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Short communication

Effect of sowing time on yield and quality of okra seed

SK Dhankhar, AC Yadav and DP Deswal

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Okra (*Abelmoschus esculentus* (L) Moench) is one of the important vegetable crops of Haryana grown for its tender green fruits during spring-summer and rainy season. The technology for seed production of okra varies with cultivar and agro-climatic conditions. The influence of season on growth and production of okra has been studied by Bisaria and Shamshery (1979). Increased vigour and high productivity were observed when the crop was grown in rainy season than summer season. However, the incidence of insect-pests and diseases is very high during rainy season, which significantly affects the quantity and quality of seeds. There is need to study the influence of sowing time on yield and quality of seed. Therefore, the present investigation was, undertaken to ascertain suitable time of sowing for seed production of newly developed okra variety Hisar Naveen.

The present experiment consisting four sowing dates, i.e. 5, 15 and 25th March and 4th April in spring-summer and four dates, i.e., 15 and 25th June, 5th and 15th July in rainy season was conducted at the Department of Vegetable Science and quality of seed was tested in the Seed testing Laboratory, Department of Seed Science and Technology, CCS Haryana Agricultural University, Hisar on newly developed okra variety Hisar Naveen during the year 2007-08. The treatments were laid out in Randomized Block Design and replicated thrice. Seeds for each date were sown at a spacing of 45x30 cm in a plot size of 2.5x1.0 m^2. All recommended cultural practices were adopted to raise a healthy crop. Fruits for the extraction of seeds were harvested at full maturity. The data on number of seeds per fruit was recorded on fruits taken from different positions (lower, middle and upper portion) of five plants selected randomly in each treatment. Standard germination test was conducted as per the rules suggested by ISTA (1996). Seed vigour index was computed by multiplying germination percent with seedling length. To carry out accelerated ageing test (A A Test), the okra seeds of each date were kept for three days at 100% relative humidity and 40±1°C temperature, and thereafter, the seeds were tested for percent germination. For dehydrogenase activity (DHA), the representative 25-30 seeds of each date were ground, passed through a 20-mesh screen and replicated thrice. The 200 mg flour was soaked in five ml of freshly prepared 0.5% tetrazolium solution having pH 7.0 at 35°C for 2 hours, afterward, it was centrifuged at 10,000 rpm for three minutes, and the supernatant was tipped off. The formazan was extracted with 10 ml acetone for 16 hours in complete dark followed by centrifugation as done above. The absorbance of the solution was determined in spectronic-20 at 520 nm. The observations were recorded at optical density. To measure electrical conductivity, fifty normal seeds of each sowing dates were soaked in 75 ml de-ionized water in a beaker and replicated three times. The seeds were immersed completely in water, and beakers were covered with aluminum foil and kept at 25°C temperature. After 24 hours, the leachates were measured with the help of conductivity meter and expressed as ìmhos cm^{-1} $seed^{-1}$. To find out field emergence (%), 100 seeds of each

SK Dhankhar, AC Yadav
Department of Vegetable Science
Chaudhary Charan Singh Haryana Agricultural University,
Hisar -125004

DP Deswal
Department of Seed Science and Technology
Chaudhary Charan Singh Haryana Agricultural University,
Hisar -125004

Table 1: Effect of sowing dates on yield and seed quality of okra cv. Hisar Naveen

Treatments	No. of seeds per fruit	Test weight (g)	Seed yield (q/ha)	Standard germination (%)	Seedling length (cm)	Vigour index-I	AA test	EC (mhos/ cm / seed)
Sowing Dates								
5th March	39.8	54.1	9.4	81.0	23.1	1771	76.3	10.22
15th March	38.6	53.2	8.7	79.6	21.9	1743	75.7	10.13
25th March	36.1	53.1	8.2	79.4	22.7	1792	76.3	09.71
4th April	35.1	52.1	7.9	77.1	22.5	1734	74.4	10.12
15th June	49.6	65.2	15.2	88.3	28.2	2480	83.3	08.61
25th June	51.1	65.2	15.3	91.1	28.5	2596	85.2	08.55
5th July	48.4	62.9	14.2	89.2	27.2	2426	79.1	08.66
15th July	46.3	58.2	12.6	86.5	27.1	2344	69.1	9.71
CD at 5%	**2.59**	**1.59**	**1.20**	**2.11**	**1.15**	**133.0**	**1.35**	**0.29**

treatment were sown on ridges at spacing of 30 x 20 cm. and replicated thrice. The number of seedlings emerged were counted on 10th day after sowing and expressed in percentage. Pearson correlation of the seed quality parameters was also calculated based on upon pooled data of the sowing dates whose seed quality was found superior.

The results of the experiment indicate that the dates of sowing have significant effect on seed yield and its quality parameters. Number of seeds per fruit (49.1), test weight (65.2 g) and standard germination (91.1 %) were found maximum in seeds of crop sown on 15th June (Table 1), however, no significant difference was observed in seeds of crop sown on 25th June and 5th July in respect to above traits and there was a significant decrease in number of seeds per fruit, test weight, seed yield and standard germination of seeds of crops sown before 15th June and 5th July onward. Length of seedlings (28.5 cm), vigour index (2535) and germination percentage after ageing test (85.2%) were also observed maximum for the seeds of crop sown on 15th June, however, no significant difference was recorded for these seed quality parameters in seeds of crops sown on 25th June and 5th July, though significant difference in value for these traits was observed when the crop was sown before 15th June or 5th July onward. This indicates that okra should be sown from 15th June to 5th July (mid June to first week of July) to obtain maximum yield and quality of okra seed. The more seeds per fruit, high-test weight and seed yield might be due to the availability of favourable environmental conditions for normal crop growth and seed formation and development. Less number of seeds per fruit, test weight and yield of seed of crop sown before 15th June and 5th July onward might be due to prevailing high and comparatively low temperature, respectively at seed development stage of the crop, which might have affected the formation of seed. Similar results were also reported by Grewal *et al.* (1974) and Yadav *et al.* (2001). Prevailing high or low temperature at seed formation and development stage also affects the quality of seed, which deteriorates at faster rate. Hence, low germination percentage was observed after ageing (Agarwal and Singh, 1980). Lowest value for electrical conductivity (8.55 ìmhos/cm/seed) was noticed in seed leachates of crop sown on 25th June, which did not differ significantly from the EC values of seeds of crops sown on 15th June and 5th July. Low value for electrical conductivity is an indicator of high seed viability since the EC value is negatively correlated with standard germination and other seed quality traits. The difference in sugar loss from seeds of crops sown on different dates might be due to difference in relative amounts of soluble sugars present in seeds or due to difference in sensitivity to the intake of water during imbibition or both (Perry and Harrison, 1970).

Field emergence (%) showed significantly positive correlation with all the seed quality parameters, *viz.* test weight (r= 0.82), standard germination (r= 0.83), vigour index-1 (r= 0.80), germination after aging test (r= 0.76) and tetrazolium test (r= 0.75) except electrical conductivity, which exhibited negative association (r= -0.55) with field emergence. Electrical conductivity also expressed negative association with other seed quality parameters (Table 2). Deterioration and low vigour of seed is generally associated with leaky cells and poor membrane structure (Paul and Ramaswamy, 1979). Standard germination also showed significantly positive association with all quality traits except electrical conductivity, which is desirable for high seed viability and it helps in the prediction of field emergence and performance of the crop under favourable environmental conditions. Yadav and Dhankhar (2001) also reported similar results in okra. Positive correlation of accelerated

Table 2: Correlation coefficient of seed quality parameters with field emergence in okra cv. Hisar Naveen

	1	2	3	4	5	6	7
Test weight (g)	1.00	0.54*	0.88**	0.55*	-0.72*	0.37	0.82**
Standard germination (%)	-	1.00	0.87*	*0.71**	-0.60*	0.90**	0.83**
Vigour index-I	-	-	1.00	0.87**	-0.40	0.85**	0.80**
A A Test	-	-	-	1.00	-0.56*	0.50*	.076**
Electrical conductivity (mhos/cm/seed)	-	-	-	-	1.00	0.61*	-0.50*
Tetrazolium test (%)	-	-	-	-	-	1.00	.075**
Field emergence (%)	-	-	-	-	-	-	1.00

aging test with test weight (r= 0.55), standard germination (r= 0.71), vigour index-1 (r= 0.88) and field emergence (r= 0.76) expressed storability and vigour of the seed. The finding of Bishnoi and Delouche (1980) and Yadav and Dhankhar (2001) also conform similar results.

From the present study, it is concluded that okra crop should be sown from mid June to first week of July for harvesting higher yield with quality seed. Standard germination may help in the prediction of seed viability, field emergence and performance under favourable environmental conditions.

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