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Study on effect of nipping and foliar spray on seed yield of sesame var. TMV 7.

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Abstract
Sesame (*Sesamum indicum* L.) (2n =26), is a well-known oil seed crop that belongs to Pedaliaceae family. The lower production and productivity of sesame were due to its cultivation in rainfed areas of marginal and sub-marginal lands with poor management practices. The growing sequence of sesame is indeterminate on which leaves, flowers and seeds are being produced as long as the favourable weather persists. This favours many late formed capsules which are usually immature at harvest and stage of capsule maturity at harvest highly influences seed yield, dormancy and germination. Apical bud cutting (otherwise called as nipping) is known to alter the source-sink relationship by arresting the vegetative growth and hastening the reproductive phase. The stress created by pinching must be compensated with additional nutrient supply. Foliar application of plant growth regulators enables a rapid phenotypic change in plants. Hence, the present study was undertaken to study the performance of sesame under different time of nipping practices followed by foliar application on seed yield and quality

Keywords: Sesame, indeterminate, nipping, source-sink relationship, foliar application

Introduction
Sesame (*Sesamum indicum* L.) (2n =26), is a well-known oil seed crop that belongs to Pedaliaceae family. It is referred as 'Queen of Oilseeds' because of its uses as condiments and ingredients in manufacture of paints, soaps, cosmetics, perfumes and insecticides (Langhan and Wiemers, 2006). The lower production and productivity of sesame were due to its cultivation in rainfed areas of marginal and sub-marginal lands with poor management practices.

Managing the crop geometry for manipulating the seed yield in crops like sesame with indeterminate growth habit is a challenging task. The growing sequence of sesame is indeterminate on which leaves, flowers and seeds are being produced as long as the favourable weather persists. This favours many late formed capsules which are usually immature at harvest and stage of capsule maturity at harvest highly influences seed yield, dormancy and germination. Apical bud cutting is known to alter the source-sink relationship by arresting the vegetative growth and hastening the reproductive phase. Hence, arresting late formed flowers by nipping of main stem and side branches not only avoid the late formed capsules but also promote the efficient source sink relations and thus seed yield and quality will be maximized.

The stress created by pinching must be compensated with additional nutrient supply. Foliar application is endorsed with the benefit of quick and effectual utilization of nutrients, purging of losses through leaching and fixation and regulating the uptake of nutrient in crop plants (Manonmani and Srimathi, 2009) [14]. Foliar application of plant growth regulators enables a rapid phenotypic change in plants. Brassinosteroids are the endogenous plant growth promoting hormones that act on plant development and affect numerous physiological processes at low concentrations (Zullo and Adam, 2002) [29]. Senescence is a developmentally regulated and genetically programmed process that may also be mediated by brassinosteroids. (Vardhini and Rao, 2002) [27] Like brassinolides, salicylic acid (SA) a phenolic compound also participates in the regulation of physiological processes in plants such as glycolysis, flowering and heat production in thermogenic plants (Khan *et al.*, 2003) [12].

Hence, the present study was undertaken to study the performance of sesame under different time of nipping practices followed by foliar application on seed yield and quality.

Materials and Methods
The field experiment was conducted during 2018-19 to determine the effect of nipping and

foliar spray on seed yield and quality in sesame *var*. TMV 7 at Department of Seed Science
and Technology, Agricultural College and Research Institute, TNAU, Madurai. Nipping was done at 65 (N_1) and 70 (N_2) days after sowing and the crop without nipping served as control (N_0). Foliar spray of various growth regulators like Benzyl Amino Purine @ 5 ppm (F_1), Brassinolide @ 0.5 ppm (F_2), Triacontanol @ 100 ppm (F_3), Salicylic acid @ 20 ppm (F_4) along with control (F_0) were given at 45 and 65 DAS. Various observations like plant height (cm), number of branches per plant, number of flowers per plant, number of capsules per plant, capsule weight (g), seed yield per capsule (g), 1000 seed weight (g), seed yield per plant (g) and seed yield per plot (g) were recorded to evaluate the effect of nipping and foliar application.
The data obtained from various observations were analysed by the 'F' test of significance following the methods described by Rangaswamy (2002) [19]. The critical differences (CD) were calculated at 5 per cent probability level. The data were tested for statistical significance. If the F test is non-significant it was indicated by the letters NS.

Results & Discussion
In sesame crop it was found that nipping of the terminal bud activates the dormant lateral buds for producing more branches and ultimately the seed yield was increased. Nipping changes both morphology and physiology of plants. Between nipping treatments higher plant height was recorded in N_0 (123.2 cm) than N_1 (98.1 cm) at the time of harvest (Table 1). Nipping recorded reduction in plant height due to the fact that sesame is having the indeterminate growth habit and as such plants grow to their original height without reduction in un-nipped plants. This is in line with the findings of Obasi and Msaakpa (2005) [17] in cotton and Aslam *et al*. (2008) [3] in chick pea. Among the foliar treatments, the maximum plant height was registered in F_2 (115.9 cm) at harvest. Foliar application of nutrient improved plant height and it might be due to ready absorption of nutrients through leaves, enhancing the physiological process (Robredo *et.al.* 2007) [22]. It is assumed that brassinolide induced synthesis of both IAA and GA in plant body and increase in plant height was probably due to their cumulative action.
Nipping results in arresting of vertical growth and has stimulated the axillary buds and thus improved the side branches. More number of branches (9.3) was recorded with early nipping or nipping at 65 DAS compared to without nipping (8.4). Similar results were observed by Kathiresan and Duraisamy (2001) [11] and Arul (2014) [2] in daincha. Foliar application of Brassinolide increased the number of branches (10.7) further than all other foliar spray treatments. Minimum number of branches was recorded in control or no spray (7.4).
In the present study though nipping at 70 DAS had minimum number of branches, recorded significantly higher values of for all yield parameters *viz*., capsule weight (0.96 g), weight of seeds per capsule (0.145 g) and 1000 seed weight (2.885 g) over control (0.81 g, 0.127 g, 2,827 g respectively). The results corroborate with the findings of Lakshmi *et al.* (1995) [4], Bhattacharjee and Mitra (1999) [5], Kathiresan and Duraisamy (2001) [11] and Marie *et al.* (2007) [15] who mentioned a significant increase in yield attributes by practice of apical bud nipping in different crops.
Nipping at early stages had a profound effect on number of flowers and it was maximum at 65 DAS whereas nipping at later stages was on par with control due to established crop geometry at the time of nipping. Increased number of flowers paves way for the increased seed yield with plants given with nipping at later stages. In all the foliar treatments, there was a gradual increase in number of flowers per plant and number of capsules per plant (150 and 114.9) over control (134 and 101.1 respectively) (Figure 1). The increased number of flowers and capsules were due to the effect of salicylic acid on physiological process such as cell division, ion uptake, enzyme activities, photosynthetic activity and source-sink regulation. The data is in accordance with the findings of Kaur *et al.* (2015) in soybean.
The significant higher seed yield recorded in nipped plants may also be attributed to diversion of photosynthates and metabolites produced by leaves to strong carbohydrate sinks that is capsules, when compared to apical meristem in un-nipped plants. Nipping increased the seed yield per plant (13.34 g) and the increase was 11 percent over without nipping (11.98 g) (Table 2). This is in agreement with the findings of Kathiresan and Duraisamy (2001) [11], Gopal (2012) [6] and Arul (2014) [2] in daincha; Venkadachalam (2003) [28], Singh *et al.* (2013) [25] in sesame and Reddy *et al.* (2009) [20] in cowpea.
Foliar application of PGR had further improvement on plant photosynthesis and it was evident when plants were sprayed with brassinolide or salicylic acid. Brassinolide sprayed twice at 45 and 60 DAS significantly increased the yield and yield attributing characters like capsule weight, seed yield per capsule, 1000 seed weight and seed yield per plant. The increase in yield was 19 per cent over the control, which might be due to increase in translocation of photosynthates with brassinolide treatment. Significant increase in DNA, RNA and protein in BR treated mung bean and beans resulted in transcription and replication leading to increase in enzyme activities during tissue growth (Kalinich *et al.* 1985) [9]. Kamal *et al.* (1995) [10] reported that BR application increased the seed and pod numbers in soybean. The increase in yield due to the application of Homobrassinolide (HBR) and Epibrassinolide (EBR) was in consonance with the findings of Ikekawa and Zhao (1991) [7], Ramraj *et al*. (1997) [18], Talaat *et al*. (2010) [26] and Ali *et al*. (2008) [1].
The increased 1000 seed weight from the treated plants might be attributed to increased mobilization of metabolites to the reproductive sinks. Cutting might have increased the supply of nitrogen and other essential elements and in turn increases the production of carbohydrates for the reproductive phase (Mathew and Karikari, 1995) [16].
In the present investigation, the plant height, number of branches, number of flowers and capsules at various stages were not significantly influenced by the combined effect of nipping and foliar sprays. However, the plant height was relatively more at all the stages of growth in non-nipped plants with all the hormonal sprays compared to control as expected, while number of branches were more at harvest in nipped plants with all the foliar sprays of the growth regulators which was also expected with these treatments, since nipping results in arresting vertical growth and stimulates shoot axillary buds. The results are in accordance with the earlier reports made by cfv (2003) in coriander and Reddy (2005) [21] in cowpea. Over all, the seed yield and yield parameters were not much influenced due to interaction effects of nipping and hormonal spray. However, among the interactions, it was evident that nipped plants sprayed with hormones had positive influence on yield compared to non-nipped plants without hormonal spray. Similarly, the various seed yield traits were also higher in nipped plants sprayed

with growth hormones.

Hence Sesame plants may be nipped at 70 days after sowing to increase the seed yield and yield attributing parameters. With addition to nipping, foliar application of growth regulators at flowering particularly with brassinolide @ 0.5 ppm evolved additional increase in seed yield.

Table 1: Effect of nipping and foliar spray on growth parameters in sesame var. TMV 7.

	Plant height (cm)				No. Of branches / plant				No. Of flowers / plant			
	N_0	N_1	N_2	MEAN	N_0	N_1	N_2	MEAN	N_0	N_1	N_2	MEAN
F_0	115.1	90.2	98.6	101.3	6.9	7.6	7.6	7.4	139.4	126.7	136.5	134.2
F_1	118.2	94	103.3	105.2	7.4	8.2	8	7.9	143.0	131.0	140.7	138.2
F_2	131.5	105.5	110.6	115.9	10.1	11.2	10.7	10.7	148.4	135.1	146.2	143.3
F_3	127.8	101.4	108.6	112.6	9.3	10.1	9.7	9.7	155.4	142.3	153.3	150.3
F_4	123.6	99.5	106.3	109.8	8.3	9.4	8.8	8.8	146.4	135.0	144.8	142.0
MEAN	123.2	98.1	105.5		8.4	9.3	9.0		146.5	134.0	144.3	
	F	N		FXN	F	N		FXN	F		N	FXN
Sed	1.4	1.0		2.4	0.1	0.1		0.2	1.5		1.1	2.6
CD (P=0.05)	2.9	2.2		NS	0.2	0.2		NS	3.1		2.4	NS

Table 2: Effect of nipping and foliar spray on capsule and seed characters of sesame var. TMV 7.

\	Capsule weight (g)				Seed yield / capsule (g)				1000 seed weight (g)			
	N_0	N_1	N_2	MEAN	N_0	N_1	N_2	MEAN	N_0	N_1	N_2	MEAN
F_0	0.76	0.83	0.90	0.83	0.123	0.126	0.137	0.129	2.805	2.834	2.856	2.832
F_1	0.78	0.85	0.93	0.85	0.125	0.131	0.142	0.133	2.814	2.854	2.875	2.848
F_2	0.87	0.95	1.01	0.94	0.133	0.144	0.151	0.143	2.852	2.883	2.908	2.881
F_3	0.84	0.93	0.99	0.92	0.129	0.14	0.148	0.139	2.840	2.865	2.899	2.868
F_4	0.81	0.90	0.95	0.89	0.127	0.136	0.145	0.136	2.826	2.851	2.889	2.855
MEAN	0.81	0.89	0.96		0.127	0.135	0.145		2.827	2.857	2.885	
	F		N	FXN	F		N	FXN	F		N	FXN
Sed	0.01		0.01	0.02	0.004		0.003	0.008	0.012		0.009	0.021
CD (P=0.05)	0.02		0.02	NS	0.009		0.007	NS	0.025		0.019	NS

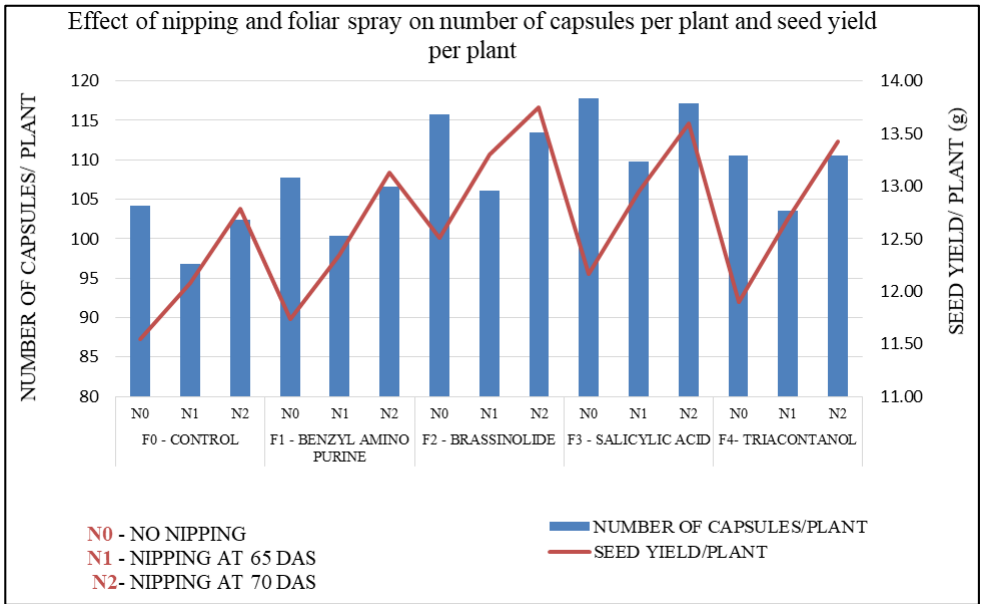

Fig 1: Effect of nipping and foliar spray on number of capsules per plant and seed yield per plant in sesame var. TMV 7.

References

1. Ali B, Hasan SA, Hayat S, Hayat Q, Yadav S, Fariduddin Q, Ahmad A. A role for brassinosteroids in the amelioration of aluminium stress through antioxidant system in mungbean (*Vigna radiata* L. Wilczek). Environmental and Experimental Botany. 2008; 62:153-159.
2. Arul A. Effect of topping and foliar nutrition on seed yield and quality of daincha *(Sesbania aculeata* (Wild.) Pers.,). M.Sc., (Ag.) Thesis, TNAU, AC & RI, Madurai, 2014.
3. Aslam M, Khalil AH, Himayatullah K, Ayaz M, Ejaz M, Arshad M. Effect of available soil moisture depletion levels and topping treatments on growth rate and total dry biomass in chickpea. J Agri. Res. 2008; 46(3):229-243.
4. Bharatha Lakshmi M, Venku Naidu M, Srinivasulu Reddy D, Venkatareddy C. Effect of time of sowing and topping on seed yield of roselle (*Hibisuss abdariffa*). Indian J Agron. 1995; 40(4):682-685.
5. Bhattacharjee AK, Mitra BN. Jute seed productivity and its quality as influenced by suppression of apical dominance. In: Palit *et al* (Eds) Jute and Allied Fibres: Agriculture and Processing, CRIJAF Publication, India, 1999, 177-185.
6. Gopal M. Influence of topping and nutrient management practices on growth and seed yield of daincha (*Sesbania*

aculeata (wild.) Pers). M.Sc., (Ag.) Thesis, TNAU, AC & RI, Killikulam, 2012.
7. Ikekawa N, Zhao YJ. Application of 24- epibrassinolide in agriculture. In: Cutler, H.G., T. Yokota, and G. Adam. Eds. Brassinosteroids: Chemistry, Bioactivity and Application. ACS Symposium. Ser 474. Washington, DC: American Chemical Society, 2008, 1991, 280-291.
8. Iyyannagouda S. Influence of spacing, nutrition, pinching and hormones on plant growth, seed yield and quality of coriander (*Coriandrum sativum* L.). M.Sc. (Agri.) Thesis, Univ. of Agric. Sci., Dharwad, Karnataka (India), 2003.
9. Kalinich JE, Mandava NB, Todhunter JE. Relationship of nucleic acid metabolism to brassinolide-induced responses in bean. Journal of Plant Physiology. 1985; 125:345-354.
10. Kamal MR, Garmabi H, Hozhabr S, Arghyris L. The development of laminar morphology during extrusion of polymer blends, Polymer Engineering Science. 1995; 35:41-51.
11. Kathiresan G, Duraisamy K. Effect of clipping and diammonium phosphate spray on growth and seed yield of dhaincha (*Sesbania aculeata*). Indian J Agron. 2001 46(3):568-572.
12. Khan W, Prithviraj B, Smith. Photosynthetic responses of corn and soybean to foliar application of salicylates. J Plant Physiol. 2003; 160:485-492.
13. Langham R, Smith G, Wiemers T, Riney J. Sesame Production Information. SESACO, Sesame Coordinators, 2006 Southwest Sesame Grower's Pamphlet, www, 2006.
14. Manonmani V, Srimathi. Influence of Mother Crop Nutrition on Seed Yield and Quality of Black gram. Madras Agric. J 2009; 96(1-6):125-128.
15. Marie IA, Abduljabbar Ihsan, Shukri H Salih. Effect of sowing date, topping and some growth regulators on growth, pod and seeds yield of Okra (*Abelmoschus esculentus*). African Crop Science Conference Proceedings. 2007; 8:473-478.
16. Mathew IP, Karikari SK. Horticulture: Principles and Practices. Published by Macmillan Education Limited, London. 1995; 7:63-67.
17. Obasi MO, Msaakpa TS. Influence of Topping, Side Branch Pruning and Hill Spacing on Growth and Development of Cotton (*Gossypium barbadense* L.) in the Southern Guinea Savanna Location of Nigeria. J of Agric. and Rural Development in the Tropics and Subtropics. 2005; 106(2):155-165.
18. Ramraj VM, Vyas BN, Godrej NB, Mistry KB, Swami BN, Singh N. Effects of 28-homobrassinolide on yields of wheat, rice, groundnut, mustard, potato and cotton. Journal of Agricultural Science. 1997; 128:405-413.
19. Rangaswamy R. A text book of Agric. Statistics: 244-433. New Age International Ltd., India, 2002.
20. Reddy BP, Ninganur T, Chetti MB, Hiremath SM. Effect of growth retardants and nipping on chlorophyll content, nitrate reductase activity, seed protein content and yield in cowpea (*Vigna unguiculata* L.). Karnataka J Agric. Sci. 2009; 22(2):289-292.
21. Reddy P. Effect of growth retardants and nipping on growth and yield parameters in cowpea (*Vigna unguiculata* L.). M.Sc. (Agri.) Thesis, Univ. of Agric. Sci., Dharwad, Karnataka (India), 2005.
22. Robredo A, Pérez-López U, González-Moro MB, Lacuesta M, Mena-Petite A, Muñoz Rueda A. Elevated CO2 alleviates the impact of drought on barley improving water status by lowering stomatal conductance and delaying its effects on photosynthesis. Environ. & Exp. Bot. 2007; 59(3):252-263.
23. Sesaco.net/2006WSesameGrowerPamphlet.pdf.
24. Sharma K, Kaur S. Effect of Salicylic acid, caffeic acid and light intensity on yield and yield contributing parameters in soybean [*Glycine max* (L.) Merrill]. Environment and Ecology. 2003; 21(2):332-335.
25. Singh B, Satyavir Singh, Vinod Kumar, Yogender Kumar. Nitrogen and nipping schedule for higher productivity of sesame (*Sesamum indicum* L.) on aridisols of South - Western Haryana. Haryana J Agron. 2013; 29(1 & 2):1-5.
26. Talaat NB, Abdallah AM. Effect of 28-homobrassinolide and 24-epibrassinolide on the growth, productivity and nutritional value of two faba bean (*Vicia faba* L.) cultivars. Archives of Agronomy and Soil Science. 2010; 56(6):649-669.
27. Vardhini BV, SSR Rao. Acceleration of ripening of tomato pericarp discs by brassinosteroids. Phytochem. 2002; 16:843-847.
28. Venkadachalam K. Response of sesame cultivars to crop geometry and clipping managememt in tail end of Cauvery delta zone. M.Sc., (Ag.) Thesis, TNAU, Coimbatore, 2003.
29. Zullo MAT, Adam G. Brassinosteroids phytohormones-structure, bioactivity and applications. Brazilian J of Plant Physiol. 2002; 14:143-181.