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# Studies on growth, yield and quality of sesame (*Sesamum indicum* L.) as influenced by chemical fertilizers and liquid biofertilizer

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**ABSTRACT**
*A field experiment was conducted during kharif season of 2018 at the Experimental farm, College of Agricultural, Latur (MS) to studies on growth, yield and quality of sesame (Sesamum indicum L.) as influenced by chemical fertilizers and liquid biofertilizer. The experiment was laid out in randomized block design with three replications and the treatment were consisting of seven with chemical fertilizers and liquid biofertilizer. The results of the field study indicated that the yield attributes and yield of sesame were significantly influenced by different treatments The significantly higher number seed capsule$^{-1}$ (64.00), seed yield plant$^{-1}$ (7.29 g), seed yield ha$^{-1}$ (779 kg ha$^{-1}$) and straw yield (3089 kg ha$^{-1}$), was obtained with the application of 60:30:00 kg NPK ha$^{-1}$ + Azotobacter + PSB ($T_7$),The higher values of yield attributes and yield of sesame was observed with the application of 60:30:00 kg NPK ha$^{-1}$ + Azotobacter + PSB ($T_7$) where as it was at par with the 60:30:00 kg NPK ha$^{-1}$ ($T_3$) and 50:25:00 kg NPK ha$^{-1}$ + Azotobacter + PSB.($T_6$)*
***Keywords*** *–Inorganic fertilizers, Biofertilizer, Sesame, randomized block design*

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## INRODUCTION

Sesame (*Sesamum indicum* L.) belongs to the family of pedaliaceae and is one of the most ancient oilseeds crop known and used by mankind of the world. It is originated in South Western Africa. It is recognised by various names like Til, Simsim, Gingelly, Ajonjoli, Sisamo, Gergelim and Biniseed, etc. It was a major oilseed crop in the ancient world due to its easiness of extraction, great stability and resistance to drought. Sesame is grown as a rainfed crop throughout the tropic and subtropic areas. It is short day plant but also grow well in long day areas. The sesame seed has been considered as 'Queen of Oilseed' for its high oilseed content and quality and traditionally categorised as a health food in China, Japan and Asian countries. It is considered to have both notional and medicinal value. Moreover seed is a rich source of edible oil (48-55%) and protein (20-28%) with anti-oxidants lignans such as sesamolin and sesamin which prevents rancidity and give sesame oil a shelf life. Sesame oil is called 'poor man's ghee'. The lignin content has useful physiological effect in human and animal health. The seeds are very rich in iron, magnesium, manganese, copper and calcium and contain vitamin E, A, B and $B_1$. The seed contain phytosterols associate with reducing the level of blood cholesterol and also phytoestrogens with anti-oxidants an anti-cancer properties.

The plant receives biofertilizer and fertilizers always give higher yield and better quality yield. The price of chemical fertilizers have gone up tremendously and the marginal farmer can not afford such costly fertilisers. About 50% of applied inorganic fertilizers are lost either through leaching or volatilization, under this situation use of biofertilizer could be the key to sustain soil fertility to obtain the desired level of yield and quality. But, the efficiency of biological fertilizers will increase at the presence of chemical fertilizers.

## MATERIAL AND METHODS

A field experiment was conducted during *kharif* season of 2018 at the Experimental farm, College of Agricultural, Latur to studies on growth, yield and quality of sesame (*Sesamum indicum* L.) as influenced by chemical fertilizers and liquid biofertilizer. The soil of the experimental site was medium, black in colour with good drainage. The soil was clayey in texture, low in available nitrogen, medium in available phosphorus, medium in available potassium and alkaline (pH 8.04) in reaction. The experiment was laid out in randomized block design with three replications and the treatment were consisting of seven with chemical fertilizers and liquid biofertilizer. The treatments were, $T_1$- 40:20:00 Kg NPK ha$^{-1}$, $T_2$- 50:25:00 kg NPK ha$^{-1}$, $T_3$- 60:30:00 kg NPK ha$^{-1}$, $T_4$ - *Azotobacter* + PSB, $T_5$– 40:20:00 kg NPK ha$^{-1}$ + *Azotobacter* + PSB, $T_6$- 50:25:00 kg NPK ha$^{-1}$ +*Azotobacter* + PSB, $T_7$- 60:30:00 kg NPK ha$^{-1}$ + *Azotobacter* + PSB. Sowing was done by dibbling by using seed rate 2.5- 4 kg ha$^{-1}$. The gross and net plot size was 5.4 m x 4.5 m and 4.5 m x 3.9 m respectively. The total rainfall received during growth period of sesame was 271.8 mm with 13 rainy days. The recommended dose of fertilizer was 50:25:00 kg NPK ha$^{-1}$ applied as per treatments through Urea, single super phosphate and application of liquid biofertilizer for seed treatment 6 ml per Kg.

## RESULT AND DISCUSSION

### Growth and growth attributes

The data presented in Table No.1 revealed that the growth attributes *viz*., The application of 60:30:00 kg NPK ha$^{-1}$ + Azotobacter and PSB ($T_7$) produced significantly higher plant height and leaf area per plant which was at par with application of 60:30:00 kg NPK ha$^{-1}$ ($T_3$) of sesame as compared to other treatments at 30, 45, 60, 75 and at harvest. The increase in growth attributes may be due to better uptake and translocation of plant nutrients to growing plants, adequate supply of nutrients resulted in higher production of photosynthate and their translocation to sink, which ultimately increased the plant growth and growth attributes. Similar result reported by Ghodke *et al.* [4] and Vani *et al.* [6]. The highest number of branches plant$^{-1}$ (3.53) was recorded with the application of 60:30:00 kg NPK ha$^{-1}$ + Azotobacter and PSB ($T_7$) followed by Treatment $T_3$ i.e. application of 60:30:00 kg NPK ha$^{-1}$ produced maximum number of branches at all growth stages of crop. The increase in growth under these treatments might be attributed due to the adequate supply of nutrients with which the crop was ultimately favoured better environment for proper growth and development. These result are in conformity similar with the Nayek *et al* [5] and Vani *et al.* [6].Total dry matter plant$^{-1}$(g) was the resultant of photosynthetic activity and its photo morphogenesis. The rate of increase in dry matter accumulation was slow up 45 days, rapid between 45 to 75 DAS and attained maximum at harvest. The application of 60:30:00 kg NPK ha$^{-1}$ + Azotobacter and PSB ($T_7$) followed by $T_3$ i.e. 60:30:00 kg NPK ha$^{-1}$ produced higher dry matter plant$^{-1}$ (g) similar result reported by Deshmukh *et al*. [2].

### Yield attributes and yield

Yield attributes viz., number of capsules, weight of capsules per plant, seed yield per plant, seed yield and straw yield (kg/ha) were significantly affected by different treatments (Table No.2). The capsule yield plant$^{-1}$ (g) seed yield plant$^{-1}$ (g) was significantly influenced by the various treatments. The application of 60:30:00 kg NPK ha$^{-1}$ + Azotobacter and PSB ($T_7$) recorded higher capsule and seed yield plant$^{-1}$ followed by application of 60:30:00 kg NPK ha$^{-1}$ ($T_3$) Higher level of these parameters could be attributed due to better uptake and translocation of plant nutrients to growing plants, adequate supply of nutrients resulted in higher production of photosynthate and their translocation to sink, which ultimately increased the plant growth and yield attributes. These result are in conformity with the results Gayatri *et al*. [3].

Data on seed yield (kg ha$^{-1}$), straw yield (kg ha$^{-1}$), biological yield (kg ha$^{-1}$) and harvest index (HI) as influenced by different treatments was found significant. The application of 60:30:00 kg NPK ha$^{-1}$+ Azotobacter and PSB ($T_7$) recorded higher number of capsules plant$^{-1}$ at harvest followed by ($T_3$) application of 60:30:00 kg NPK ha$^{-1}$ ($T_3$). This variation in seed yield, straw yield, biological yield (kg ha$^{-1}$) might be due to balanced and adequate supply of nutrients. Same result reported by Deshmukh *et al.* [1].

Based on above studies it is concluded that among various treatments, application of 60:30:00 kg N.P.K / ha +Azotobacter + PSB observed highest seed yield (779 kg/ha) and straw yield (3089) followed by 50:25:00 kg N.P.K /ha + Azotobacter + PSB and 30:60:00 kg N.P.K / ha and found significantally superior over remaining treatments.

**Table 1**. Plant height, number of branches plant-1, leaf area plant -1and dry matter plant -1 influenced by resource constraints

| Treatment details | Plant height plant-1 (cm) | No. of branches plant-1 | Leaf area plant-1 (dm2) | Dry matter plant-1 (g) |
|---|---|---|---|---|
| T1- 40:20:00 Kg NPK ha-1 | 81.10 | 2.83 | 1.86 | 19.50 |
| T2- 50:25:00 kg NPK ha-1 | 81.97 | 2.90 | 2.03 | 20.17 |
| T3 - 60:30:00 kg NPK ha-1 | 92.00 | 3.40 | 2.40 | 22.19 |
| T4 – *Azotobacter* + PSB | 75.07 | 2.67 | 1.58 | 19.04 |
| T5 - 40:20:00 kg NPK ha-1 + *Azotobacter* + PSB | 81.80 | 2.87 | 2.02 | 19.58 |
| T6- 50:25:00 kg NPK ha-1 + *Azotobacter* + PSB | 89.53 | 3.00 | 2.23 | 20.37 |
| T 7- 60:30:00 kg NPK ha-1 + *Azotobacter* + PSB | 94.93 | 3.53 | 2.50 | 22.79 |
| SEm± | 3.24 | 0.11 | 00.11 | 0.79 |
| C.D. at 5% | 10.00 | 0.34 | 0.36 | 2.46 |
| **General Mean** | **85.20** | **3.03** | **2.09** | **20.53** |

***A.H- At harvest**

**Table 2.** Effect of Number of capsules plant-1, weight of capsules plant-1, Seed yield plant-1, Seed yield kg ha-1, and straw yield kg ha-1

| Treatments | Number of capsules plant-1 | Weight of capsules plant-1(g) | Seed yield plant-1(g) | Seed yield (kg ha-1 ) | Straw yield (kg ha-1) |
|---|---|---|---|---|---|
| T1- 40:20:00 Kg NPK ha-1 | 44.03 | 12.61 | 4.89 | 591 | 2712 |
| T2- 50:25:00 kg NPK ha-1 | 48.10 | 13.60 | 5.23 | 651 | 2868 |
| T3 - 60:30:00 kg NPK ha-1 | 51.22 | 17.79 | 6.41 | 693 | 2951 |
| T4 – *Azotobacter* + PSB | 38.27 | 13.28 | 4.26 | 460 | 2426 |
| T5 - 40:20:00 kg NPK ha-1 + *Azotobacter* + PSB | 48.10 | 13.55 | 5.14 | 598 | 2724 |
| T6- 50:25:00 kg NPK ha-1 + *Azotobacter* + PSB | 49.33 | 15.58 | 6.32 | 665 | 2772 |
| T 7- 60:30:00 kg NPK ha-1 + *Azotobacter* + PSB | 56.33 | 18.02 | 7.29 | 779 | 3089 |
| SEm± | 2.21 | 0.76 | 0.32 | 39 | 103 |
| C.D. at 5% | 6.81 | 2.34 | 0.99 | 121 | 316 |
| **General Mean** | **47.91** | **14.92** | **5.65** | **634** | **2792** |

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