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Effect of sowing dates and plant geometry on growth and yield of okra cv. PARBHANI KRANTI AND PUSA A-4

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ABSTRACT : The present investigation was carried out in rainy season during 2009 and 2010 at Research Farm and Seed Testing Laboratory of Gochar Mahavidyalaya, Rampur Maniharan, Saharanpur, Uttar Pradesh with a view to study the influence of sowing time and plant geometry on plant growth and yield of okra. The experiment was laid out in split-split plot design with three replications and four dates of sowing in each season *viz.*, 10 June, 24 June, 8 July and 22 July 2009 and 2010 taken in main plots and three plant geometries *viz.*, 60 x 30 cm, 60 x 45 cm and 60 x 60 cm in sub plots and two varieties *viz.*, Parbhani Kranti and Pusa A-4 in sub-sub plots. The plant growth and vigour which was evident from greater plant height, pod development, seed size and yield obtained in the crop sown on 10th and 24th June. Seed yield is correlated with the performance of yield contributing attributes and a perusal of data pertaining to seed yield components *viz.* per cent fruit set, number of pods per plant, pod length, pod thickness, number of seeds per pod revealed that the environment was more favourable for okra seed production when the crop was sown on 10th June and 24th June which were found superior in seed yield and its components over rest of the sowing dates.

KEY WORDS : Date of sowing, Spacing, Growth, Yield, Variety, Okra

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Okra [*Abelmoschus esculentus* (L.) Moench.] belonging to the family 'Malvaceae', is an important crop grown mainly for its tender green fruits used as vegetable. In India, it is grown twice a year during spring-summer and rainy seasons. Okra has a vast potential for consumption in the country and export to the Middle-East and Gulf countries. A number of high yielding and good quality varieties are grown in the country; however their quality seed is always in short supply. The information available regarding seed production technology of okra is inadequate. Although some literature about seed production of Pusa Sawani variety are available, but there is immense need to develop and standardize the technology for seed production of important cultivars *viz.*, Parbhani Kranti, Pusa A-4, Arka Anamika etc. The seed quality as determined by vigour and viability of the seeds is greatly influenced by the environmental conditions to which the seed crop is exposed from sowing to seed maturity and harvesting. Besides environmental factors, seed production in okra is also influenced by plant geometry or spacing. Available reports suggest that planting date plays an important role in plant growth, fruit development, seed yield and its quality in okra. The early sown crop in rainy season experiences high temperature and hot winds during their growth period resulting in stunted growth, less number of fruits and reduced seed yield. The late sown crops encounter high rainfall during flowering and fruit set are more prone to attack by insect-pests and diseases. Plant density plays an important role in the seed production of okra and high seed yield, may be obtained from the densely sown crop (Baruah, 1995 and Raghav, 1996). However, closer spacings in okra especially during rainy season pose greater problems of manual weeding and hoeing by adjusting the row and plant spacing without affecting the yield and quality of seed and, therefore, the optimum spacing needs to be worked out. Keeping the above facts in view, the present investigation was undertaken to study the effect of sowing dates on yield

and quality of seed and determine the most suitable time of sowing of okra.

RESEARCH METHODS

The present investigation was carried out in rainy season during 2009 and 2010 at Research Farm and Seed Testing Laboratory of Gochar Mahavidyalaya, Rampur Maniharan, Saharanpur, Uttar Pradesh with a view to study the influence of sowing time and plant geometry on plant growth and yield of okra. The experiment was laid out in split-split plot design with three replications and four dates of planting in each season *viz.*, 10 June, 24 June, 8 July and 22 July 2009 and 2010 taken in main plots and three plant geometries *viz.*, 60 x 30 cm, 60 x 45 cm and 60 x 60 cm in sub plots and two varieties *viz.*, Parbhani Kranti and Pusa A-4 in sub-sub plots. The plant distance was maintained as between and 50 cm within the rows. Regular cultural operations were done according to the need of crop. Seed yield was recorded on plot basis. Observations on plant height (cm), days to 50% flowering, fruit set (%), number of pods/plant, pod length (cm), pod thickness (cm), number of seeds/pod and seed yield per plant (g) were recorded from five randomly selected plants from each plot.

RESEARCH FINDINGS AND DISCUSSION

The data pertaining to observations recorded on plant growth characters, pod attributes and seed yield parameters in rainy season during both the years of investigation separately and pooled mean of both the years of okra crop were tested statistically.

The comprehensive studies conducted during the present investigation revealed that the average seed yield and the yield contributing characters of okra seed crop were expressed significantly better in the June sown crop as compared to July sown crop under Rampur Maniharan climatic conditions. Hence, the temporal differences of various parameters recorded under different sowing dates in June and July were probably due to more favourable weather conditions during June. June sown crop receiving adequate regular rainfall during initial crop growth stage (*i.e.* in June-July) resulting in moderate temperature boosted the plant growth and vigour which was evident from greater plant height (174.40cm.), per cent fruit set (89.31), pod length (17.26cm.), pod thickness (1.59cm.), number of seeds per pod (45.08) seed yield per plant (64.24g) and seed yield (18.36q/ha) in the crop sown on 24th June, while, the highest days to 50% flowering (54.95days) was estimated in crop sown on 22nd July (Table 1). The lower estimates of most of the parameters *viz*., plant height, per cent fruit set, pod length, pod thickness, number of seeds per pod and seed yield of July sowing may be attributed to overall reduced growth and vigour of the plants under excessive relatively humidity and temperature conditions which are not so conducive for okra and offer short duration for growth and development to the plants.

The optimum date of sowing plays a pivotal role for

Table 1: Effect of sowing dates and plant geometry on growth and yield of okra cv. Parbhani Kranti and Pusa A-4

Treatments	Plant height (cm)	Days to 50% flowering	Fruit set (%)	Number of pods/plant	Pod length (cm)	Pod thickness (cm)	Number of seeds/pod	Seed yield per plant (g)	Seed yield (q/ha)
Date of sowing									
D_1	172.00	49.60	85.96	16.42	16.70	1.50	43.63	53.51	17.66
D_2	174.40	49.67	89.31	18.98	17.26	1.59	45.08	64.24	18.36
D_3	166.20	52.64	81.39	17.92	16.75	1.53	43.75	47.20	15.42
D_4	93.73	54.95	72.95	14.11	15.48	1.49	42.42	23.80	9.97
S.E.±	1.67	0.54	0.87	0.44	0.24	0.05	0.41	0.52	0.09
C.D. (P=0.05)	5.98	1.89	2.65	1.12	0.45	NS	1.65	1.35	0.25
Spacing									
S_1	147.90	49.99	80.76	15.61	15.88	1.44	42.52	45.80	15.74
S_2	149.90	50.60	81.52	16.46	16.43	1.51	43.97	46.68	13.27
S_3	151.70	51.57	83.29	17.25	16.91	1.54	44.92	48.45	11.24
S.E.±	0.97	0.56	0.48	0.11	0.13	0.02	0.35	0.36	0.04
C.D. (P=0.05)	NS	NS	1.23	0.35	NS	NS	0.89	0.73	0.16
Variety									
V_1	153.80	51.07	82.64	17.06	16.80	1.54	44.67	49.54	15.02
V_2	150.10	51.11	82.17	16.66	16.45	1.52	42.77	47.67	14.32
S.E.±	1.02	0.53	0.65	0.15	0.25	0.04	0.31	0.19	0.04
C.D. (P=0.05)	2.56	NS	NS	NS	NS	NS	0.76	0.75	0.13

NS=Non-significant

producing better crop growth as well as fruit and seed development and has been reported to exert a significant influence on the seed yield. The significant effect of sowing time/date on seed yield and its components even within the same cropping season was quite prominent in the present studies.

Seed yield is correlated with the performance of yield contributing attributes and a perusal of data pertaining to seed yield components *viz.*, per cent fruit set, number of pods per plant, pod length, pod thickness, number of seeds per fruit revealed that the environment was more favourable for okra seed production when the crop was sown on 10th June and 24th June which were found superior in seed yield and its components over rest of the sowing dates.

Significantly higher seed yield obtained in June sown crops (*i.e.* 10 and 24 June) over those of July sowing were consistent with the observations of Bisen *et al*. (1994), Marie *et al.* (2007), Singh *et al.* (1988), Singh *et al.* (1986), Kamalnathan *et al.* (1970) and Ijoyah *et al.* (2010) who reported best yield of okra seed from the crop sown on 20th June.

The highest percentage of fruit set was recorded in the crop sown on 24 June and a decreasing trend was noted in later sowing dates. The lower fruit set, number of pods per plant and pod length in July sown crops (*i.e*. 8 and 22 July) may be attributed to shorter plant height under decreasing temperature (average temperature 28-29°C) experienced by the plants during reproductive phase. These results are in conformity with the findings of Raghav (1996) and Yadav and Dhankar (1999).

No significant difference between the two varieties namely Parbhani Kranti and Pusa A-4 was observed for traits like plant height, days to 50 % flowering, per cent fruit set and pod size in rainy season crops.

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