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Effect of Nipping on Productivity and Economics of Summer Sesame (*Sesamum indicum* L.) under Varying Levels of Plant Density

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A field experiment was conducted at Pulses and Oilseeds Research Sub-Station, Beldanga, Murshidabad, West Bengal to study the effect of nipping on growth, productivity and economics of summer sesame. Among the four plant density levels, 3.3 lakhs plant ha^{-1} (30 x10 cm) was superior to other three levels in respect of plant height and number of seeds per capsules resulting in higher seed yield of sesame. Nipping of terminal bud at 25 DAS significantly increased the branches, number of capsules, seed yield (13 and 10%), net return and benefit cost ratio of sesame over no nipping in both the years of study. The increase in yield by nipping at 25 DAS was more at lower plant density level than that with higher one over no nipping.

Key words: Sesame, nipping, plant geometry, growth, yield, economics

Sesame (*Sesamum indicum* L.) is an important oilseed crop in West Bengal cultivated mainly in summer season and sometimes in rainy season in some areas of the state. The productivity of the crop in the state of West Bengal is 701 kg/ha, which is higher than national average (WBEAP, 2001). But the sesame varieties have higher production potentiality. Lack of optimum plant population is one of the most important factors for low productivity of this crop (Patra, 1990). The plant population of sesame after sowing with optimum seed rate may get reduced in field condition due to several reasons. Thus the yield is decreased as a result of which activates the dormant lateral buds to produce more branches, is an important operation for increasing the sesame yield (Reddy and Narayanan, 1987; Ramanathan and Chandrashekharan, 1998). With this perspective, attempts were made to study whether the agronomic practice such as nipping can compensate the seed yield under the situation of reduced plant population.

Materials and Methods

The field experiment was conducted at Pulses and Oilseeds Research Sub-station, Beldanga, Murshidabad, West Bengal during the summer seasons of 2000 and 2001. The experiment was laid out in randomized block design with 12 treatment combinations of three nipping levels (N_0: no nipping, N_1: nipping at 25 DAS and N_2: nipping at 35 DAS) and four levels of plant densities [P_1: 3.3 lakhs plant ha^{-1} (30 x 10 cm), P_2: 1.48 lakhs plant ha^{-1} (45 x 15 cm), P_3: 1.11 lakhs plant ha^{-1} (30 x 30 cm) and P_4: 0.74 lakh plant ha^{-1} (45 x 30 cm)] replicated thrice. The soil of the experimental field was sandy loam with p^H 7.2, 0.43% organic carbon, available P_2O_5 90 kg ha^{-1} and K_2O 115 kg ha^{-1}. Tilottoma, a popular sesame variety recommended for summer was sown in March. Nipping of terminal bud was done by hand clipping at 25 and 35 days after sowing (DAS), which was compared with no nipping. The crop was fertilized with recommended dose of 60 kg N, 30 kg P_2O_5 and 30 kg K_2O ha^{1}. Nitrogen, Phosphorus and Potash were applied through urea, single super phosphate and muriate of potash, respectively. Half dose of N, entire P_2O_5 and K_2O were applied as basal. Top dressing of rest of the half dose of N was done at 30 days after sowing. Cost of cultivation and gross return were computed considering the cost of inputs, labourers and the current price of sesame grain (Rs. 16 kg^{-1} in 2003).

Results and Discussion

Growth and Yield Attributes

Nipping of terminal bud at 25 days significantly increased the number of branches and capsules/ plant. Arresting the terminal growth through clipping of terminal bud activated the lateral dormant buds. It would have facilitated the significant increase in the number of capsules/plant. The results were in conformity with the findings of Saha and Bhargava (1980); Ramanathan and Chandrashekharan (1998). But nipping had no-significant influence on the number of seeds/capsule and test weight.

Among the plant densities 0.74 lakh plants ha^{-1} (45 x 30 cm) recorded more number of branches/ plant, capsules/plant and seeds/capsule and it was superior to other plant densities tested (Table 1).

The plants under lower density would have grown vigorously due to lesser competition for space,

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Table 1. Effect of nipping and plant density on growth attributes and yield components of sesame

Treatment	Plant height (cm)		Effective branches plant^{-1}		Number of capsules plant^{-1}		Number of seeds capsule^{-1}		1000 seed weight (g)		Seed yield (kg ha^{-1})	
	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001
Nipping (N)												
N_0- No nipping	45.9	53.5	5.0	5.5	67	46	75	88	3.18	2.68	872	785
N_1- Nipping at 25 DAS	43.7	51.2	5.6	6.0	78	55	71	88	3.11	2.65	986	865
N_2- Nipping at 35 DAS	42.9	50.3	5.3	5.8	64	46	73	90	3.17	2.64	903	762
SEd	0.8	0.9	0.1	0.1	2	2	4	4	0.2	0.12	27	15
CD (P=0.05)	1.8	2.0	0.4	0.2	6	4	NS	NS	NS	NS	56	31
Plant Density (P)												
P_1- 3.3 lakhs ha^{-1} (30 x 10 cm)	46.2	56.5	4.6	4.9	52	35	69	84	3.10	2.62	1021	896
P_2- 1.48 lakhs ha^{-1} (45 x 1 cm)	45.3	55.3	5.0	5.5	62	50	73	87	3.15	2.66	932	826
P_3- 1.1 lakhs ha^{-1} (30 x 30 cm)	41.6	52.5	5.6	5.8	77	55	73	90	3.18	2.69	889	799
P_4 0.74 lakh ha^{-1} (45 x 30 cm)	41.9	50.1	6.0	6.2	87	54	79	93	3.19	2.66	838	694
SEd	0.9	1.0	0.2	0.1	3	2	2	2	0.2	0.14	31	19
CD (P=0.05)	1.9	2.2	0.5	0.4	7	5	5	5	NS	NS	64	40

radiation and nutrients. This resulted in increased growth and yield attributes. But more number of plants in higher density (30x10 cm) might have compensated the number of capsules/plant and seeds/capsules of plants under lower density. The results confirm the finding of Patra and Mishra (2000) and Kathiresan (2002).

Interaction between plant density and nipping was also significant in case of number of capsules/ plant (Table 2). Highest number of capsules/plant was obtained with nipping at 25 DAS in the plant density of 0.74 lakh plants ha^{-1} (45 x 30cm).

Seed Yield and Economics

Nipping at 25 DAS had significant influence on the seed yield. Ramathan and Chandrasekharan (1998) and Narayanan and Narayanan (1987) reported the favourable effect of nipping on seed yield in sesame. The increase in seed yield due to nipping at 25 DAS was 13.07 and 10. 2 % over control in 2000 and 2001 respectively (Table 3).

The plant density of 3.3 lakhs plant ha^{-1} (30 x 10cm) recorded the highest seed yield and was significantly higher than other three levels of plant densities tested. The yield was reduced with

Table 2. Number of capsules plant^{-1} of sesame as influenced by nipping under varying plant densities

Plant density (P)	N_0			N_1			N_2			Mean		
	2000	2001	Average	2000	2001	Average	2000	2001	Average	2000	2001	Average
P_1	55	39	47	51	35	43	51	33	42	52	35	43
P_2	59	47	53	73	62	62.5	53	42	47.5	62	50	56
P_3	78	48	63	84	64	74	70	53	61	77	55	66
P_4	77	49	63	105	58	81	80	56	68	87	54	70.5
Mean	67	46	56.5	78	55	67	64	46	55			
		N				**P**				**N x P**		
		2000		2001		2000		2001		2000		2001
SEd		2		2		3		2		5		4
CD at 5%		6		5		7		4		12		10

corresponding reduction of plant densities. The similar results were reported by Patra and Mishra (2000) and Ghosh and Patra (1994).

Higher net return (Rs. 6904 and Rs. 4847) and benefit - cost ratio (1.70 and 1.49) were recorded in 2000 and 2001 respectively when nipping was done in sesame at 25 DAS. Plant density of 3.3 lakhs plant ha^{-1} (30 x 10 cm) gave the highest net returns (Rs. 7299 and Rs. 5174) and benefit - cost ratio (1.73 and 1.51) (Table 4). The results are in conformity with Patra (1990).

The interaction effect of nipping and plant density was found significant on yield of sesame under both the years of study. There was no response of nipping at highest plant population level. However the significant yield increase was recorded by nipping

Table 3 . Seed yield (kg ha^{-1}) of sesame as influenced by nipping under varying plant densities

Plant density (P)	N_0			N_1			N_2			Mean		
	2000	2001	Average	2000	2001	Average	2000	2001	Average	2000	2001	Average
P_1	1093	920	1006	1017	916	966	953	853	903	1021	896	958.5
P_2	875	823	849	1013	906	959	910	750	830	932	826	879
P_3	803	773	788	957	880	918	907	743	825	889	799	844
P_4	717	623	670	957	756	856	840	703	771	838	694	766
Mean	872	785	828	986	865	925	903	762	832			
		N			**P**					**N x P**		
		2000		2001		2000		2001		2000		2001
SEd		27		15		31		19		54		34
CD at 5%		56		31		64		40		112		72

at 25 DAS in all the plant density levels except in 3.3 lakhs plant ha^{-1} (30 x 10 cm) (Table 3).The yield increase by nipping at 25 DAS were 15 and 10% under 1.48 lakhs plant ha^{-1} (45 x 15 cm), 19 and 13% under 1.1 lakhs plant ha^{-1} (30 x 30 cm) and 29 and 21% under 0.74 lakh plant ha^{-1} (45 x 30 cm) in 2000 and 2001 respectively. Nipping in lower plant density increased the seed yield.

Table 4. Effect of nipping and plant density on economics of sesame cultivation

Treatment	Cost of cultivation (Rs. ha^{-1})	Gross return (Rs. ha^{-1})		Net return (Rs. ha^{-1})		B:C Ratio	
		2000	2001	2000	2001	2000	2001
Nipping (N)							
N_0- No nipping	9758	14824	13345	5066	3587	1.52	1.37
N_1- Nipping at 25 DAS	9858	16762	14705	6904	4847	1.70	1.49
N_2 -Nipping at 35 DAS	9858	15351	12954	5493	3096	1.56	1.31
Plant density (P)							
P_1- 3.3 lakhs ha^{-1} (30 x 10 cm)	10058	17357	15232	7299	5174	1.73	1.51
P_2- 1.48 lakhs ha^{-1} (45 x 15 cm)	9783	15844	14042	6061	4259	1.62	1.43
P_3- 1.1 lakhs ha^{-1} (30 x 30 cm)	9733	15113	13583	5380	3850	1.55	1.40
P_4- 0.74 lakh ha^{-1} (45 x 30 cm)	9458	14246	11798	4788	2340	1.51	1.25

From this study, it can be concluded that significant increase in seed yield of sesame could be obtained with nipping at 25 DAS. And the yield increase by nipping was more under lower level of plant density than that with higher one. Nipping of sesame is effective and economic and can compensate the seed yield of sesame to certain extent under the situation of reduced plant density.

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