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GROWTH, YIELD ATTRIBUTES, YIELD AND ECONOMICS OF SESAME (*Sesamum indicum* L.) AS INFLUENCED BY SYSTEM OF CROP INTENSIFICATION (SCI) PRACTICES

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ABSTRACT

A field experiment was conducted during the early summer season at Tamil Nadu Agricultural University, Coimbatore, to evaluate the System of Crop Intensification (SCI) practices in sesame. The experiment was laid out in Randomized Complete Block Design, comprised of ten treatments and replicated thrice. The results revealed that closer square planting of sesame at 30 × 30 cm with TIBA application @ 50 ppm at 30 DAS and hand weeding at 35 DAS (T_2) showed its superiority in recording the higher plant height, number of branches m^{-2}, LAI and drymatter production, number of capsules m^{-2}, seeds capsules^{-1}, test weight and in producing greater seed yield, stalk yield, harvest index and economic profit than the control and any other treatments tested in the study.

KEY WORDS: SCI, sesame, growth characters, yield attributes, yield and economics

INTRODUCTION

Edible oils are next to food grains in Indian diet. With burgeoning population, the demand of edible oils will remain at its peak. To meet this demand, it becomes essential to identify new technological options to increase the productivity of oilseed crops. In India, sesame or gingelly is an important oilseed crop next to groundnut and rapeseed-mustard. Sesame has the highest oil content of 46-64 per cent with 25 per cent protein (Goel and Kumar, 1994). There is a wide gap between the potential and actual yield of sesame obtained by the farmers.

The probable reason for the low yield is the lack of appropriate production technology for increasing and sustaining its productivity. To narrow down this yield gap and to enhance the productivity, a new investigation in line with System of Rice Intensification (SRI) has been initiated. SRI is a new innovation in rice cultivation. SRI increases the rice yield than the conventional method of rice cultivation. A similar approach has been tried with other crops with some variations to specific crop is termed as system of crop intensification (SCI) (ISD, 2009). So, the present experiment was carried out to study the influence of SCI practices on growth characters, yield attributes and yield of sesame.

MATERIAL AND METHODS

A field experiment was conducted during the early summer season (January to May, 2013) at Wetland farms of Tamil Nadu Agricultural University, Coimbatore, to evaluate the System of Crop Intensification (SCI) practices in sesame. The soil of the experimental field was clay loam in texture belonging to *Typic Haplustalf* with pH of 8.35, EC 0.4 dSm^{-1}, organic carbon 0.33 % and available nitrogen (N), phosphorus (P) and potassium (K) were 236, 15.08 and 506 kg ha^{-1}, respectively. The experiment was laid out in Randomized Complete Block design, comprised of ten treatments were replicated thrice *viz*., T_1 - 30 × 30 cm spacing + No nipping + HW at 35 DAS (Control), T_2 - 30 × 30 cm spacing + TIBA @ 50 ppm at 30 DAS + HW, T_3 - 40 × 40 cm spacing + Nipping at 35 DAS + HW, T_4 - 40 × 40 cm spacing + Nipping at 35 DAS + MW, T_5 - 40 × 40 cm spacing + TIBA @ 50 ppm at 30 DAS + HW, T_6 - 40 × 40 cm spacing + TIBA @ 50 ppm at 30 DAS + MW, T_7 - 50 × 50 cm spacing + Nipping at 35 DAS + HW, T_8 - 50 × 50 cm spacing + Nipping at 35 DAS + MW, T_9 - 50 × 50 cm spacing + TIBA @ 50 ppm at 30 DAS + HW and T_{10} - 50 × 50 cm spacing + TIBA @ 50 ppm at 30 DAS + MW. The sesame variety, VRI (SV) 2 was used as test cultivar sown on 28.01.2013 at 30 × 30 cm, 40 × 40 cm

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and 50 × 50 cm. Full dose of N, P and K (35:23:23) was applied basal at the time of sowing. All other recommended package of practices for growing of sesame were followed as per the recommendations of Crop Production Guide (CPG, 2012). TIBA was sprayed @ 50 ppm at 30 days of crop growth. Nipping was done by terminal clipping of first pair of leaves and mechanical weeding was done using self-propelled power weeder at 35 days of after sowing. In the net plot area, five plants were selected at random, tagged and used for taking biometrical data at 30 days interval starting from 30 DAS to at harvest stage. The data were subjected to statistical analysis as prescribed by Gomez and Gomez (2010).

RESULTS AND DISCUSSION

Growth characters

The treatments imposed had no significant influence on plant height of sesame barring at harvest stage. At harvest, the taller plants were recorded under closer square planting of 30 × 30 cm without nipping and hand weeding at 35 DAS (T_1) (Table 1), whereas, it was statistically on par with wider square planting of 50 × 50 cm with TIBA application @ 50 ppm at 30 DAS and mechanical weeding at 35 DAS (T_{10}) or hand weeding at 35 DAS (T_9) and wider square planting of 40 × 40 cm with TIBA application @ 50 ppm at 30 DAS and mechanical weeding at 35 DAS (T_6) or hand weeding at 35 DAS (T_5). This was perhaps due to the competition between the inter and intra plants for sun light under closer spacing encouraged self-thinning of branches and enhanced vertical growth rather than horizontal growth. The action of auxins present at apical part of stem increased the rate of cell elongation and cell division which might have lead to increased plant height in case of non-nipped plants or non-spraying of TIBA. Similar findings were reported by Kokilavani *et al*. (2007) in sesame.

The SCI practices exerted significant influence on the number of branches m^{-2}, drymatter production and leaf area index at all the stages of sesame. Closer square planting of 30 × 30 cm with TIBA application @ 50 ppm at 30 DAS and hand weeding at 35 DAS (T_2) registered perceptibly higher number of branches m^{-2}, drymatter production and leaf area index compared to all other SCI practices tested. This was mainly due to more population resulting in higher number of leaves unit $area^{-1}$ under closer geometry level and hand weeding also might had positive influence through provision of weed free environment to the crop and all combinedly had cumulative effect in enhancing the drymatter and leaf area. Spraying of TIBA increases the number of branches plant by better translocation of natural auxins to lateral bud stimulates lateral branches to grow. These results are in conformity with Caliskan *et al.* (2004) in sesame.

Yield attributes

Closer square planting of 30 × 30 cm with TIBA application @ 50 ppm at 30 DAS and hand weeding at 35 DAS (T_2) gave more number of capsules m^{-2} whereas, it exhibited statistical similarity with wider square planting of 40 × 40 cm with nipping and mechanical weeding at 35 DAS (T_4). The reason for more number of capsules m^{-2} might be due to combined effect of more number of plants m^{-2} and increased number of branches $plant^{-1}$ leads to increasing the total number of capsules $plant^{-1}$ ultimately results in higher number of capsules unit $area^{-1}$. The least number of capsules m^{-2} was recorded under wider square planting of 50 × 50 cm with nipping and hand weeding at 35 DAS (T_7) (Table 1). The results were in conformity with Caliskan *et al*. (2004) in sesame.

The treatments imposed set a prominent variation on number of seeds $capsule^{-1}$, number of seeds $locule^{-1}$ except test weight of sesame. Wider square planting of 50 × 50 cm with TIBA application @ 50 ppm at 30 DAS and mechanical weeding at 35 DAS (T_{10}) registered higher number of seeds $locule^{-1}$ and capsule $^{-1}$ (Table 1). Lower number of seeds $locule^{-1}$ was found in closer square planting of 30 × 30 cm without nipping and hand weeding done at 35 DAS (T_1). Overall improvement in plant vigour and production of sufficient photosynthates through increased leaf area and higher dry matter production $plant^{-1}$ with better partitioning might have increased the number of seeds $locule^{-1}$ capsule $^{-1}$ due to the combined effect of crop geometry, TIBA application @ 50 ppm at 30 DAS and mechanical weeding at 35 DAS. These results are in agreement with Basha and Reddy (2001) in sesame.

There were no discernible variations on 1000-seed weight of sesame due to adoption of SCI practices (Table 2). However, maximum 1000-seed weight (3.6 g) was noticed under wider square planting of 50 × 50 cm with nipping and mechanical weeding at 35 DAS (T_8). The minimum test weight was with closer square planting of 30 × 30 cm without nipping and hand weeding done at 35

Table 1. Effect of system of crop intensification practices on growth and yield attributes of sesame at harvest stage

Treatments	Plant height (cm)	Number of branches m^{-2}	Drymatter (kg ha^{-1})	Leaf area index	Capsule number m^{-2}	Number seeds $capsule^{-1}$	Number of seeds $locule^{-1}$	1000 seed weight (g)
T_1 : 30 × 30 cm + No nipping + HW at 35 DAS – Control	100.3	167.2	6504	0.40	908	59.6	14.8	3.1
T_2 : 30 × 30 cm spacing + TIBA @ 50 ppm at 30 DAS + HW	86.0	202.4	9113	0.68	1408	63.1	15.6	3.2
T_3 : 40 × 40 cm spacing + Nipping at 35 DAS + HW	77.8	127.2	6432	0.60	1162	65.4	16.3	3.3
T_4 : 40 × 40 cm spacing + Nipping at 35 DAS + MW	79.0	136.2	7195	0.63	1318	66.5	16.5	3.4
T_5 : 40 × 40 cm spacing + TIBA @ 50 ppm at 30 DAS + HW	93.0	114.6	6169	0.61	1074	61.0	15.8	3.3
T_6 : 40 × 40 cm spacing + TIBA @ 50 ppm at 30 DAS + MW	94.8	126.6	6450	0.61	1106	61.9	15.9	3.4
T_7 : 50 × 50 cm spacing + Nipping at 35 DAS + HW	89.4	93.2	6176	0.44	796	63.7	17.0	3.5
T_8 : 50 × 50 cm spacing + Nipping at 35 DAS + MW	91.1	100.4	6571	0.49	948	70.1	17.7	3.6
T_9 : 50 × 50 cm spacing + TIBA @ 50 ppm at 30 DAS + HW	96.5	79.2	4613	0.44	913	66.3	17.0	3.5
T_{10} : 50 × 50 cm spacing + TIBA @ 50 ppm at 30 DAS + MW	97.8	86.8	5344	0.49	991	70.9	17.9	3.6
SEd	4.5	7.4	427	0.04	65	3.5	0.7	0.2
CD (P=0.05)	9.4	15.5	897	0.08	137	7.4	1.4	NS

HW: Hand weeding; MW: Mechanical weeding; TIBA: Tri iodo benzoic acid; NS: Non significant

Table 2. Influence of system of crop intensification practices on yield, harvest index and economics of sesame production

Treatments	Seed yield (kg ha^{-1})	Stalk yield (kg ha^{-1})	Harvest index	Gross return (₹ ha^{-1})	Net return (₹ ha^{-1})	B: C
T_1 : 30 × 30 cm + No nipping + HW at 35 DAS – Control	793	1882	0.30	39650	10229	1.35
T_2 : 30 × 30 cm spacing + TIBA @ 50 ppm at 30 DAS + HW	1137	2087	0.35	56850	23434	1.70
T_3 : 40 × 40 cm spacing + Nipping at 35 DAS + HW	822	1774	0.32	41100	10029	1.32
T_4 : 40 × 40 cm spacing + Nipping at 35 DAS + MW	1022	1970	0.34	51100	19829	1.63
T_5 : 40 × 40 cm spacing + TIBA @ 50 ppm at 30 DAS + HW	763	1522	0.33	38150	4734	1.14
T_6 : 40 × 40 cm spacing + TIBA @ 50 ppm at 30 DAS + MW	803	1685	0.32	40150	6534	1.19
T_7 : 50 × 50 cm spacing + Nipping at 35 DAS + HW	775	1658	0.32	38750	7679	1.25
T_8 : 50 × 50 cm spacing + Nipping at 35 DAS + MW	944	1862	0.34	47200	15929	1.51
T_9 : 50 × 50 cm spacing + TIBA @ 50 ppm at 30 DAS + HW	812	1726	0.32	40600	7184	1.21
T_{10} : 50 × 50 cm spacing + TIBA @ 50 ppm at 30 DAS + MW	997	1888	0.35	49850	16234	1.48
SEd	40	74	0.02	–	–	–
CD (P=0.05)	84	156	NS	–	–	–

HW: Hand weeding; MW: Mechanical weeding; TIBA: Tri iodo benzoic acid; NS: Not Significant

DAS (T_1). Similar results were also noticed by Basha and Reddy (2001) in sesame.

Yield

Effect of SCI practices brought out a significant influence on both seed and stalk yield of sesame (Table 2). Among the treatments, closer square planting of 30 × 30 cm with TIBA application @ 50 ppm at 30 DAS and hand weeding at 35 DAS (T_2) shown its superiority over other treatments in recording higher seed and stalk yield of sesame. Whereas, wider square planting of 40 × 40 cm with TIBA application @ 50 ppm at 30 DAS and hand weeding at 35 DAS (T_5) registered the lowest seed and stalk yield. This was due to more plant population unit area^{-1} and also application of TIBA under closer spacing lead to increased number of branches and drymatter production with better source-sink partition to produce more number of capsules plant^{-1} which inturn increased the seed yield. Similar findings were also reported by Tiwari and Namdeo (1997) in sesame. The SCI practices did not exert significant difference among the treatments related to harvest index of sesame due to significant biological yield which indicates that the partitioning efficiency of crop was not up to the mark owing to capsule wall. Similar results were reported by Harsha (2006) in sesame.

Economics

The highest gross return (₹ 56850 ha^{-1}) and net return (₹ 23434 ha^{-1}) were obtained with treatment composed of closer square planting (30 × 30 cm) with TIBA application @ 50 ppm at 30 DAS and hand weeding at 35 DAS (T_2). Whereas, the lowest gross return (₹ 38150 ha^{-1}) and net return (₹ 4734 ha^{-1}) were noticed under wider square planting of 40 × 40 cm with TIBA application @ 50 ppm at 30 DAS and hand weeding at 35 DAS (T_5). Similar to gross return and net return, the benefit-cost ratio was also maximum under closer square planting of 30 × 30 spacing cm with TIBA application @ 50 ppm at 30 DAS and hand weeding at 35 DAS (T_2). The economic efficiency and viability of crop cultivation are mainly the outcome of crops and yield with lesser management cost. Among the SCI practices, closer spacing of 30 × 30 cm with TIBA @ 50 ppm at 30 DAS and hand weeding at 35 DAS (T_2) gave higher gross and net returns with benefit-cost ratio. This might be due to lesser cost of cultivation in addition to increased seed yield. This result is supported by the findings of Tiwari and Namdeo (1997) in sesame.

REFERENCES

Basha S J and Reddy P M 2001. Effect of plant geometry and topping on growth and yield of summer sesame. *Journal of Oilseeds Research* 18(2): 273-274.

Caliskan S, Arslan M, Arioglu H and Isler N 2004. Effect of planting method and plant population on growth and yield of sesame (*Sesamum indicum* L.) in a Mediterranean type of environment. *Asian Journal of Plant Science* 3(5): 610-613.

CPG (Crop Production Guide). 2012. In: http://www.tnau.ac.in/tech/cgagri.pdf. Department of Agriculture, Govt. of Tamil Nadu, Chennai and Tamil Nadu Agric. Univ., Coimbatore. Pp. 173-178.

Goel P D and Kumar, S 1994. A great ancient oilseed sesamum. *Farmer and Parliament* 12: 6-7.

Gomez K A and Gomez A A 2010. Statistical Procedure for Agricultural Research. 2nd edition, John Willey and Sons, New York. Pp. 704.

Harsha K N 2006. Effect of plant density on growth and yield of sesame cultivars during summer. M.Sc. (Ag.) Thesis. University of Agricultural Sciences. Dharwad, Karnataka, India.

ISD (Institute for Sustainable Development) 2009. Piloting a system of crop intensification. In: http://sri.ciifad.cornell.edu/aboutsri/othercrops/otherSCI/EthSCI_ISD09.pdf.

Kokilavani S, Jagannathan R, Selvaraju R and Thavaprakaash N 2007. Influence of terminal clipping on growth and yield of sesame varieties. *Asian Journal of Agricultural Research* 1(3): 142-145.

Tiwari K P and Namdeo K N 1997. Response of sesame (*Sesamum indicum*) to planting geometry and nitrogen. *Indian Journal of Agronomy* 42(2): 365-36.