The Pharma Innovation Journal 2021; 10(5): 518-521

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; 10(5): 518-521

www.thepharmajournal.com
Received: 25-03-2021
Accepted: 27-04-2021

S Kavivel
Department of Crop Physiology, TNAU, Coimbatore, Tamil Nadu, India

S Srinivasan
Regional Research Station, TNAU, Aruppukottai, Coimbatore, Tamil Nadu, India

S Vincent
Water Technology Centre, TNAU, Coimbatore, Tamil Nadu, India

T Selvakumar
Department of Oilseeds, TNAU, Coimbatore, Tamil Nadu, India

Corresponding Author:
S Kavivel
Department of Crop Physiology, TNAU, Coimbatore, Tamil Nadu, India

Influence of nipping, application of growth retardants, phosphorous and VAM on growth and yield of sesame (*Sesamum indicum* L.)

S Kavivel, S Srinivasan, S Vincent and T Selvakumar

Abstract
Sesame (*Sesamum indicum* L.) (2n =26), is one of the important edible oilseed crops cultivated from the olden days which belongs to the family Pedaliaceae. Mainly the sesame is grown in rainfed areas of marginal and sub-marginal lands with poor management practices are the reason for lower production and productivity. It possesses an indeterminate growing nature. Since the late formed capsule is being immature at the harvesting stage which affects the yield and quality of the sesame. Nipping is well known to alter the source-sink relationship by arresting the vegetative growth and hastening the reproductive phase. Hence, the present study was undertaken to study the performance of sesame under different time of nipping practices, foliar application of growth retardants, soil application of phosphorous and VAM on seed yield and quality.

Keywords: sesame, nipping, growth retardants, phosphorous, VAM source-sink relationship, yield

Introduction
Sesame is an important edible oilseed crop next to the mustard and groundnut in India. It is referred to as a "queen of oilseed crop" and the first oil consumed by a human (Prasad *et al*., 2013) [12]. Sesame is highly tolerant to drought or any other environmental variation where other crops may fail to grow (Raghav *et al*., 1990) [13]. It is extensively cultivated in the states of Gujarat, West Bengal, Tamil Nadu, Maharashtra, Karnataka, Rajasthan and Madhya Pradesh. Compared to other oilseed crop sesame has a higher concentration of oil content (42-50%), protein (25%) and carbohydrate (16-18%) (Miah *et al.*, 2015) [9]. The sesame oil is highly stable to rancidity. It being a rich source of quality edible oil enriched with proteins, vitamins, amino acids and antioxidants like sesamin, sesamolin and sesamol (Vasanth *et al.*, 2019) [17]. Sesame is grown on more than 8.0 million hectares across the globe with production of 5.0 million tonnes and productivity of 565 kg/ha (Anonymous, 2016-17). India is the largest producer of sesame in the world. It is cultivated on 20 lakh hectares in country with total production of 8.11 lakh tonnes. The average productivity of the crop is 430.5 kg/ha (Anonymous, 2016-17). 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 the stage of capsule maturity at harvest highly influences seed yield, dormancy and germination. Apical bud cutting, application of growth retardants, phosphorous and vesicular-arbuscular mycorrhiza (VAM) are known to alter the source-sink relationship and there by sesame yield and quality will be maximized.

Materials and Method
A field experiment was conducted during 2020 to determine the influence of nipping, application of growth retardants, phosphorous and VAM on growth and yield of sesame *var.* TMV 7 at Eastern block farm (11° N latitude, 77° E longitude; 426.7 MSL), Tamil Nadu Agricultural University, Coimbatore. Sesame variety TMV 7 seeds were used. Nipping was done at 30 (T_2) and 60 (T_3) days after sowing (DAS) and the crop without nipping served as control (T_1). Foliar spray of growth retardant such as, mepiquate chloride @ 100ppm (T_4), mepiquate chloride @ 150ppm (T_5), mepiquate chloride @ 200ppm (T_6), chlormequat chloride

@ 50 ppm (T_7), chlormequat chloride @ 100 ppm (T_8) and chlormequat chloride @ 150 ppm (T_9) were given at 30 DAS and soil application of Phosphorous (150% RDP (23 kg ha $^{-1}$, 35: 23: 23)) (T_{10}) and VAM (T_{11}) at the time of sowing. Various observations like plant height (cm), number of branches per plant at harvest, number of capsules per plant, Leaf area index, 1000 seed weight (g) and yield per plant were recorded at various stage such as vegetative (30 DAS), reproductive early bloom (45 DAS), reproductive mid bloom (65 DAS) and physiological maturity (90 DAS) were recorded.

The data obtained from the field experiment were analysed by the 'F' test of significance following the methods described by Rangaswamy (2002) [14]. The critical differences (CD) were calculated at 5 per cent probability level.

Result and Discussion

Growth attributes

The growth attributes *viz*., plant height, number of branches per plant and leaf area index were significantly influenced by nipping, foliar spraying of growth retardant, and soil application of phosphorous and VAM (Table 1, 2 & 3). Foliar application of Mepiquate Chloride @ 200 ppm at 30DAS recorded the maximum reduction in plant height (123.73) in comparison with control at physiological maturity. Mepiquat chloride has been found to reduce stem elongation reported by (Mccarty *et al*., 1985) [8].

Terminal nipping at 30 DAS (T_2) recorded a greater number of branches per plant (9.47) with a high leaf area index (1.50) at physiological maturity in compared to the other treatment. This is in line with the findings of Vincent *et al.*, (2019) [3] in sesame. The leaf area index had declined from the early stages to later stages. The declination of leaf area index at later stages were also reported by (Saren *et al.*, 2004) [15]. In this study, it was also recorded that nipping of the terminal bud resulted in reduction of plant height (104.9 cm) compared to other treatment. The similar result also reported by Obasi and Msaakpa (2005) [10] in cotton.

Soil application of phosphorous at the time of sowing found to increase the plant height (127.7 cm) and number of branches (5.70) compared to the control at the physiological maturity stage as shown in table 1&2. The similar result recorded in the foliar application of phosphorous by Kiruthika *et al.*, (2019) [5] in sesame.

Table 1: Treatment effect on plant height (cm) in sesame var. TMV 7

Treatments	Plant height (cm)			
	Vegetative stage	Reproductive stage (Early bloom)	Reproductive stage (Mid bloom)	Physiological maturity
T1	30.6	59.5	83.3	121.2
T2	29.6	49.3	71.8	104.9
T3	29.9	59.5	78.8	118.8
T4	31.6	55.9	78.9	115.9
T5	31.7	57.7	78.4	113.2
T6	30.1	56.9	77.8	113.1
T7	31.5	56.9	80.3	117.3
T8	32.2	56.5	79.9	117.7
T9	31.6	55.9	78.9	115.9
T10	31.8	63.9	86.9	127.7
T11	32.0	61.0	84.6	125.3
Mean	31.1	57.5	80.0	117.4
SEd	1.032	2.523	3.155	3.188
CD (0.05)	NS	5.299	6.627	6.7

Table 2: Treatment effect on number of branches in sesame var. TMV 7

Treatments	Number of branches			
	Vegetative stage	Reproductive stage (Early bloom)	Reproductive stage (Mid bloom)	Physiological maturity
T1	2.33	5.30	5.30	5.30
T2	2.73	9.47	9.47	9.47
T3	2.34	5.32	5.32	5.32
T4	2.10	5.80	5.80	5.80
T5	2.70	5.97	5.97	5.97
T6	2.83	6.20	6.20	6.20
T7	2.20	5.20	5.20	5.20
T8	2.40	5.33	5.33	5.33
T9	2.30	5.63	5.63	5.63
T10	3.40	5.70	5.70	5.70
T11	3.30	7.70	7.70	7.70
Mean	2.65	6.19	6.19	6.19
SEd	0.049	0.15	0.15	0.15
CD (0.05)	2.249	2.965	2.965	2.965

Table 3: Treatment effect on Leaf Area Index in sesame var. TMV 7

Treatments	Leaf Area Index			
	Vegetative stage	Reproductive stage (Early bloom)	Reproductive stage (Mid bloom)	Physiological maturity
T1	0.80	1.21	1.43	1.23
T2	0.80	1.45	1.80	1.50
T3	0.80	1.23	1.43	1.17
T4	0.83	1.50	1.60	1.37
T5	0.83	1.53	1.73	1.41
T6	0.83	1.50	1.77	1.43
T7	0.80	1.26	1.43	1.17
T8	0.83	1.27	1.47	1.20
T9	0.83	1.30	1.53	1.23
T10	0.84	1.51	1.84	1.13
T11	0.84	1.31	1.51	0.89
Mean	0.82	1.36	1.59	1.25
SEd	0.033	0.027	0.037	0.032
CD (0.05)	NS	0.057	0.078	0.067

Yield and Yield Attributes

The yield attributes *viz*., the number of capsules per plant, 1000 seed weight and yield per plant are the most critical parameters for the yield of sesame, which was found to be significantly influenced by terminal nipping, application of phosphorous and mepiquate chloride spray (Table 4). Terminal nipping at 30 DAS registered the higher number of capsules per plant (137.7) and yield per plant (24.4 g). The foliar application of mepiquate chloride @ 200 (T3) at 30 DAS resulted in the higher number of capsules (131.3) in comparison with soil application of 150% RDP phosphorous (T5).

Table 4: Treatment effect on number of capsules, yield plant^{-1} (g) and test weight (g) of sesame var. TMV7

Treatment	Number of capsules	Yield/plant (g)	Test weight (g)
T1	127.3	10.2	2.56
T2	137.7	24.4	3.06
T3	124.0	22.0	3.56
T4	129.3	16.8	2.98
T5	130.3	17.8	3.10
T6	131.3	19.3	3.30
T7	120.0	14.4	2.88
T8	121.7	15.3	3.00
T9	122.7	16.6	3.20
T10	127.7	20.5	3.45
T11	125.3	18.6	3.40
Mean	127.0	17.8	3.14
SEd	2.308	0.648	0.072
CD (0.05)	4.848	1.362	0.152

In the present study, nipping at 60 DAS (T_3) had a minimum number of branches and recorded significantly higher values of test weight (3.56 g) among all the treatments. this increase of test weight might be due to the transfer of photoassimilates to the developing capsule by diverting the photoassimilates which is being supplied to the newly formed flower and axillary bud. The results corroborate with the findings of Marie *et al*., (2007) [7].

In terminal nipping practice, the apical bud is nipped, hence the utilization of the photosynthates by the crop for lateral branches could be higher, and this might be the reason for higher yield attributes and sesame seed yield, which was also reported by Singh *et al.*, (2013). Similarly, Dhuary and Ghosh (2009) [2] stated that arresting the terminal growth through terminal nipping mainly activated the lateral dormant buds and it would have balanced source to sink significantly, which increased the number of capsules per plant and sesame seed yield. Sarkar and Pal (2005) [16] opined that terminal nipping is a vital operation which activates the dormant lateral buds to produce a higher number of branches per plant, which could be attributed to an overall improvement in plant vigour leading to initiation of more significant number of branches and ultimately better manifestation of yield attributes in sesame. The clipping practice might have effectively altered the crop architecture, which in turn increased the lateral branches that led to greater ability for development of source and sink features in sesame (Kokilavani *et al*., 2007) [6].

Conclusion

The nipping at 30 DAS in sesame were found to have profound impact on increasing the productivity of sesame. Nipping at 60 DAS practice improved the portioning efficiency of translocating assimilates to the sink organ of sesame, thus resulted in higher test weight.

Reference

1. Bharatha Lakshmi M, Venku Naidu M, Srinivasulu Reddy D, Venkatareddy C. Effect of time of sowing and topping on seed yield of roselle (*Hibiscus sabdariffa*). Indian J Agron 1995;40(4):682-685
2. Duary B, Ghosh AK. Effect of Nipping on Productivity and Economics of Summer Sesame (*Sesamum indicum* L.) under Varying Levels of Plant Density. Madras Agric. J 2009;96(7-12):386-8.
3. Harisudan C, Vincent S. Enhancing source-sink partitioning efficiency and productivity of sesame.

Madras Agricultural Journal 2019;106(7/9):488-91.
4. Khan EA, Hussain I, Ahmad HB, Hussain I. Influence of nipping and foliar application of nutrients on growth and yield of chickpea in rain-fed condition. Legume Research-An International Journal 2018;41(5):740-4.
5. Kiruthika M, Srinivasan S, Menaka C, Kalarani MK, Rakavi B. Effect of seed pelleting and foliar spraying on sesame productivity. International Journal of Farm Sciences 2019;9(4):119-123.
6. Kokilavani S, Jagannathan R, Natarajan SK. Manual terminal clipping on yield and nutrient uptake of sesame varieties. Res. J Agric. Biol. Sci 2007;3(6):987-99.
7. 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.
8. McCarty Jr JC, Hedin PA. Effects of 1, 1-dimethylpiperidinium chloride on the yields, agronomic traits, and allelochemicals of cotton (*Gossypium hirsutum* L.), a nine year study. Journal of Agricultural and Food Chemistry 1994;42(10):2302-4.
9. Miah MAM, Afroz A, Rashid MA, Shiblee SAM. Factors affecting adoption of improved sesame technologies in some selected areas in Bangladesh. The Agriculturists 2015;13(1):140-151.
10. 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. Journal of Agriculture and Rural Development in the Tropics and Subtropics (JARTS) 2005;106(2):155-65.
11. Prasad PK, Pal R, Pathania V. Effect of decapitation and nutrient applications on shoot branching, yield, and accumulation of secondary metabolites in leaves of *Stevia rebaudiana* Bertoni. Journal of Plant Physiology 2013;170(17):1526-1535
12. Pal, PK, Prasad R, Pathania V. Effect of decapitation and nutrient applications on shoot branching, yield, and accumulation of secondary metabolites in leaves of *Stevia rebaudiana* Bertoni. Journal of Plant Physiology 2013;170(17):1526-1535.
13. Raghav R, David C, Juan R, Craig C. Sesame: New Approaches for Crop Improvement. Purdue University 1990.
14. Rangaswamy R. A text book of Agric. Statistics: 244-433. New Age International Ltd., India 2002.
15. Saren BK, Tudu S, Nandi P. Effect of irrigation and sulphur on growth and productivity of summer sesame (*Sesamum indicum* L.). Madras Agric. J 2004;91:56-60.
16. Sarkar RK, Pal PK. Effect of crop geometry, fertility level and nipping on physiological parameters in relation to productivity of sesame (*Sesamum indicum*). Indian journal of agricultural science 2005;75(3):143-6.
17. Vasanthan V, Geetha R, Menaka C, Vakeswaran V, Parameswari C. "Study on effect of nipping and foliar spray on seed yield of sesame var. TMV 7." IJCS 7, no. 3 2019,4180-4183.
18. Yadav P, Yadav SS, Garg K, Athnere S, Yadav S. Effect of sulphur and zinc fertilization on productivity and economics of sesame (*Sesamum indicum* L.) in semi-arid conditions of Rajasthan. IJCS. 2020;8(3):675-9.