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Quality seed production of okra in northern plains of India

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Okra [*Abelmoschus esculentus* (L) Moench] is an important annual vegetable crop propagated through seed in tropical and sub tropical regions of the world. It is grown mainly for its tender green fruits used as vegetable. In Haryana, it is grown twice a year during spring–summer (March-June) and rainy (July -October) seasons. A number of high yielding and good quality varieties are grown in the country, however their quality seed is always in short supply. Seed production technology may vary among cultivars. Hence there is need to develop and standardize the technology for seed production for each of the important cultivars. The seed production in okra is influenced by different sowing time and plant spacing. Therefore, there is an urgent need to find out the suitable sowing time and plant population for good quality seed production of okra var. Hisar Unnat.

The experiment was conducted at vegetable research farm and seed technology centre of CCS Haryana Agricultural University, Hisar during rainy season of year period of experiment not given to evaluate the effect of different sowing time and plant spacing on quality seed production of okra cv. Hisar Unnat. The experiment was laid out in split plot design with three replications having four sowing times viz. second week of June, last week of June, second week of July and last week of July as main plot treatments and four spacings *viz.* 45 x 20 cm, 45 x 30 cm, 60 x 20 cm & 60 x 30 cm as sub-plot treatments. Thus, a total of sixteen treatment combinations were evaluated.

Plant height (114.15 cm) was observed maximum in second week of June sown crop which was followed by last week of June (102.06 cm). The shortest plants (81.23 cm) were observed in last week of July sowing. The plant density also had a significant effect on plant height. The tallest plants (105.63 cm) were observed at a spacing of 60x30 cm while shortest plants (84.76 cm) were recorded at a spacing of 45x20 cm).

Days to 50 per cent flowering was recorded maximum (55.50) when crop was sown on last week of July, while minimum number of days (50.25) was recorded in second week of June. It seems that decreasing temperature at the time of flowering increased the number of days to 50 per cent flowering. Similarly, plant density also had a significant effect on 50 per cent flowering.

The highest fruit set (89.64 per cent) was recorded in second week of June sown crop, while lowest fruit set (80.71 per cent) was recorded in last week of July sown. Regarding spacing maximum fruit set (89.16 per cent) was recorded at a spacing 60x30 cm which was followed by 45x30 cm. Fruits per plant were recorded highest (18.65) in second week of June sowing which was significantly superior to other sowing times. The lowest number of fruit (11.72) were recorded when crop was sown in last week of July. Plant density also influenced number of fruits per plant significantly. The number of fruits per plant (16.73) was recorded maximum at a spacing of 60x30 cm, while minimum (12.69) were recorded at 45x20 cm spacing. This might be due to availability of more feeding area in terms of nutrients and light to plants in comparison to plants at closer spacings. Singh *et al.* (1986; 1988) also observed maximum plant height, number of fruits per plant and number of seeds per fruit in 15 or 20 June sown crop.

The data presented in Table 1 indicates that various sowing times influenced the seed yield per plant significantly. Maximum seed yield per plant (69.80 g) was recorded in second week of June sown crop which was significantly higher than other sowing dates. This may be due to more number of flowers, number of fruits, number of branches and number of seeds per fruit and per plant in second week of June sown crop. The seed yield per plant was recorded minimum (35.91 g) in last week of July sowing. Plant density also influenced seed yield per plant significantly. Per plant seed yield (63.24 g) was observed maximum under 60x30 cm plant

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Table 1. Effect of sowing time and date of planting on growth and quality characters of okra seed crop

Sowing time	Plant Height (cm)	Days to 50% flowering	Fruit set (%)	No. of fruits per plant	Seed yield/ plant (g)	Seed yield (q/ha)	Test weight (g)	Standard Germination (%)	Seed vigour Index-1
Second week of June	114.15	50.25	89.64	18.65	69.80	18.61	64.31	75.73	1345.66
Last week of June	102.06	52.00	87.90	15.27	54.37	15.57	62.64	73.83	1266.19
Second week of July	88.35	53.75	84.04	13.00	41.91	11.59	60.74	72.40	1189.73
Last week of July	81.23	55.50	80.71	11.72	35.91	8.52	59.60	70.98	1123.90
CD at 5%	1.07	0.92	0.88	0.45	1.71	0.49	0.49	0.79	61.15
Spacings (cm)									
45 x 20	84.76	55.00	82.53	12.69	36.46	12.06	57.13	70.67	10.76.69
45 x 30	103.92	52.25	86.66	15.51	57.72	13.94	64.62	73.86	1301.86
60 x 20	91.50	53.75	83.95	13.72	44.58	12.74	60.12	72.87	1198.00
60 x 30	105.63	50.50	89.16	16.73	63.24	15.57	65.41	75.54	1348.93
CD at 5%	1.04	1.70	1.28	0.56	3.05	1.29	1.29	0.53	48.73

spacing. However, the minimum (36.46 g) was recorded at 45x20 cm spacing.

The highest seed yield (18.61q) per hectare was observed in second week of June sown crop, which proved to be statistically superior over all other sowing dates. Because all the growth and yield attributing characters directly or indirectly favoured the total seed yield in second week of June sown crop followed by last week of June sown crop. The lowest seed yield per hectare (8.52q) was observed in last week of July sowing. Higher seed yield of okra in June sown crop has been reported by Yadav *et al*. (2001). Plant density also had a significant effect on seed yield per hectare. Seed yield was recorded highest (15.57q) at 60x30 cm spacing compared to other spacings. These findings are similar to those of Birbal *et al.* (1995) and Sharma and Gupta (2005) who have observed higher seed yield under 60x30 cm spacing in comparison to closer and wider spacing.

The seeds harvested from plants sown in second week of June had the highest test weight (64.31 g) and was found to be significantly superior over other sowing dates (Table-1). Plant density also had significant difference on test weight.

Higher values of standard germination were observed in early crop sown on second week of June (75.73 per cent), which was significantly superior to all other dates of sowing. Lowest germination (70.98 per cent) was observed in last week of July sown crop. Similarly plant density also had significant effect on standard germination percentage. 60x30 cm spacing proved better than closer spacings. Similar findings were reported by Singh and Gill (1988).

The vigour index-I is a function of germination and total seedling length (root + shoot) which indicated that the highest value of vigour index (1345.66) was observed in second week of June sown crop, which was significantly higher than all other dates of sowing. Plant density also had significant effect on vigour index-I. The highest value of vigour index-I (1348.93) was recorded at a spacing of 60x30 cm and it was significantly superior to all other plant spacings. The lowest vigour index value (1076.69) was recorded under 45x20 cm plant spacing. Yadav *et al.* (2001) reported higher values for test weight, standard germination, seedling length and vigour index in 13th June sown crops as compared to other sowing dates.

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