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Growth and yield attributes of sesame (*Sesamum indicum* L.) as influenced by different organic manures

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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_1-Control, T_2-100%N (Urea**)**, T_3-75%N (Urea**)** + 25%N (FYM), T_4-75%N (Urea**)** + 25%N (Vermicompost), T_5-75%N (Urea**)** + 25%N (Poultry manure), T_6-75%N (Urea**)** + 25%N (Neem cake), T_7-75%N(Urea**)** + 25%N (Karanj cake), T_8-75%N (Urea**)** + 25%N (Castor cake) and T_9-75%N (Urea**)** + *Azotobactor*. Results revealed that among the different organic manures applied, the application of 75%N through (Urea**)** + 25%N through (Poultry manure) (T_5) was found beneficial in increasing growth attributes *viz*., higher plant height (81.67cm), number of branches plant^{-1} (4.2), number of functional leaves (79.93), leaf area (10.68 dm^2) and dry matter plant^{-1} (37g). The higher values of yield attributes *viz*., number of capsules plant^{-1} (53.80), seed yield plant^{-1} (8.95 g), capsule yield plant^{-1} (45.21 g), seed yield (516 kg ha^{-1}) and test weight (3.9g) were obtained due to 75%N (Urea**)** + 25%N (Poultry manure) (T_5).

Keywords: Growth attributes, INM, RBD, organic manures, sesame, yield attributes

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 been a rich source of food and oil. It is also called as poor means ghee. It has one of the highest oil content of any oilseed (50 per cent). Sesame seed is rich source of protein (25%), energy (631 kcal/100g), fat (60.2%), carbohydrate (11.7%), dietary fibre (11.6%) and also contains thiamin, riboflavin, niacin, ascorbic acid, vitamin A, minerals (Mg, Ca, Fe, P, Zn), phytic and oxalic acid. 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 sesamum was 0.18 lakh ha with the production of 0.042 lakh tonnes having productivity 233 kg ha^{-1}. (Anonymous, 2017-18) [2]. Sesame has ability to grow in areas that do not support the growth of other crops. It is also a robust crop and 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. 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) [4]. Vermicomposting is a potential organic source containing beneficial microorganism, major nutrients (NPK) and micronutrients, enzymes and hormones. 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. Application of bio fertilizers *viz*., *Azotobactor* provides the nitrogen to the crops. Neem seedcake mixed with urea fertilizer significantly improves efficiency of fertilizer utilization in crop production by gradual release of nitrogen to crops thereby increasing the fertility of the soil (Ketkar, 1983) [6]. Karanj cake and castor cake are rich source of N, P, K which on application increase soil fertility and residual effect. Considering the low nutrient status of soil and low yield potential of sesame, there is need of integrated nitrogen management through organic manures that can increase and sustain growth and yield of crop. Therefore, the field experiment was carried out to find out the influence of different organic manures on growth and yield attributes on sesame.

2. Materials and Methods
The field experiment was conducted during *kharif* season of 2019-20, at Agronomy Section Farm, College of Agriculture, Latur (Maharashtra).

The soil of experimental plot was medium and black in colour with good drainage. It was clayey in texture. The soil was low in available nitrogen (121.3 kg ha^{-1}), medium in available phosphorous (18.57 kg ha^{-1}) and very high in available potassium (499.9 kg ha^{-1}). The soil was moderately alkaline in reaction having P^H (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_1-Control, T_2-100%N (Urea), T_3-75%N (Urea) + 25%N (FYM), T_4-75%N (Urea) + 25%N (Vermicompost), T_5-75%N (Urea) + 25%N (Poultry manure), T_6-75%N (Urea) + 25%N (Neem cake), T_7-75%N(Urea) + 25%N (Karanj cake), T_8-75%N (Urea) + 25%N (Castor cake), T_9-75%N (Urea) + *Azotobactor*. A popular sesame variety in the region, JLT-408, which is a white bolded variety released in 2010 by Oilseed Research Centre, Jalgaon, Maharashtra, was used in the study. Seeds of the sesame were sown on 2nd August, 2019 at 45 X 15 cm^2. 2-4 seeds were dibbled at each hill at about 2 cm depth. After sowing, the seeds were covered with moist soil.

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. Biofertilizer *Azotobactor* was applied on the seeds as per treatment. Various intercultural operations and plant protection measures were undertaken to improve the growth and yield of crops. The crop was harvested on 27th October 2019 by cutting to the ground level with the help of sickle.

3. Results and Discussion

3.1 Growth attributes

Maximum plant height (81.67 cm) was obtained due to the application of 75%N (Urea) + 25%N (Poultry manure) which was closely followed by the treatment of 75%N (Urea) + 25%N (Vermicompost) (T_4) (Table 1). The beneficial effect of poultry manure on height might also be due to the increased supply of all the essential nutrients in available form by poultry manure which is good organic manure applied in combination with the nitrogenous fertilizer. This result is in confirmity with the results of Pushpanjali *et al*. (2018) [7] or Das and Pavitra Kumar (2019) [3].

Application of 75%N (Urea) + 25%N (Poultry manure) (T_5) produced highest number of branches $plant^{-1}$ (4.20), number of functional leaves $plant^{-1}$ (79.93) and leaf area (10.68 dm^2) (Table 1) which may be obtained due to combined application of nitrogen through urea and poultry manure. Similar result also reported by Abdullahi *et al*. (2013) [1].

Significantly, highest dry matter $plant^{-1}$ (37g) was obtained due to the treatment of 75%N (Urea) + 25%N (Poultry manure) (T_5) (Table 1). It may be due to increase in number of branches, functional leaves $plant^{-1}$ and leaf area produced through combined application of urea and poultry manure which ultimately contributed to the dry matter. Similar trend was also reported by Pushpanjali *et al*. (2018) [7].

Table 1: Influence of organic manures on growth attributes of sesame

Treatment	Plant height (cm)	Number of branches $plant^{-1}$	Number of functional leaves $plant^{-1}$	Leaf area (dm^2)	Dry matter $plant^{-1}$ (g)
T_1-Control	62.27	3.07	63.20	7.32	22.67
T_2-100%N (Urea)	67.13	3.23	66.27	7.89	25.00
T_3-75%N (Urea) + 25% N (FYM)	67.80	3.27	72.33	8.78	28.27
T_4-75%N (Urea)+ 25% N (Vermicompost)	76.33	3.83	78.60	10.02	35.33
T_5-75%N (Urea) + 25% N (Poultry manure)	81.67	4.20	79.93	10.68	37.00
T_6-75% T_6-75%N (Urea) + 25% N (Neem cake)	70.53	3.53	72.77	8.96	31.67
T_7-75%N (Urea) + 25% N (Karanj cake)	71.73	3.67	75.53	9.48	32.33
T_8-75%N (Urea) + 25% N (Castor cake)	71.40	3.60	73.93	9.02	32.00
T_9-75%N (Urea) + *Azotobactor*	72.13	3.77	78.40	9.96	33.33
SE+	3.42	0.20	3.39	0.45	1.73
CD at 5%	10.26	0.60	10.17	1.34	5.19

3.2 Yield attributes

Application of 75%N (Urea) + 25%N (Poultry manure) (T_5) produced significantly highest number of capsules $plant^{-1}$ (53.80) (Table 2) which may be due to balanced and adequate supply of nutrients through poultry manure asper requirement of crop with which the crop ultimately favoured better environment for proper growth and development. These results are in confirmity with the results of Haruna and Abimiku (2012) [5].

The treatment of 75%N (Urea) + 25%N (Poultry manure) (T_5) noticed significantly higher capsule yield $plant^{-1}$ (45.21 g), seed yield $plant^{-1}$ (8.95 g) and test weight (3.9 g) (Table 2) may be due to easier absorption of plant nutrients through poultry manure and utilization by growing plants. Adequate supply of nutrients through organic manure resulted in higher production of photosynthates and their translocation to sink, which ultimately increased the plant growth and yield attributes. These results are in confirmity with the results Haruna and Abimiku (2012) [5].

The maximum seed yield (516 kg ha^{-1}) (Table 2) was obtained due to application of 75%N (Urea) + 25%N (Poultry manure) (T_5) may be because 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.

Table 2: Influence of organic manures on yield attributes of sesame

Treatment	Number of capsules $plant^{-1}$	Seed yield $plant^{-1}$ (g)	Capsule yield $plant^{-1}$ (g)	Seed yield (kg ha^{-1})	Test weight (g)
T_1-Control	33.20	6.41	29.16	328	3.30
T_2-100%N (Urea)	41.07	6.99	31.49	343	3.37
T_3-75%N (Urea) + 25% N (FYM)	41.33	7.21	32.67	347	3.40
T_4-75%N (Urea)+ 25% N (Vermicompost)	50.67	8.87	38.26	481	3.70
T_5-75%N (Urea) + 25% N (Poultry manure)	53.80	8.95	45.21	516	3.90
T_6-75% T_6-75%N (Urea) + 25% N (Neem cake)	44.67	7.25	32.89	379	3.43

T_7-75%N (Urea) + 25% N (Karanj cake)	46.73	8.18	35.04	418	3.57
T_8-75%N (Urea) + 25% N (Castor cake)	44.73	7.71	33.86	403	3.50
T_9-75%N (Urea) + *Azotobactor*	46.80	8.70	36.85	429	3.63
SE+	2.99	0.52	2.35	27	0.16
CD at 5%	8.96	1.57	7.05	82	NS
General Mean	44.78	7.81	35.05	405	3.53

4. Conclusion

Higher growth attributes *viz*., plant height, number of branches plant^{-1}, number of functional leaves plant^{-1}, leaf area and dry matter plant^{-1} were received due to application of 75%N (Urea) + 25%N (Poultry manure) (T_5). This treatment also produced maximum yield attributes *viz*., number of capsules plant^{-1}, seed yield plant^{-1}, capsule yield plant^{-1}, seed yield and test weight.

5. References

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