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Effect of Plant Density on Yield and Yield Components in sesame (*Sesamum indicum* L.)

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Two cultivars, viz, Pb; Til No, 1 and TC 25 of sesame (*Sesamum indicum* L.)were used to study the effect of Plant density on yield and yield components. Five spacings i. e., 30x0, 30x7.5, 30x15, 30x22.5 and 30x30cm. were used. Cultivars differed significantly with respect to flowering days, maturity days and capsules on main shoot whereas plant density produced highly significant effects on flowering days, maturity days, branches and yield. Linear and non-linear components were significant for all characters except plant height, pods on main shoot and yield. Linear relationship was observed for flowering days, maturity days, branches whereas linear to non-linear relationship was noticed for pods on main shoot, pods per plant and yield with increase in spacing from plant to plant. Highest yield was obtained at 30x15cm, spacing. This spacing can be used with advantage for branched varieties of sesame in Punjab for maximum grain yield.

Grain yield in sesame is the result of many plant growth processes which are ultimately expressed in the yield components like total capsules per plant, number of branches, length of fruit bearing branch. The highest grain yield is obtained when all yield components are optimised for a specific environment. An increase in sesame yield may be achieved through agronomic and genetic manipulations. Delgado and Yermanos (1975) observed changes in seed yields were mainly due to the effect of plant spacing on the number of capsules per plant. Plant population density effected to some degree other plant characteristics, such as pattern of branching, plant height and height of first fruit bearing branch. The objective of the present investigation was to observe the magnitude of changes in yield and yield components caused by difference in stand density.

MATERIAL AND METHODS

Two cultivars of sesame namely Pb. Til. No. 1 an approved variety for cultivation throughout the Punjab State and TC 25, national check in All India Co-ordinated Research Project on Oilseeds were used in this study. In 1978, a four replicate split plot design was adopted with cultivars as the main plots and plant densities as sub plots. The sub plot consisted of 4 rows of 4.5 metre length with a row spacing of 30 cm. To produce the desired spacing, the cultivars were planted at heavy seedling rates (5 kg./ ha). After twenty days of planting, rows were thinned by hand to realize spacings of 30 x 7.5, 30 x 15, 30 x 22.5 and 30 x 30 cm. The following observations were recorded : days to flowering, days to maturity, plant height (cm), No. of branches per plant, No. of capsules on

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main shoot, No. of capsules per plant and grain yield (g/plot). Analysis of variance for each of the characters was done. The effect of plant density was partitioned into linear and non-linear functions (Steel and Torrie 1960).

RESULTS AND DISCUSSION

Analyses of variance for yield and yield components are presented in Table 1. Significant differences were observed for days to flowering, days to maturity and capsules on main shoot. Significant interactions between cultivars and plant densities were not independent. The cultivars and densities were observed for flowering days, branches, pods per plant. This indicates that the factors cultivars and plant densities were not independent. The cultivars showed varying response to different spacings or populations. Significant linear and non-linear effect of plant density were observed for flowering days, maturity days, branches and linear component alone was significant in respect of capsules per plant.

The mean values of different yield components of Pb. Til No. 1 and TC 25 at five population densities are given in Table 2. The flowering days were effected by changes in plant spacing. At no thinning (30 x 0), Pb. Til No. 1 took 48 days to flower while at 30. spacing, the flowering period increased to 63 bays. Similar trend was observed in case of TC 25. Both the cultivars showed linear response (Table2). The maturity period reduced with the dense population but when the varieties were planted at wider spacing the period prolonged progressively, giving linear response. The effects of plants pacing on plant height were the same for both the varieties. These are branched varieties having no differential response to varying plant densities. The varieties have different genetic ability to produce branches. The results presented in Table 2. clearly revealed that plants tend to produce more branches when they are grown at wider spacings. At no thinning 3.30 and 3.05 branches were produced while at 30 cm plant spacing there were 5.85 and 5.60 branches. This trait showed linear response in case of Pb. Til No. 1 and linear to non-response in case of TC 25. Capsules on the main shoot and capsules per plant showed the same tondency with different plant denisities The grain yield was maximum when planted at a distance of 30 x 15cm. As plant to plant spacing increased from 15cm onward the yield decreased.

The data presented show that different yield components were strongly affected by population density. It was noticed that yield increased upto a certain level beyond which there was decrease in yield but other yield components such as branches, capsules per plant and capsules on the main shoot increased with increase in plant to plant spacing. Sesame has the ability to compensate for the yield with plant densities but only upto certain extent.

Mazzani and Cobo (1956) obtained maximum yield at highest population density but Menon (1967) found maximum increase in seed yield when

the distance decreased down to 6 inches between rows and 1 inch between plants in row. But in the present investigation, the highest yield of sesame was obtained when the distance was 30x15cm. Delgado and Yermanos (1975) also observed changes for the pattern of branches, plant height and height of first fruit. The linear response was noticed for flowering days, maturity days, branches and capsules per plant in the present investigation. The compromise was at 30x15 cm spacing for grain yield of sesame. This spacing can be profitably used for planting branched sesame varieties in Punjab, State.

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Table 1. Analysis of variance for yield and yield components of sesame under five plant densities.

Source	Mean Squares						
	Flowering. (Days)	Maturity. (Days)	Plant height (cm)	Branches (No)	Capsules on main shoot (No)	Capsules plant (no)	Yield/plot (gm)
Blocks	4.09	7.62	69.15	1.53	174.12	292.12	109077.29
Cultivars	13.22x	11.02x	1.94	1.09	591.36xx	160.80	525.62
Error (a)	0.89	0.69	339.10	1.15	14.15	335.57	11772.29
Plant densities	402.16xx	218.50xx	24.56	7.24xx	50.24	706.84	27052.50xx
Linear components	701.41xx	432.31xx	14.28	13.11xx	81.23	1282.56xx	926.41
Non-linear components	302.41xx	147.23xx	27.99	5.28xx	39.91	514.94	5711.20
Cultivars x densities	14.16xx	4.78	31.52	0.26x	23.59	143.03	2478.75
Error (b)	1.01	1.80	69.88	0.08	29.45	116.43	5974.79

x = Significant at 5% level
xx = Sianificant at 1% level.

Table 2. Yield and Yield components of two cultivars grown at five population densities.

Character	Cultivar									
	Pb Til No. 1					TC 25				
	30x0	30x7.6	30x15	30x22.5	30x30	30x0	30x7.5	30x15	30x22.5	30x30
Flowering (days)	48	54	58	61	63	46	54	58	64	67
Maturity (days)	79	82	83	88	91	78	83	86	90	92
Plant height (cm)	143	140	140	142	141	145	142	144	145	144
Branches (No)	3.30	3.90	4.05	5.00	5.85	3.05	3.90	3.85	4.05	5.60
Capsules on main shoot (No)	14.20	14.55	15.60	15.70	17.45	19.20	19.10	24.10	28.80	24.75
Capsules/plant (No)	30.05	25.30	31.95	40.10	42.20	24.75	29.05	40.80	37.80	57.65
Yield/plot (g)	243	215	268	238	170	208	231	263	218	228

	Flowering days	Maturity days	Plant height (cm)	Branches (cm)	Capsules on main shoot (No)	Capsules/Plant (No)	Yield/plot (g)
Between two plant density means of same cultivar	1.44	1.93	12.01	0.08	7.80	15.50	113.85
Between two plant density mean of different cultivars	1.26	1.58	15.06	0.75	6.50	16.92	121.62