.20 abc	10.84 bc	1.49 c	15.09 ab
V2 = Sabz Pari	32.75 a	11.57 a	1.67 a	16.04 a
V3 = Pusa Green	30.30 bc	10.66 bc	1.45 c	14.38 b
V4= Pusa Sawani	29.44 cd	10.28 cd	1.37 d	12.74 c
V5 = Green Star	27.62 d	9.69 d	1.32 d	11.62 d
V6= Sarhad Green	31.65 ab	11.03 ab	1.56 b	15.76 a
LSD at 5%	2.11	0.62	0.07	1.02

Table-2: Effect of different sowing dates on the growth and yield of various okra cultivars.

Treatments	Plant height (cm)	Pod yield (t ha ⁻¹)	Seed yield (kg ha ⁻¹)	1000-seed weight (gm)
Sowing dates				
SD1 = 15 th March	172.97 b	15.31 b	1553.78 b	78.63 b
SD2 = 30 th March	184.28 a	16.24 a	1601.92 a	86.92 a
SD3 = 14 th April	165.18 c	14.09 c	1402.36 c	81.34 b
LSD at 5%	4.34	0.58	55.61	2.97
Cultivars				
V1 = Irka	175.66 bc	15.51 b	1522.36 bc	85.17 ab
V2 = Sabz Pari	187.17 a	17.50 a	1735.00 a	89.32 a
V3 = Pusa Green	172.21 c	14.63 bc	1444.22 cd	82.30 b
V4= Pusa Sawani	168.53 c	13.96 cd	1391.70 dc	76.89 c
V5 = Green Star	159.90 d	13.11 d	1301.09 c	73.74 c
V6= Sarhad Green	181.38 ab	16.57 a	1621.74 ab	86.37 ab
LSD at 5%	7.58	1.00	116.50	5.28

Means followed by the same letter (s) do not differ significantly from one another at 5% probability level, using LSD test.

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