

**DETERMINATION OF OPTIMUM SOWING DATE FOR HIGHER
PRODUCTIVITY AND PROFITABILITY IN SESAMUM
(*SESAMUM INDICUM* L.)**

V SUJATHA*, R SARITHA AND ABM SIRISHA

*Agricultural Research Station, Yellamanchili-531 055, Acharya N.G. Ranga Agricultural
University (ANGRAU), Guntur, Andhra Pradesh, India-531001*

Keywords: Date of sowing, Seed yield, Oil content, Economics, Sesamum.

Abstract

In the context of optimizing sowing dates for realizing higher productivity and profitability for sesamum an experiment with twelve different sowing dates (T_1 to T_{12}) from second fortnight of December to first fortnight of June at 15 days interval was executed at Agricultural Research Station, Yellamanchili, Andhra Pradesh, India during *rabi-summer* and *kharif*, 2015-16 and 2016-17. The findings revealed that during *rabi-summer*, sesamum sown on second and first fortnight of January (T_3 and T_2) recorded highest seed yield (541.1 and 509.3 kg/ha), oil content (46.33 and 46.20 %), net returns (Rs. 29878 ha⁻¹ and Rs. 27330 ha⁻¹) and BC ratio (2.23 and 2.04) and during *kharif*, sowing on second fortnight of May and first fortnight of June (T_{11} and T_{12}) produced significantly higher seed yield (323.7 and 258.4 kg ha⁻¹), oil content (45.98 and 45.88 %), net returns (Rs. 14886 ha⁻¹ and Rs. 9658 ha⁻¹) and BC ratio (1.36 and 0.88) than rest of sowing dates. Delay in sowing after first fortnight of February gradually decreased the seed yield of sesamum. Significantly the lowest seed yield (70.4 and 87.0 kg ha⁻¹, respectively) and negative net returns were obtained when crop was sown on first and second fortnight of April (T_8 and T_9).

Sesamum (*Sesamum indicum* L.) is one of the most important oil seed crop grown extensively in India. The world produces 6.11 million tons out of 7.73 million hectares of cultivated area. India ranks first in area (17.5 lakh ha) and production (8.93 lakh tons) with a relatively low productivity of 368 kg ha⁻¹ (Anonymous, 2012). The acreage of sesamum in Andhra Pradesh is 0.61 lakh hectares with production of 0.2 lakh tons and productivity of 321 kg ha⁻¹ (Anonymous, 2017). For successful production of crop time of sowing can have a major effect on final size of plants and the yield. In Andhra Pradesh, sesamum is cultivated mostly as a rainfed crop during *pre-kharif* and *khari* f season and also grown during *summer* season in residual soil moisture under poor management practices. Hence, the yield of sesamum in this region is generally low due to use of low yielding local cultivars (Sujatha *et al.* 2021, Saritha *et al.* 2020). Research works are limited on sowing dates in sesamum. Hence, present study was carried out to determine the optimum sowing date of sesamum to get higher yield under north coastal zone of Andhra Pradesh.

Field study was carried out at Agricultural Research Station, Yellamanchili, Visakhapatnam District, Andhra Pradesh, India during *rabi-summer* and *kharif*, 2015-16 and 2016-17 in a randomized block design with twelve treatments replicated thrice. The site is located at 17.5701° N latitude and 82.8499° E longitude with an altitude of 23.0 m above mean sea level. The soils were sandy loam in nature, slightly alkaline (pH 7.6), with 0.20 % organic carbon and 154, 17 and 98 kg ha⁻¹ of N, P and K, respectively. The treatments comprised of twelve sowing dates *viz.*, T_1 - 2nd fortnight of December, T_2 - 1st fortnight of January, T_3 - 2nd fortnight of January, T_4 - 1st fortnight of February, T_5 - 2nd fortnight of February, T_6 - 1st fortnight of March, T_7 - 2nd fortnight of March for *rabi-summer* season and T_8 - 1st fortnight of April, T_9 - 2nd fortnight of April, T_{10} - 1st fortnight of May, T_{11} - 2nd fortnight of May, T_{12} - 1st fortnight of June for *kharif* season.

*Author for correspondence : <sujatha.agro12@gmail.com>.

Sesamum cv. YLM-66 was sown @ 5 Kg seeds ha⁻¹ with spacing of 30 cm between the rows and 10 cm between the plants. Thinning and gap filling was done 7 days after sowing. Recommended doses of 40 kg N + 20 kg P₂O₅ + 20 kg K₂O/ha was given through urea (46% N), single super phosphate (16% P₂O₅) and muriate of potash (60% K₂O) to the sesamum crop field. Half of the total nitrogen was applied at the time of sowing and rest of nitrogen was top dressed at 30 days after sowing. Full dose of P₂O₅ and K₂O were given at the time of sowing. Recommended agronomic practices and plant protection measures were followed to maintain a good crop. The growth and yield attributing parameters such as plant height, number of branches and capsules per plant were recorded from randomly selected ten plants in each plot before harvesting of sesamum. Seed yield was recorded at the time of harvest. The data on seed yield recorded from net plot were converted to per hectare basis. The economics of the treatments was worked out on the basis of pooled mean seed yield. Cost of cultivation, gross return, net return and benefit cost ratio were worked out to evaluate the economics of each treatment based on the existing market prices of inputs and output. Seed oil content (%) was determined by using Soxhlet method. Data was subjected to statistical analysis (Rangaswamy 1995).

Data regarding growth and yield of sesamum are presented in Table 1. Results revealed that during *kharif* season, sowing on second fortnight of May (T₁₁) and first fortnight of June (T₁₂) resulted in higher plant height (143.0 and 139.3 cm) due to onset of monsoon favouring vegetative growth of sesamum compared to other dates of sowing and 71.2 cm plant height was recorded on when the sowing was on second fortnight of February (T₅). During *rabi*, when sesamum was sown on second and first fortnight of January (T₃ and T₂) it showed greater plant height (84.9 and 82.9 cm) due to rising temperature favouring vegetative growth of sesamum compared to other dates of sowing.

Sesamum sown on second fortnight of January (T₃), second fortnight of May (T₁₁), first fortnight of June (T₁₂) and first fortnight of January (T₂) recorded maximum number of branches (4.72, 4.65, 4.55 and 4.51 plant⁻¹) over all other dates. It was found that the number of branches plant⁻¹ decreased from second fortnight of February to second fortnight of April sowing.

Planting date had significant effect on the number of capsules per plant. During *rabi-summer*, number of capsules plant⁻¹ was significantly higher (96.6 and 94.4) when sesamum was sown during second and first fortnight of January (T₃ and T₂) followed by T₄ i.e. first fortnight of February (90.4) compared to other dates of sowing. During *kharif* season, the highest number of capsules plant⁻¹ (85.4 and 80.0) was obtained in second fortnight of May and first fortnight of June (T₁₁ and T₁₂) sowing over other sowing dates. The increase in the number of capsule plant⁻¹ might be due to the environment and length of growth period has significantly influenced on number of capsule plant⁻¹. It was observed that the number of capsules plant⁻¹ decreased markedly up to second fortnight of April sowing. Significantly the lowest number of capsules per plant (23.9 and 24.9) was obtained when the sowing was done on second and first fortnight of April (T₉ and T₈).

The different sowing dates significantly influenced the seed yield of sesamum during individual years and in pooled results (Table 1).

Sowing of sesamum crop in second and first fortnight of January (T₃ and T₂) resulted in significantly the highest seed yield of 541.1 and 509.3 kg ha⁻¹, respectively over other sowing dates during *rabi-summer*. Statistically similar yields (438.0 and 429.4 kg ha⁻¹, respectively) was found in first fortnight of February and second fortnight of December (T₄ and T₁) sown crops. The highest grain yield might be due to enhanced germination due to optimum soil temperature and later on favourable climatic condition might have favoured growth and development as compared to rest of the sowing dates.

Table 1. Growth, yield and oil content of sesamum owing to different treatments during 2015-16 and 2016-17.

Treatments	Plant height (cm)			No. of branches Plant ⁻¹			No. of capsules Plant ⁻¹			Seed yield (kg ha ⁻¹)			Oil content (%)		
	2015-16	2016-17	Pooled	2015-16	2016-17	Pooled	2015-16	2016-17	Pooled	2015-16	2016-17	Pooled	2015-16	2016-17	Pooled
T ₁ - 2 nd fortnight of December	80.6	75.4	78.0	4.25	4.20	4.23	90.3	83.4	86.8	437.7	421.0	429.4	46.09	46.03	46.06
T ₂ - 1 st fortnight of January	86.5	79.2	82.9	4.74	4.27	4.51	98.6	90.1	94.4	530.5	488.0	509.3	46.35	46.30	46.33
T ₃ - 2 nd fortnight of January	82.1	87.6	84.9	4.62	4.81	4.72	95.7	97.5	96.6	518.2	564.0	541.1	45.74	46.66	46.20
T ₄ - 1 st fortnight of February	72.2	84.3	78.3	4.17	4.73	4.45	86.4	94.4	90.4	352.9	523.0	438.0	44.94	46.53	45.73
T ₅ - 2 nd fortnight of February	70.3	72.1	71.2	3.86	3.90	3.88	64.5	67.2	65.9	123.1	230.0	176.6	45.02	45.34	45.18
T ₆ - 1 st fortnight of March	106	107.5	106.8	3.44	3.42	3.43	40.4	51.3	45.9	97.2	127.0	112.1	45.99	45.65	45.82
T ₇ - 2 nd fortnight of March	103.2	104.8	104.0	3.87	3.92	3.90	35.5	44.7	40.1	90.7	110.0	100.4	45.55	45.30	45.43
T ₈ - 1 st fortnight of April	121.4	123.2	122.3	3.03	3.07	3.05	20.4	29.4	24.9	55.8	85.0	70.4	44.92	44.82	44.87
T ₉ - 2 nd fortnight of April	128.7	130.4	129.6	3.23	3.26	3.25	24.1	23.7	23.9	82.0	92.0	87.0	45.48	45.07	45.28
T ₁₀ - 1 st fortnight of May	135.6	134.6	135.1	4.40	4.40	4.40	70.3	71.5	70.9	179.6	188.0	183.8	45.53	45.83	45.68
T ₁₁ - 2 nd fortnight of May	143.8	142.2	143.0	4.66	4.63	4.65	84.2	86.6	85.4	305.4	342.0	323.7	45.67	46.30	45.98
T ₁₂ - 1 st fortnight of June	140.2	138.4	139.3	4.53	4.57	4.55	79.5	80.4	80.0	236.7	280.0	258.4	45.44	46.31	45.88
SEM ±	5.01	4.94	4.39	0.14	0.14	0.10	3.73	3.61	2.57	17.91	18.42	13.98	0.27	0.91	0.50
CD (P = 0.05)	14.70	14.48	12.9	0.41	0.42	0.40	10.92	10.60	7.45	52.52	54.03	41.27	0.8	2.67	1.4
CV%	8.3	8.02	7.2	6.2	6.11	5.2	9.8	9.10	7.0	12.8	11.09	9.0	1.5	3.5	2.0

Table 2. Economics and BC ratio of sesamum owing to different treatments during 2015-16 and 2016-17.

Treatments	Gross returns (Rs. ha ⁻¹)			Cost of cultivation (Rs. ha ⁻¹)			Net returns (Rs. ha ⁻¹)			BC Ratio		
	2015-16	2016-17	Mean	2015-16	2016-17	Mean	2015-16	2016-17	Mean	2015-16	2016-17	Mean
	T ₁ - 2 nd fortnight of December	35016	33680	34348	13410	13410	13410	21606	20270	20938	1.61	1.51
T ₂ - 1 st fortnight of January	42440	39040	40740	13410	13410	13410	29030	25630	27330	2.16	1.91	2.04
T ₃ - 2 nd fortnight of January	41456	45120	43288	13410	13410	13410	28046	31710	29878	2.09	2.36	2.23
T ₄ - 1 st fortnight of February	28232	41840	35036	13410	14822	14822	14822	28430	21626	1.11	2.12	1.62
T ₅ - 2 nd fortnight of February	9848	18400	14124	13410	-3562	4990	-3562	4990	714	-0.27	0.37	0.05
T ₆ - 1 st fortnight of March	7776	10160	8968	13410	-5634	-4442	-5634	-3250	-4442	-0.42	-0.24	-0.33
T ₇ - 2 nd fortnight of March	7256	8800	8028	13410	-6154	-5382	-6154	-4610	-5382	-0.46	-0.34	-0.40
T ₈ - 1 st fortnight of April	4464	6800	5632	14420	-9956	-8788	-9956	-7620	-8788	-0.69	-0.53	-0.61
T ₉ - 2 nd fortnight of April	6560	7360	6960	14420	-7860	-7460	-7860	-7060	-7460	-0.55	-0.49	-0.52
T ₁₀ - 1 st fortnight of May	14368	15040	14704	11010	3358	3694	3358	4030	3694	0.30	0.37	0.34
T ₁₁ - 2 nd fortnight of May	24432	27360	25896	11010	13422	14886	13422	16350	14886	1.22	1.49	1.36
T ₁₂ - 1 st fortnight of June	18936	22400	20668	11010	7926	9658	7926	11390	9658	0.72	1.03	0.88

Results revealed that delay in sowing after first fortnight of February gradually decreased seed yield of sesamum. Much lower yields (70.4 and 87.0 kg/ha, respectively) were obtained when crop was sown on first and second fortnight of April (T₈ and T₉).

Sesamum sown on first and second fortnight of January (T₂ and T₃) recorded maximum oil content (46.33 and 46.20 %) during *rabi*-*summer*. The highest oil percent (45.98 and 45.88) was observed on when the sowing was on second fortnight of May (T₁₁) and first fortnight of June (T₁₂) during *kharif* season compared to other sowing dates.

Economics of different treatment was worked out on the basis of pooled seed yield over two years for each treatment (Table 2).

The cost of cultivation for *rabi*-*summer* (T₁ to T₇) was Rs. 13410 ha⁻¹ and for *kharif* Rs. 14420 ha⁻¹ for T₈ and T₉ and Rs. 11010 ha⁻¹ for T₁₀ to T₁₂. During *rabi*-*summer*, the highest gross returns (Rs. 43288 ha⁻¹ and Rs. 40740 ha⁻¹), net returns (Rs. 29878 ha⁻¹ and Rs. 27330 ha⁻¹) and BC ratio (2.23 and 2.04) were obtained when the sesamum was sown on second and first fortnight of January (T₃ and T₂). During *kharif*, the highest gross returns (Rs. 25896 ha⁻¹), net returns (Rs. 14886 ha⁻¹) and BC ratio (1.36) was registered with second fortnight of May (T₁₁) sowing followed by first fortnight of June (T₁₂) sowing (Rs. 20668 ha⁻¹, Rs. 9658 ha⁻¹ and 0.88, respectively). The lowest/negative net returns and BC ratio were observed in first/second fortnight of March and April sowing dates. Based on the studies conducted, it may be concluded that sesamum can be sown during first /second fortnight of January during *rabi*-*summer* and second fortnight of May during *kharif* season for manifesting higher productivity, profitability and oil content in coastal Andhra Pradesh.

Acknowledgements

The authors are very much thankful to the authorities of Acharya NG Ranga Agricultural University, Andhra Pradesh, India for the financial support.

References

- Anonymous 2017. Annual Report of Oilseeds Division, Department of Agriculture, Cooperation and Farmers' welfare, Krishi Bhawan, New Delhi.
- Anonymous 2012. Third Advance Estimates of Production of Oilseeds and Other Commercial Crops for 2011-12, Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Agricultural Statistics Division, India.
- Rangaswamy R 1995. A Text Book of Agricultural Statistics. New age International (p) Ltd., Publishers, New Delhi, India, 1st edition. pp.1-358.
- Saritha R, Sirisha ABM, Haseena SK, Sujatha V 2020. Studies on succession and population dynamics of sap feeders as influenced by weather on sesame. *Int. J. Curr. Microbiol. Appl. Sci.* **9**(7): 839-849.
- Sujatha V, Saritha R, Haseena Bhanu SK, Sirisha ABM, Gangadhara Rao SVS 2021. Effect of sulphur on growth, yield and economics of sesame (*Sesamum indicum*). *Inter. J. Agricul. Sci.* **17**(1): 233-236.

Manuscript received on 24 May, 2023; revised on 28 August, 2023)