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Effect of Spacing and Fertilizer Application on Growth Components of Safflower (Carthamus tinctorius L.) Variety N-62-8 (I).

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Increase in row to row and plant to plant spacing increased favourably the height spread, main and sub-branches/plant. However, the grain yield decreased gradually with increase in both the spacings. The highest grain yield was obtained with closest spacings (45 cm row and 15 cm plant spacing).

Increase in the level of nitrogen application increased the spread, main and sub-branches and grain yield.

Phosphate fertilization did not show beneficial effect on the growth components studied.

Amongst the oil seed crops, safflower is next in importance to groundnut in Maharashtra State. Safflower crop is drought tolerant and therefore it is mainly grown in low rainfall areas (scarcity areas) as a mixed crop in *rabi jowar* or a border crop. The average yield of such an important oil crop in India is 3.1 q/ha and for Maharashtra state it is 3.28 q/ha, as compared to that in california (U. S. A. 44.91 q/ha).

It is, therefore, very necessary to increase the per hectare yield of this crop by evolving proper Agronomical practices. Optimum plant density and adequate supply of nutrients play a major role in increasing the yield. These two factors are interdependent. In the case of safflower crop, in Maharashtra, there is practically no information available in this aspect. With this background in view the present investigation was carried out, at Agric. College Farm, Dhule, during 1971-72 and 1972-73 to study the effect of different spacing between rows and within rows in combination with different levels of nitrogen and phosphorus on the growth, yield and quality of safflower.

Beech *et al.*, (1966) concluded that the number of heads/plant decreased with the increased plant density. Hoag *et al.*, (1968) reported that plants in 15 cm row spacing had significantly fewer heads/plant and were more advanced at flowering and maturity than those in 53 cm and 91 cm rows. In respect of plant height however, Montilla (1968) noticed that it remained unaffected due to the different spacings.

Nitrogen is the most important nutrient influencing the plant growth. In a pot culture trial at Agricultural College, Pune, Dhote and Ballal (1964)

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observed that there was no significant variation in height of plant, number of flower and capsule/plant and the weight of capsule due to the fertilizer treatments. They, however, observed that application of nitrogen increased subsequently the branches/plant. Jones (1966), however, observed that number of heads/plant were increased with the increasing doses of nitrogen. Hoag *et al*, (1968) also reported that growth rate, plant height and number of heads/plant were significantly increased by the fertilizers.

MATERIAL AND METHODS

The experiment to study the response of safflower variety N-62-8 to different levels of spacing and fertilization was conducted during the rabi seasons of 1971-72 and 1972-73 on medium black soil, rich in nitrogen and available P_2O_5. The experiment was laid out in $3^2 \times 2$ confounded split plot design with two replications. The main plot treatments consisted of 27 treatments due to the combinations of three levels of nitrogen (0, 50 and 100 kg/ha), three row to row (15, 22.5 and 30 cm) spacings, while the sub-plot treatments consisted of two levels (0 and 50 kg P_2O_5/ha) of phosphorus.

The sowing of crop was done during the 41st meteorological week i. e. on October 8th, 9th and 10th in 1972 October, 9th, 10th and 11th in 1973, and the crops were raised by giving supplementary irrigations as and when required. The periodical observations on growth variable were recorded and are presented in Table 1 along with yield data.

RESULTS AND DISCUSSIONS

Effect of row to row spacings:

Height : It would be seen from table 1 that in 1972, at 90 days plant height was increased significantly with 60 cm where as during 1973 it was increased with 75 cm at harvest.

Spread : The spread of the plant indicates the expansion of the individual plant for photosynthesis. A glance at table 1 would indicate that there was a marked effect of different row to row spacings on the spread of the plant. It increased more or less progressively and significantly as row to row spacing increased in both the years.

Main and Sub-branches : The number of main as well as sub-branches/plant was influenced significantly by the different row to row spacings. Plants with 60 and 75 cm row to row spacings showed significantly more number of branches in both the seasons. The increase in the number of main branches due to 75 cm row to row spacing over 45 cm spacing was 32.53 per cent in 1972 and 22.97 percent in 1973, indicating considerable effect of wider spacing on the growth of the crop.

The number of sub-branches also increased significantly with increase in the row to row spacing from 45 to 75cm The increase in the number of sub-branches due to 75 cm spacing over 45 cm row to row spacing was 76.82 and 57.45 per cent in 1972 and 1973, respectively

Yield : The grain yield obtained was significantly lower with 75 cm row to row spacing as compared to 45 and spacings, which were at per in 60 cm both the years of experimentation.

Effect of plant to plant spacing

Height : The plant to plant spacing affected the plant height significantly in both the seasons. The plant height increased with the decrease in plant to plant spacing in both the seasons.

Spread : The different plant to plant spacings showed significant effect on the plant spread in both the seasons. The spread of the plant showed increasing trend due to increase in plant to plant spacing in 1972 where as spread was increased with 30 cm spacing during the year 1973 at harvest.

Main and Sub-branches : In the first year of the trial the number of main and sub-branches/plant increased significantly with increase in the plant to plant spacing. In the second year, though the plant to plant spacing did not show significant improvement of main and sub-branches however, they showed an increasing trend.

Yield : The yield increased significantly with decrease in plant to plant spacing in both the years.

Effect of nitrogen :

Height : The height of the plant was not influenced significantly due to different levels of nitrogen in both the seasons.

Spread : The differences in mean plant spread, due to different levels of nitrogen were found to be significant in both the years of the trial. The spread of the plant at harvest increased significantly due to application of 100 kg N/ha over control and 50 kg N/ha during the year 1972, where as during the year 1973, the plant spread increased due to nitrogen fertilization over control.

Main and sub-branches : The production of mean number of main branches/plant was significantly influenced by the nitrogen levels at harvest in both the years of trial. At harvest, in 1972 the main branches/plant showed progressive and significant increase with the successive increase in the level of nitrogen upto 100 kg N/ha. However, in the second year of the trial, 100 kg and 50 kg N/ha levels were found to be equally effective and produced significantly more number of main branches over 0 kg N/ha.

The number of sub-branches/plant were influenced significantly by the different levels of nitrogen application during both the seasons. In 1972 the number of sub-branches/plant increased significantly with increase in nitrogen fertilization. Nitrogen fertilization increased the number of sub-branches/plant significantly over control during the year 1973 at harvest.

Yield : The grain yield was significantly increased due to 100 kg N/ha over control in both years and application of 50 kg N/ha was also found superior over control in the second year only. The maximum cost benefit ratio

1.70 and 1.71 was with application of 50 kg N/ha during both the years. I was reduced due to further increase ir N doss.

Effect of Phosphate : The appli cation of phosphatic fertilizers did no show significant improvement ove control. However, appreciable increas in most of the growth characters wa observed dus to phosphate application

Yield : The grain yield was also not affected significantly due to phos phate application during both the years of experimentation.

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TABLE 1 Mean height, spread in cm., main and Sub-branches per plant as affected by different treatments in both the seasons.

Treatment	Height in cm		Spread in cm		Main branches/plant		Sub-branches/plant		Yield q/ha.	
	1972 Harvest (1)	1973 Harvest (2)	1972 Harvest (3)	1973 Harvest (4)	1972 Harvest (5)	1973 Harvest (6)	1972 Harvest (7)	1973 Harvest (8)	1972 (9)	1973 (10)
Row to row spacing (cm)										
45	74.68	64 47	45.53	41.22	10.88	10 23	16.43	17.91	25.42	15.27
60	75.26	65.86	50.25	44.75	13.16	18.36	22.03	23.46	22.34	15.27
75	73.83	96.71	59.94	47.82	14.42	12.58	29.07	28.20	20.07	13.57
'F' test	N.S.	*	*	*	*	*	*	*	*	*
Plant to plant spacing (cm)										
15	75.89	66.74	47.13	43.67	10.76	10.95	16.81	22.02	24.07	16.63
22.5	74.03	65.36	53.06	44.06	12.88	11.65	22.00	22.58	21.85	14.73
30	73.85	64.94	58 31	46.06	14.81	11.57	29.00	24.97	19.92	12.80
'F' test	*	*	*	*	*	N.S.	*	N.S.	*	*
Levels of Nitrogen (Kg/ha)										
0	75.08	66.68	50 09	42·87	11.95	10.84	18.20	20.82	20.64	13.37
50	73.87	65 27	52.10	45.39	12.83	11.54	21.68	23.84	22.12	14.86
00	74.82	65.11	56,31	45.53	13.67	11.80	27.11	24.92	23.08	15.93
'F' test	N.S.	N S.	*	*	*	*	*	*	*	*
S.E. ±	0.4844	0.5465	0.8370	0.670	0.228	0.223	1.060	1.001	0.52	0.43
CD at 5%	1.399	1.578	2.418	1.936	0.658	0.645	3.272	2.890	1.50	1.24
Levels of phosphate (kg/ha)										
0	74.15	65.75	52.30	44.10	12.75	11.24	22.11	22.58	21.86	14.98
50	75.02	65.31	53.36	45.01	12.89	11.53	23.09	23.80	22.02	14.44
'F' test	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
S.E. ±	0.346	0.470	0.513	0.375	0.704	0.174	0.623	0.561	1.63	3.17
C.D. at 5%	—	—	—	—	—	—	—	—	—	

*—Significant. N.S.—Not Significant