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EFFECT OF TERMINAL BUD NIPPING AND SALICYLIC ACID SPRAY ON GROWTH AND YIELD OF SESAME

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ABSTRACT

An experiment was conducted at College of Agriculture, Nagpur to study the effect of terminal bud nipping and salicylic acid spray on growth and yield of sesame during *kharif* season of 2016-17. The experiment was laid out in Split Plot Design with two terminal bud nipping treatments *viz.,* N_0 (no terminal bud nipping) and N_1 (terminal bud nipping at 35 DAS) as main plot and five salicylic acid spray treatments *viz.,* S_0 (no spraying), S_1 (50 ppm spray of salicylic acid at 35 DAS), S_2 (50 ppm spray of salicylic acid at 35 and 50 DAS), S_3 (100 ppm spray of salicylic acid at 35 DAS) and S_4 (100 ppm spray of salicylic acid at 35 and 50 DAS) as sub plot treatments, and were replicated thrice. The results of the study indicated that the terminal bud nipping at 35 DAS and 100 ppm spray of salicylic acid at 35 and 50 DAS were recorded higher growth, yield and yield attributing characters viz., number of branches plant^{-1}, dry matter accumulation plant^{-1}, number of flowers plant^{-1}, number of capsules plant^{-1}, grain yield plant^{-1}, test weight and seed yield (kg ha^{-1}) but the plant height was higher in no terminal bud nipping and no salicylic acid spray. GMR, NMR and B:C ratio were significantly more in the treatments of terminal bud nipping at 35 DAS (2.48) and 100 ppm spray of salicylic acid at 35 and 50 DAS (2.71).

(Key words: Sesame, nipping, salicylic acid, growth and yield)

INTRODUCTION

Sesame (*Sesamum indicum* L.) is one of the oldest oilseed crop cultivated in India. It is called as "Queen of oil seed crop" by virtue of its excellent quality. It has been called a survivor crop, with an ability to grow where most crops fails. It ranks third in terms of total oilseed area and fourth in terms of total oil seed production in India. India is the world's largest producer of sesame with the maximum production from the largest area and highest export of sesame in the world.

Salicylic acid is a growth regulator which participates in the regulation of physiological processes in plants. Salicylic acid could be attributed to an increased carbon dioxide assimilation and photosynthetic rate and increased mineral uptake by the stressed plant under salicylic acid treatment. The promoting effect of salicylic acid on the leaf area was attributed to its important roles on activating cell division and the biosynthesis of organic foods. It stimulates flowering in a range of plants, increases flower life, controls ion uptake by roots and stomatal conductivity. The enhancing effect of salicylic acid on the availability and movement of nutrients could result in stimulating different nutrients in the leaves. Salicylic acid induced flowering by acting as a chelating agent and directly related to yield and productivity of plants (Vazirimehr and Rigi, 2014).

Besides, the productivity of sesame crop in different agro ecological zones can be increased by various agronomic practices. Terminal bud nipping in sesame is one of the important parameter for the enhancement of yield and yield contributing parameters. Nipping of terminal bud which activates the dormant lateral buds to produce more branches is an important operation for increasing sesame yield. Nipping practices efficiently alter the crop architecture which in turns increases the lateral branches that lead to greater chances for development of source to sink features in sesame (Ramanathan and Chandrashekharan, 1993). Considering the above facts present investigation was undertaken to study the effect of terminal bud nipping and salicylic acid spray on growth and yield of sesame.

MATERIALS AND METHODS

A field experiment was conducted at Agronomy farm, College of Agriculture, Nagpur during *kharif* season of 2016-17. The experiment was laid out in Split Plot Design with two terminal bud nipping treatments *viz.,* N_0 (no terminal bud nipping) and N_1 (terminal bud nipping at 35 DAS) as main plot and five salicylic acid spray treatments *viz.,* S_0 (no spraying), S_1 (50 ppm spray of salicylic acid at 35 DAS), S_2 (50 ppm spray of salicylic acid at 35 and 50 DAS), S_3 (100 ppm spray of salicylic acid at 35 DAS) and S_4 (100 ppm spray of salicylic acid at 35 and 50 DAS) as sub plot treatments, and were replicated thrice. The soil of experimental plot was clayey

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in texture, low in available nitrogen (256.52 kg ha^{-1}), medium in phosphorus (19.78 kg ha^{-1}) and organic carbon (0.60 %) and very high in available potash (406.06 kg ha^{-1}) and slightly alkaline in reaction (pH 7.98).

The crop variety AKT- 64 was used with spacing of 30 x 10 cm. Gross plot size was 6.0 m × 3.6 m and net plot size was 5.0 m × 3.0 m. Full dose of phosphorus and half dose of nitrogen were applied at sowing and remaining half dose of N was applied at 30 DAS. In order to represent the plot, five plants of sesame from each net plot were selected randomly and labeled properly. The growth attributing characters *viz.,* plant height, number of branches plant^{-1} and dry matter accumulation plant^{-1} were recorded at harvest and yield attributing characters and yield *viz.,* number of flowers plant^{-1} was recorded during flowering and number of capsules plant^{-1}, grain yield plant^{-1}, test weight and seed yield (kg ha^{-1}) were also recorded at harvest. The gross monetary and net monrtary returns along with B:C ratio were calculated. The data were analysed as per the method suggested by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Effect on growth attributes

The data pertaining to various crop growth attributes studied *viz.,* mean plant height, mean number of branches plant^{-1} and dry matter accumulation plant^{-1} at harvest as influenced by various treatments are presented in table 1.

Effect of terminal bud nipping

The plant height at harvest was significantly more in no-terminal bud nipping (N_0) compared to terminal bud nipping at 35DAS (N_1). The higher plant height recorded by treatment N_0 might be due to continuous supply of auxin to apical meristematic tissues leading to apical dominance while lesser plant height in treatment N_1 might be due to removal of the apical bud or top shoots from plant which arrests the vertical growth of plant.

Numbers of branches plant^{-1} were significantly increased due to terminal bud nipping at 35 DAS compared to no terminal bud nipping. In terminal bud nipping, the apical portion of main stem was removed, therefore; more side branches were formed below clipped portion. This might be due to dispersion of carbohydrates or food material towards the auxillary vegetative buds below nipped portion. Also, nipping of terminal bud might have activated the dormant lateral buds to produce more branches.

Total dry matter accumulation plant^{-1} was increased significantly due to terminal bud nipping at 35 DAS. The dry matter accumulation plant^{-1} depends on leaf area, photosynthetic rate and dry matter partitioning. The positive increase in number of branches plant^{-1} due to nipping might have offered higher chance for the increased production of leaves plant^{-1}, which subsequently resulted in higher dry matter accumulation plant^{-1}.

Similar results were obtained by Kokilavani *et al.* (2007), they reported that highest plant height was noticed in no clipping treatment compared to all manual terminal clipping treatments. Terminal clipping at 35 DAS recorded more number of branches plant^{-1}, dry matter production compared to other treatments in sesame. Sushma *et al*. (2014) reported that pinching at 30 and 45 DAT had reported more reduction in plant height whereas, maximum number of branches plant^{-1}, diameter of stem and number of flowers plant^{-1} were recorded with pinching at 30 DAT in chrysanthemum.

Effect of salicylic acid spray

The effect of salicylic acid spray on height of plant was found to be non-significant at harvest. Foliar spray of 100 ppm salicylic acid at 35 and 50 DAS (S_4) produced highest number of branches plant^{-1} which was significantly superior over all the treatments, followed by the treatment S_3 (100 ppm spray of salicylic acid at 35 DAS) and S_2 (50 ppm spray of salicylic acid at 35 and 50 DAS) as compared to no spraying (S_0) but 50 ppm spray of salicylic acid at 35 DAS (S_1) was found at par with no spraying (S_0).

Two sprays of 100 ppm salicylic acid (S_4) recorded the significantly highest dry matter accumulation plant^{-1}, except S_3 (100 ppm spray of salicylic acid at 35 DAS) over rest of the salicylic acid treatments and no spraying (S_0), but 50 ppm spray of salicylic acid at 35 DAS (S_1) was found at par with no spraying (S_0). Treatment S_2 (50 ppm spray of salicylic acid at 35 and 50 DAS) was also found significantly superior over treatment S_0 (no spraying). The dry matter accumulation plant^{-1} mostly depends on leaf area, photosynthetic rate and dry matter partitioning.

Vazirimehr and Rigi, (2014) reported that, the positive effect of salicylic acid could be attributed to an increased CO_2 assimilation and photosynthetic rate. The positive increase in number of branches plant^{-1} due to foliar application of salicylic acid might have offered higher chance for the increased production of leaves plant^{-1}, which subsequently resulted in higher dry matter accumulation plant^{-1}. Anitha *et al*. (2007) reported that, foliar spray of salicylic acid @ 100 ppm resulted in maximum plant height, leaf area index, specific leaf weight, net assimilation rate, leaf area duration and total dry matter production over water spray.

Interaction effect

Interaction effect between terminal bud nipping and salicylic acid spray on plant height, number of branches plant^{-1} and dry matter accumulation plant^{-1} was found non-significant at harvest.

Effect on yield attributes and yield

The data pertaining to various yield attributes and yield studied *viz.,* number of flowers plant^{-1}, number of capsules plant^{-1}, seed yield plant^{-1} (g), test weight (g) and seed yield (kg ha^{-1}) as influenced by various treatments are presented in table 1.

Effect of terminal bud nipping

Terminal bud nipping at 35 DAS resulted into significant increase in number of flowers plant^{-1} (67.7), number of capsules plant^{-1} (73.7), seed yield plant^{-1} (5.89g) and seed yield (469 kg ha^{-1}) compared to no terminal bud

nipping. The increase in yield attributes under terminal bud nipping at 35 DAS might be due to enhanced branching and dispersion of carbohydrates or food material towards auxillary vegetative buds below nipped portion which, intern, might have helped in production of more number of flowers plant^{-1}, number of capsules plant^{-1}, seed yield plant^{-1} (g) and seed yield (kg ha^{-1}) compared to no terminal bud nipping. Similar results were found by Kathiresan (1997), he revealed that manual nipping increased the number of branches and consequently improved the number of capsules plant^{-1} and seed yield in sesame. Ramanathan and Chandrashekhar (1998) reported that nipping of the terminal bud at 25 days after sowing of sesame significantly increased the seed yield. They also reported that nipping of terminal leaves activates the dormant lateral buds to produce more branches as an important factor for increased sesame yield. The effect of terminal bud nipping on test weight (g) was found to be non-significant.

Effect of salicylic acid

The treatment of 100 ppm spray of salicylic acid at 35 and 50 DAS (S_4) recorded significantly higher number of flowers plant^{-1} (76.3) as compared to all other treatment, but 100 ppm spray of salicylic acid at 35 DAS (S_3) was at par with 50 ppm spray of salicylic acid at 35 and 50 DAS (S_2), again S_2 was at par with S_1 (50 ppm spray of salicylic acid at 35 DAS) and S_1 was significant over no spraying (S_0).

Number of capsules plant^{-1} (84) was higher under treatment of S_4 (100 ppm spray of salicylic acid at 35 and 50 DAS) as compared to other treatments but S_3 (100 ppm spray of salicylic acid at 35 DAS) was at par with S_2 (50 ppm spray of salicylic acid at 35 and 50 DAS), treatment S_2 was significant over S_1 and S_0 followed by S_1 was significant over S_0 (no spraying).

100 ppm spray of salicylic acid at 35 and 50 DAS (S_4) recorded significantly higher seed yield plant^{-1} (7.02g) as compared to other treatments. But S_3 (100 ppm spray of salicylic acid at 35 DAS) treatment was at par with S_2 (50 ppm spray of salicylic acid at 35 and 50 DAS)) followed by S_2 was at par with S_1 (50 ppm spray of salicylic acid at 35 DAS). Then, S_1 was recorded significantly higher seed yield plant^{-1} as compared to S_0 (no spraying).

Significantly higher seed yield ha^{-1} (509 kg ha^{-1}) was recorded in 100 ppm spray of salicylic acid at 35 and 50 DAS as compared to all other treatments, followed by S_3, S_2 and S_1 treatments recorded higher seed yield ha^{-1} as compared to no spraying (S_0). But S_1 was at par with S_0 treatment.

This might be due to transfer of photosynthates from source to sink and increased number of branches plant^{-1} and dry matter accumulation plant^{-1}. The results are in close conformity with Heitholt *et al.* (2001). They reported that, the foliar applied salicylic acid on cotton increased the flowering, boll retention and yield compared to control. Kothule *et al.* (2003) studied the effect of growth regulators on yield attributes and yield of soybean. They found that, salicylic acid @ 200 ppm was most effective in increasing the number of pods plant^{-1}, number of grains pod^{-1}, weight of grains pod^{-1}, weight of straw plant^{-1} number of, 100 seed weight, seed yield plant^{-1} and ha^{-1} and harvest index compared to control. The effect of salicylic acid spray on test weight (g) was found to be non-significant.

Effect of Interaction

Interaction effects of terminal bud nipping and salicylic acid spray was found to be non-significant.

Economic studies

Data on gross monetary return, net monetary return and B:C ratio were affected by various treatments of terminal bud nipping and salicylic acid spray are presented in table 1.

Effect of terminal bud nipping

Perusal of the data indicated that GMR (Rs. 37620 ha^{-1}), NMR (Rs. 22495 ha^{-1}) and B:C ratio (2.48) were significantly higher in terminal bud nipping at 35 DAS compared to no nipping.

Sharma *et al.* (2003) observed that the highest gross income (Rs.24180), net income (Rs.16068) and benefit:cost ratio (1.98) was obtained when nipping was done at 50 DAS compared to control in sesame.

Singh and Devi (2006) conducted an experiment to evaluate the profitability of nipping in pea and observed that the highest net return (Rs. 13799.5 ha^{-1}) was obtained from the treatment of nipping at 30 DAS and followed by at 35 DAS (Rs.13759.5 ha^{-1}).While lowest net return of Rs. 5254.9 ha^{-1} was observed in the control.

Effect of salicylic acid spray

Application of 100 ppm spray of salicylic acid at 35 and 50 DAS (S_4) recorded significantly higher value of GMR (Rs. 40720 ha^{-1}) and NMR (Rs. 25715 ha^{-1}) as compared to other treatments, followed by 50 ppm spray of salicylic acid at 35 and 50 DAS (S_2) as recorded higher GMR and NMR as compared to S_1 (50 ppm spray of salicylic acid at 35 DAS) and S_0 (no spraying). But, S_3 (100 ppm spray of salicylic acid at 35 and 50 DAS) treatment was at par with S_2 (50 ppm spray of salicylic acid at 35 and 50 DAS) followed by S_1 (50 ppm spray of salicylic acid at 35 DAS) was at par with S_0 (no spraying) regarding GMR and NMR.

Higher B:C ratio (2.71) was recorded under 100 ppm spray of salicylic acid at 35 and 50 DAS (S_4) as compared to all other salicylic acid treatments, followed by 100 ppm spray of salicylic acid at 35 DAS (S_3), 50 ppm spray of salicylic acid at 35 and 50 DAS (S_2) and 50 ppm spray of salicylic acid at 35 DAS (S_1) as compared to control.

Kaur *et al.* (2015) showed that the higher net returns (Rs. 27579 ha^{-1}) were recorded under salicylic acid spray at 50 mg L^{-1} compared to water spray (23037 Rs. ha^{-1}). Similarly higher B:C ratio were recorded under salicylic acid spray at 50 mg L^{-1} (2.08) as compared to water spray (1.74).

Effect of Interaction

Interaction effects of terminal bud nipping and salicylic acid spray on economics was found to be non-significant.

Table 1. Effect of terminal bud nipping and salicylic acid spray on growth, yield contributing parameters , yield and economics of sesame

Treatments	Growth attributes			Yield attributes and yield					Economics		
	Plant height (cm) at harvest	No. of branches plant^{-1} at harvest	Dry matter plant^{-1} (g) at harvest	No. of flowers plant^{-1}	No. of capsules plant^{-1}	Seed yield plant^{-1} (g)	Test weight (g)	Yield (kg ha^{-1})	GMR	NMR	B:C ratio
Terminal bud nipping (N)											
N_0- No terminal bud nipping	116.3	3.53	27.2	56.6	61.5	4.49	2.89	367	29360	15415	2.10
N_1- Terminal bud nipping at 35 and 50 DAS	109.2	4.67	32.1	67.7	73.7	5.89	2.98	469	37520	22495	2.48
S E (m) ±	1.3	0.13	0.9	2.5	0.3	0.31	0.04	10	823	823	-
C D at 5%	5.7	0.57	3.9	10.9	1.3	1.35	—	44	3543	3543	-
Salicylic acid spray (S)											
S_0- No spraying	120.3	3.33	23.9	47.5	49.2	3.25	2.88	341	27280	13515	1.98
S_1- 50 ppm spray of salicylic acid at 35 DAS	115.1	3.67	25.2	59.6	61.8	4.83	2.88	377	30160	15815	2.10
S_2- 50 ppm spray of salicylic acid at 35 and 50 DAS	109.9	4.17	29.1	62.2	69.3	5.03	2.88	436	34880	19955	2.34
S_3-100 ppm spray of salicylic acid at 35 DAS	110.6	4.17	32.9	65.6	74.3	5.82	2.91	428	34240	19855	2.38
S_4-100 ppm spray of salicylic acid at 35 and 50 DAS	107.9	5.17	34.6	76.3	84.0	7.02	3.13	509	40720	25715	2.71
S E (m) ±	6.8	0.21	1.1	2.5	3.0	0.49	0.09	20	1653	1652	-
C D at 5%	–	0.46	2.4	5.3	6.4	1.05	–	43	3506	3504	-
Interaction (N X S)											
S E (m) ±	10.7	0.83	2.1	4.9	3.1	0.16	0.15	34	2737	2735	-
C D at 5%	–	–	–	–	–	–	–	–	–	–	-
GM	112.7	4.10	29.1	62.3	67.6	5.19	2.89	418	33490	19005	1.96

REFERENCES

Anitha, R., N. Sritharan, M. Vanangamudi and P. Jeyakumar, 2007. Effect of certain plant growth regulators on growth and yield of sunflower. Plant Archives. **7** (1): 309-312.

Gomez, K. A. and A. A. Gomez, 1984. Statistical Procedure for Agril. Research. An International Rice Research Institute book. A Wiley-Interscience Publ., New York (U.S.). :99-101.

Heitholt, J. J., J. H. Schmidt and J. E. Mulrooney, 2001. Effect of foliar applied salicylic acid on cotton flowering, boll retention and yield. J. Mississippi Academy Sci. **46** (2): 105-109.

Kathiresan, G. 1997. Effect of growth regulators and clipping on sesame growth and yield in different seasons. Sesame and Safflower Newsletter. No. 14.

Kaur, J., H. Ram, B.S. Gill and J. Kaur, 2015. Agronomic performance and economic analysis of soybean in realation to growth regulating substances in Punjab, India. Legume Res. **38**(5) : 603-608

Kokilavani, S., R. Jagannathan, R. Selvaraju and N. Thavaprakash, 2007. Influence of terminal clipping on growth and yield of sesame varieties. Asian J. Agri. Res. **1** (3): 142-145.

Kothule, V. G., R. K. Bhalerao and T. H. Rathod, 2003. Effect of growth regulators on yield attributes, yield and correlation coefficients in soybean. Annals Plant Physiol. **17** (2): 140-142.

Ramanathan, S. P. and B. Chandrashekharan, 1998. Effect of nipping plant geometry and fertilizer on summer sesame. Indian J. Agron. **43** (2): 329-332.

Sharma, A., M. P. Potdar, B. T. Pujari and P. S. Dharmaraj, 2003. Studies on response of pigeon pea to canopy modification and plant geometry. Karnataka J. Agric. Sci. **16** (1): 1-3.

Singh, M. S. and Kh. S. Devi, 2006. Profitability of nipping in cultivation of pea-An indigenous agro-technique in Manipur. Indian J. Agron. **51** (3): 206-208.

Sushma, S., D. M. Panchbhai and S. Badge, 2014. Effect of pinching and cycocel on growth and flower yield of annual chrysanthemum. J. Soils and Crops. **24** (2): 338-340.

Vazirimehr, M.R. and K. Rigi, 2014. Effect of salicylic acid in agriculture. Int. J. Plant, Animal and Envir. Sci. :291-296 (http://www.rroij.com).

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