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## Influence of different organic manures on seed and oil yield and economics of sesame (*Sesamum indicum* L.)

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**Abstract**

A field experiment was conducted during *kharif* season of 2019-20 at Farm of Agronomy Section, College of Agriculture, Latur to find out the influence of different organic manures on growth and yield attributes of sesame. The experiment was laid out in a Randomized Block Design with nine treatments and replicated three times. The treatments were T<sub>1</sub>-Control, T<sub>2</sub>-100%N (Urea), T<sub>3</sub>-75%N (Urea) + 25%N (FYM), T<sub>4</sub>-75%N (Urea) + 25%N (Vermicompost), T<sub>5</sub>-75%N (Urea) + 25%N (Poultry manure), T<sub>6</sub>-75%N (Urea) + 25%N (Neem cake), T<sub>7</sub>-75%N(Urea) + 25%N (Karanj cake), T<sub>8</sub>-75%N (Urea) + 25%N (Castor cake) and T<sub>9</sub>-75%N (Urea) + *Azotobactor*. Application of 75%N through (Urea) + 25%N through (Poultry manure) (T<sub>5</sub>) resulted in maximum seed yield (516 kg ha<sup>-1</sup>), oil content (48.67%) and oil yield (251 kg ha<sup>-1</sup>). Maximum gross monetary return (₹ 51642 ha<sup>-1</sup>), net monetary return (₹ 29106 ha<sup>-1</sup>), cost of cultivation (₹ 22536 ha<sup>-1</sup>) and B:C ratio (2.29) were also obtained due to application of 75%N through (Urea) + 25%N through (Poultry manure) (T<sub>5</sub>).

**Keywords:** INM, oil content, oil yield, organic manures, RBD, sesame, seed yield

**1. Introduction**

*Sesamum* (*Sesamum indicum* L.) is an important oilseed crop of India belongs to family *Pedaliaceae* and the genus *Sesamum*. Sesame is also known as queen of oil seeds. It has about 50 per cent oil content. The sesame oil contains oleic acid (47 %), linoleic acid (39 %), omega 6 fatty acids and highest ferric reducing antioxidant power (FRAP) value.

The important countries producing sesame are India, China, Japan, Sudan, Mexico, Turkey, Myanmar and Pakistan. In India, the major sesame growing states are Uttar Pradesh, Rajasthan, Madhya Pradesh, Andhra Pradesh, Maharashtra, Gujarat, Tamil Nadu and Odisha. In Maharashtra, the important districts growing this crop are Jalgaon, Nashik, Dhule, Pune and Solapur. Area under sesame in India was 18-20 lakh ha with the production of 6.6 lakh metric tonnes during 2017-18. In Maharashtra, the total area under sesame was 0.18 lakh ha with the production of 0.042 lakh tonnes having productivity 233 kg ha<sup>-1</sup>. (Anonymous, 2017-18) [1].

Sesame is a robust crop that grows in drought conditions, in high heat, with residual moisture in soil after monsoons are gone or even when rains fail or when rains are excessive. It is a crop that could be grown by subsistence farmers at the edge of deserts, where no other crops can grow, so it has been called a survivor crop.

Addition of vermicompost to soil improves the chemical and biological properties of soil and thereby improves its fertility. Poultry manure has been recognized as the most desirable organic manure in sesame. It improves soil fertility by adding N and P as well as micronutrients and improves moisture and nutrient retention (Farhad *et al.*, 2009) [2]. Use of FYM has been found to enhance the crop yields by improving physical and biological properties of soil and increasing water holding capacity of soil. *Azotobactor* has the ability to fix atmosphere nitrogen and to make it available to the plants. Neem seed cake (*Azadirachta indica*), when added to the soil, increases the yield of crops on the long term, an excellent soil conditioner and has no negative effect on the environment (Lokanadhan *et al.*, 2012) [3]. Karanj cake and castor cake are rich source of N, P, K which on application increase soil fertility and residual effect.

Keeping in view of the beneficial effects of the organic manures, field experiment was carried out to study the effect of organic manures on seed and oil yield and economics of sesame.

## 2. Materials and Methods

The field experiment was conducted during *kharif* season of 2019-20, at Farm of Agronomy Section, College of Agriculture, Latur (Maharashtra). The soil of experimental plot was clayey in texture with chemical composition such as low in available nitrogen (121.3 kg ha<sup>-1</sup>), medium in available phosphorous (18.57 kg ha<sup>-1</sup>) and very high in available potassium (499.9 kg ha<sup>-1</sup>). The soil was moderately alkaline in reaction having P<sup>H</sup> (7.7) and containing very low organic carbon (0.85%). The experiment was laid out in Randomized Block Design with nine treatments and replicated three times. The treatments were T<sub>1</sub>-Control, T<sub>2</sub>-100%N (Urea), T<sub>3</sub>-75%N (Urea) + 25%N (FYM), T<sub>4</sub>-75%N (Urea) + 25%N (Vermicompost), T<sub>5</sub>-75%N (Urea) + 25%N (Poultry manure), T<sub>6</sub>-75%N (Urea) + 25%N (Neem cake), T<sub>7</sub>-75%N (Urea) + 25%N (Karanj cake), T<sub>8</sub>-75%N (Urea) + 25%N (Castor cake), T<sub>9</sub>-75%N (Urea) + *Azotobacter*. A popular sesame variety in the region, JLT-408 was used in the study. Seeds of the sesame were sown on 2 August, 2019 in the rows spaced 45 X 15 cm<sup>2</sup>. 2-4 seeds were dibbled at each hill at about 2 cm depth. Nitrogen and phosphorous were applied as per treatment through urea and SSP. Farm yard manure (FYM), vermicompost, poultry manure, karanj cake, castor cake and neem cake were applied as per treatments and mixed thoroughly in to the soil after layout. Various intercultural operations and plant protection measures were undertaken to improve the growth and yield of crops. The crop was harvested on 27<sup>th</sup> October 2019 by cutting to the ground level with the help of sickle.

## 3. Results and discussion

### 3.1 Quality attributes

The mean oil content did not differ significantly due to different treatments. Highest oil content (48.67%) (Table 1) was obtained with application of 75%N (Urea) + 25% N (Poultry manure) (T<sub>5</sub>) which was closely followed by the treatment of 75%N (Urea) + 25%N (Vermicompost) (T<sub>4</sub>). Significantly higher oil yield (251 kg ha<sup>-1</sup>) (Table 1) was produced due to application of 75%N (Urea) + 25% N (Poultry manure) (T<sub>5</sub>) which was closely followed by the treatment of 75%N (Urea) + 25%N (Vermicompost) (T<sub>4</sub>). This might be happened due to the higher oil content in seed. The higher oil extracted ultimately from higher seed yield. This result is in the line of Paul *et al.* (2017) [4].

### 3.2 Yield and yield attributes

The seed yield of sesame was differed significantly due to different treatments. The maximum seed yield (516 kg ha<sup>-1</sup>) was produced by the application of 75%N (Urea) + 25% N (Poultry manure) (T<sub>5</sub>). The result is in conformity with the results of Singh *et al.* (1997) [5].

The higher straw (3004 kg ha<sup>-1</sup>) biological yield (3521 kg ha<sup>-1</sup>) (Table 1) was produced due to the application of 75% N (Urea) + 25% N (Poultry manure) (T<sub>5</sub>). This increase in seed yield, straw yield and biological yield may be because of poultry manure has been known to help in reducing the soil pH to some extent by producing organic acids while their decomposition cause greater availability and mobility of nutrients mainly of micronutrients.

Application of 75%N (Urea) + 25% N (Poultry manure) (T<sub>5</sub>) recorded maximum harvest index (14.67%) (Table 1), which was closely followed by the treatment of 75%N (Urea) + 25% N (Vermicompost) (T<sub>4</sub>).

**Table 1:** Influence of organic manures on oil content, oil and seed yield, straw and biological yield and harvest index of sesame

Treatment	Oil content (%)	Oil yield (kg ha <sup>-1</sup> )	Seed yield (kg ha <sup>-1</sup> )	Straw yield (kg ha <sup>-1</sup> )	Biological yield (kg ha <sup>-1</sup> )	Harvest index (%)
T <sub>1</sub> -Control	45.36	149	328	2253	2581	12.61
T <sub>2</sub> -100%N (Urea)	47.52	165	343	2315	2658	12.72
T <sub>3</sub> -75%N (Urea) + 25% N (FYM)	47.71	168	347	2407	2755	12.91
T <sub>4</sub> -75%N (Urea)+ 25% N (Vermicompost)	48.51	229	481	2932	3413	14.09
T <sub>5</sub> -75%N (Urea) + 25% N (Poultry manure)	48.67	251	516	3004	3521	14.67
T <sub>6</sub> -75% T <sub>6</sub> -75%N (Urea) + 25% N (Neem cake)	47.76	183	379	2490	2868	13.20
T <sub>7</sub> -75%N (Urea) + 25% N (Karanj cake)	48.26	204	418	2572	2990	13.63
T <sub>8</sub> -75%N (Urea) + 25% N (Castor cake)	48.18	192	403	2562	2965	13.60
T <sub>9</sub> -75%N (Urea) + <i>Azotobacter</i>	48.35	205	429	2716	3145	13.99
SE+	1.17	12	27	143	146	-
CD at 5%	NS	35	82	429	437	-

### 3.3 Economics

Application of different organic manures significantly influenced gross monetary return. Significantly highest gross monetary return (₹ 51642 ha<sup>-1</sup>) (Table 2) was obtained with the application of 75%N (Urea) + 25% N (Poultry manure) (T<sub>5</sub>). This might be due to higher seed obtained with the 75%N (Urea) + 25%N (Poultry manure) (T<sub>5</sub>) resulted in higher gross monetary return. This result is similar with Haruna and Aliyu (2012) [6].

Application of different organic manures significantly influenced net monetary return. Significantly highest net monetary return (₹ 29106 ha<sup>-1</sup>) (Table 2) was recorded with the treatment of 75%N (Urea) + 25% N (Poultry manure) (T<sub>5</sub>). It may happened due to higher gross monetary return and comparatively no much higher cost of cultivation. These results are in conformity with the results of Singh *et al.* (1997) [5].

The higher cost of cultivation (₹ 22536 ha<sup>-1</sup>) and B:C ratio (2.29) (Table 2) was noticed due to application of 75%N (Urea) + 25% N (Poultry manure). This may be due to higher gross return and comparatively no much more cost of cultivation.

## 4. Conclusion

Application of 75%N through (Urea) + 25%N through (Poultry manure) (T<sub>5</sub>) resulted in maximum oil content (48.67%), seed (516 kg ha<sup>-1</sup>) and oil yield (251 kg ha<sup>-1</sup>), straw (3004 kg ha<sup>-1</sup>) and biological yield (3521 kg ha<sup>-1</sup>) and harvest index (14.67 %). While, maximum gross monetary return (₹ 51642 ha<sup>-1</sup>), net monetary return (₹ 29106 ha<sup>-1</sup>), cost of cultivation (₹ 22536 ha<sup>-1</sup>) and B:C ratio (2.29) were obtained due to application of 75%N through (Urea) + 25%N through (Poultry manure) (T<sub>5</sub>).

**Table 2:** Influence of organic manures on seed yield, gross monetary return, net monetary return, cost of cultivation and B:C ratio of sesame

Treatment	Seed yield (kg ha <sup>-1</sup> )	GMR (₹ ha <sup>-1</sup> )	NMR (₹ ha <sup>-1</sup> )	Cost of cultivation (₹ ha <sup>-1</sup> )	B:C ratio
T <sub>1</sub> -Control	328	32840	12693	20147	1.63
T <sub>2</sub> -100%N (Urea)	343	34300	14058	20299	1.68
T <sub>3</sub> -75%N (Urea) + 25% N (FYM)	347	34743	14101	20485	1.69
T <sub>4</sub> -75%N (Urea)+ 25% N (Vermicompost)	481	48086	26619	21467	2.23
T <sub>5</sub> -75%N (Urea) + 25% N (Poultry manure)	516	51642	29106	22536	2.29
T <sub>6</sub> -75% T <sub>6</sub> -75%N (Urea) + 25% N (Neem cake)	379	37860	17072	20788	1.82
T <sub>7</sub> -75%N (Urea) + 25% N (Karanj cake)	418	41831	21020	20812	2.00
T <sub>8</sub> -75%N (Urea) + 25% N (Castor cake)	403	40335	19530	20806	1.93
T <sub>9</sub> -75%N (Urea) + <i>Azotobactor</i>	429	42860	21608	21252	2.01
SE+	27	2724	2724	-	-
CD at 5%	82	8166	8166	-	-

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