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Effect of Spacing and Fertiliser Application on Yield Contributory Characters of Safflower (*Carthamus tinctorius* L) Variety N-62-8 (II)*

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The capsule number/plant and the grain wight/plant increased significantly with increase in row to row spacing upto 75 cm. The number of grains/capsule were slightly increased by adopting wider row to row spacings. The test weight and yield however were adversely affected by the wider row to row spacings. The number of capsules/plant, grain weight/plant and number of grains/capsule increased with increased in plant to plant spacing. The test weight and grain yield were adversely affected due to increase in plant to plant spacing. The number of capsules/plant, test weight, number of grains/capsule, grain weight/plant and grain yield were favourably influenced by nitrogen fertilization. The phosphate application did not show much advantage in safflower manuring

Beech *et al.* (1966) reported that number of heads/plant decreased with the increased plant density, while 1,000 grain-weight and number of seeds/head showed little effect of plant densities. Gillbert and Tucker (1967) reported that the number of seeds/head was affected to a minor degree due to plant density and the seed weight/plant did not show significant differences.

Hoag *et al.* (1968) from the trial on fertiliser and row spacings concluded that plants in 15 cm rows had significantly fewer heads/plant, fewer seed/head and lower 100 seed-weight than the plants in 53 and 93 cm row spacings.

Dhote and Ballal (1964) from their pot culture trial on N. P and K noticed that there was no significant variation in capsule number/plant due to fertiliser treatments.

Jones (1966) while studying the effect of nitrogen and irrigation levels on growth and yield of safflower observed that the number of heads/plant and number of seeds/head intertiary heads were increased with the increased dose of nitrogen.

Hoag *et al.* (1968) studies the effect of different spacings and N and P fertilization on safflower for 3 years. They reported that the number of head/plant, test weight and the seed yield were significantly increased by the fertilization.

Jones and Tucker (1963) observed that nitrogen fertilization increased the number of seed/head and number of

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seed/head and number of seed/head in fertiary heads, seed-weight in secondary heads and head-weight in the secondary and tertiary heads. During the present oil crises safflower stands better chances to grow even as a sole crop. The yield of the crop has been found to be the resultant of number of plants/unit area and weight of grains in each plant, yield of the latter is directly affected by the former With this back-ground in view the present investigation was carried out at Agricultural College Farm, Dhule (M.S.).

MATERIAL AND METHODS

The experiment was carried out at Agricultural College Farm, Dhule 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 desing with two replications. In all there were 54 treatments due to three levels of nitrogen (0, 50 and 100 kg/ha), three row to two spacings (45, 60 and 75 cm), three plant to plant spacings (15, 22.5 and 30 cm), and two levels of phosphate (0 and 50 kg/ha). The sowing of crop was done during the 41st meteorological week *i*.e. on October 8th, 9th and 10th in 1972 and October 9th, 10th and 11th in 1973. The rainfall received during the life of the crop in both the seasons was quite inadequate (Table 2) and the crops were raised by giving supplementary irrigations as and when required. The observations on yield contributory characters were recorded and are presented in Table 1 alongwith the yield data.

RESULTS AND DISCUSSIONS

Effect of row spacings:

Capsule: The number of capsules/plant was found to increase significantly with each increase in row to row spacing in both the seasons. The increased number of capsules/plant in wider spacing was, reference of Part 1; due to increased number of branches/plant (unpublished). Similar results were also obtained by Beech *et al.* (1966) and Hoag *et al.* (1968).

Number of grains/capsule: The row to row spacings did not influence significantly the number of grains/capsule in both the seasons. A little effect and plant densities on number of grains/head was also reported by Beech *et al.* (1966) and Gillbert and Tucker (1967).

Weight of grains / plant: In first year of trial, the grain-weight/plant increased significantly with increase in the row to row spacings. In the second year both 60 and 75 cm spacings produced significantly more grain-weight/plant than 45 cm spacing, but both of them were at par. Thus, on the whole, the weight of grains/plant was considerably improved due to 75 cm row to row spacing. The findings of Gillbert (1967) did not show significant differences. The higher yield/plant in wider row to row spacing might be due to mainly higher number of capsules/plant.

Mean test weight: In both years of trial, the test weight showed decreasing trend with the increasing row to row spacing. The 75 cm row to row spacing resulted into the lowest, 1.000 grain

weight. In the case of wider spacing the production of large number of branches some of which being produced at later stage of growth, might have resulted in the production of small size of capsules having smaller grains leading to lower test weight. The findings of Beech *et al.* (1966) showed little effect of plant densities on test weight. In contrast to these results (Hoag *et al.*, 1968) there was lower 100 seed weight with 15 cm row spacings than 53 and 93 cm row spacings.

Yield: The grain yield was found to be significantly affected by the row to row spacings in both the years of experimentation. The 75 cm row to row spacing decreased the grain yield significantly over both 45 and 60 cm spacings. The latter two spacings were, however, on par.

Effect of plant to plant spacings:

Number of capsules : In 1972, it was observed that with the increase in plant to plant spacing, the number of capsules/plant also increased significantly In the second year of experimentation at 90 days and at harvest, 30 cm spacing showed significantly more number of capsules/plant than 15 cm spacing but it was on par with the 22.5 cm spacing which in turn was on par with the 15 cm spacing.

No. of grains/capsule: Like the row to row spacings the plant to plant spacings also did not affect significantly the number of grains/capsule.

Weight of grains/plant: In the first year of the trial the per plant grain-weight increased significantly with increase in the plant to plant spacings. In the second year, though the differences in grain-yield were not significant, there was slight increasing trend.

Mean test weight : The test weight was not influenced significantly due to plant to plant spacings in both the seasons. The plant to plant spacings showed a similar trend like that of row to row spacing in influencing the test weight. These results are similar to row to row spacing and in accordance with the findings of Beech *et al.* (1966), Hoag *et al.* (1968) and Gillbert (1967).

Yield : The grain yield decreased significantly with increase in the plant to plant spacings in both the years.

Effect of nitrogen :

Number of capsules : The number of capsules increased with increase in the nitrogen dose in both the seasons. In 1972, at 90 days and at harvest plants fertilized with 100 kg N/ha showed significantly more number of capsules than the plants fertilized with 50 and 0 kg N/ha. However, the differences in number of capsules between 50 kg N/ha and 0 kg N/ha were not significant.

In 1973, at 90 days 100 kg N/ha produced significantly more number of capsules/plant than 0 kg N/ha but it was on par with 50 kg N/ha,, which in turn was on par with 0 kg N/ha. However, at harvest both 50 and 100 kg/ha were on par and proved to be superior over 0 kg/ha.

Number of grains/capsule : The number of grains/capsule was not significantly affected by the different levels of nitrogen in both the years.

Weight of grains/plant : In 1972, application of 100 kg N/ha increased the grain yield/plant significantly over both 0 and 50 kg N/ha levels. In 1973, though the differences in grain yield/plant were not significant, each increase in the level of nitrogen showed a slight beneficial effect. The increase in per plant grain yield due to increased dose of N may be attributed to the increased number of capsules/plant.

Mean test weight : The mean test weight was significantly influenced by the different levels of nitrogen in both the seasons, application of 50 and 100 kg N/ha produced significantly more test weight than 0 kg N/ha, but 100 kg N/ha did not show significant advantage over 50 kg N/ha level. These results corroborate the findings of Jones (1966) for capsule/plant and number of grains/capsule, Hoag *et al.* (1968) for capsule/plant and test weight and Jones and Tucker (1968) for number of grains/capsule and test weight.

Yield : The grain yield was found to increase with increase in the level of N. Application of 100 kg N/ha increased the grain yield significantly over 0 kg N/ha in both years. These results are in conformity with those of Rahaman *et al.* (1978).

Effect of phosphate : The yield contributory characters showed only a slight improvement due to phosphate application.

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TABLE 1 Yield components and yield as affected by different treatment

Variables / Treatments	Capsule/plant: At 90 days	Capsule/plant: At harvest	No. of grains/ capsule	Grain wt/ plant (g)	Test wt. (g)	Grain yield (q/ha)
			1972			
Row to row spacings (cm):						
45	27 46	28.12	20.88	32 00	57.70	23.42
60	35.18	36.35	20.22	40.00	56.71	22 34
75	43 06	44.93	21.66	50 00	55 34	20.07
'F' test	Sigt	Sigt	N.S.	Sigt	Sigt	Sigt
Plant to plant spacings (cm):						
15	27.91	28.51	20.55	33 00	57.12	24.07
22.5	34 37	35 74	20.95	41.00	56 58	21.65
30	43 42	45 14	21.56	50.00	55.07	19 92
'F' test	Sigt.	Sigt.	N.S.	Sigt.	N.S.	Sigt
Levels of nitrogen (kg/ha):						
0	31.70	32.31	20.49	36.00	56.55	20 64
50	34.29	35.60	21.01	40.00	57.04	22.12
100	39.72	41.16	21.01	47.00	57.17	23.08
'F' test	Sigt.	Sigt.	N.S.	Sigt.	Sigt	Sigt.
S. E. ±	1.15	1.13	0.494	1.61	0.467	0.62
C. D. at 5%	3.33	3 26	—	4 57	1.201	1.60
Levels of phosphate (kg/ha):						
0	34.66	35.19	20.00	39.00	56 53	21 86
50	35 61	37 00	21.40	43 00	56 64	22 02
'F' test	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
S. E. ±	0.718	0.721	0.334	1.06	0.026	1.63
C.D. at 5%	-	-	-	-	-	-

TABLE 1 (Contd.)

1	2	3	4	5	6	7
			1973			
Row to row spacing (cm):						
45	28.27	29.00	14.99	22.50	64.06	15.27
60	31.61	35.04	16.27	29.30	61.57	15.27
75	36.67	41.63	14.98	32.40	60.06	13.57
'F' test	Sigt.	Sigt.	N.S.	Sigt	Sigt.	Sigt.
Plant to plant spacings (cm):						
15	29.76	33.69	15.46	26.30	52.36	16 63
22.5	31.34	34.54	16.41	27.90	52.48	14.72
30	33.21	37.45	15.37	29.90	60.86	12.30
'F' test	Sigt.	Sigt.	N.S.	N.S.	N.S.	Sigt.
Levels of nitrogen (kg/ha):						
0	29.54	32.32	15.36	25.90	50.02	13.37
50	31.78	36.14	13.36	29.00	52.23	14.86
100	33.29	37.21	15.52	29.00	53.48	15.93
'F' test	Sigt.	Sigt.	N.S.	N.S.	Sigt.	Sigt.
S.E. ±	0.798	1.220	0 495	1.205	0.754	0.42
C.D. at 5%	2.306	3.523	—	3.652	2.179	1.24
Levels of phosphate (kg/ha) :						
0	30.86	34.38	15.19	27.30	51.46	14 98
50	32.23	36.07	15.64	25.80	52.34	14.44
'F' test	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
S. E. ±	0.578	0.752	0.422	0.774	0.718	3.17
C.D. at 5%	—	—	—	—	—	—