*The Andhra Agric. J* 71 (3): 271-275, 2024
doi :10.61657/aaj.2024.129

# Response of sesame to foliar nutrition

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## ABSTRACT

A field experiment was conducted to know the response of sesame to foliar nutrition during *rabi* 2023 -24 at agricultural College Farm, Bapatla, Andhra Pradesh, India. The experiment was laid-out in a randomized block design with seven nutrient management treatments and replicated thrice on sand loam soils. The test variety of sesame was Sarada (YLM-66) released during the year 2009 from Agricultural Research Station, Yellamanchili, Andhra Pradesh .The results revealed that application of RDF N-P-K 40:20:20 kg $ha^{-1}$ along with foliar spray of 19:19:19 @ 1 % (T4) at early budding stage or application of RDF along with foliar spray of KNO3 @ 1.5 % (T3) at early budding stage recorded higher plant height (95.2 cm) higher dry matter production (2435.4kg $ha^{-1}$) at maturity, and yield attributing characters like number of capsules per plant (49.3), number of seeds per capsule (71.0), maximum seed yield (782.3 kg $ha^{-1}$), gross returns (67552.4 Rs. $ha^{-1}$), net returns (38920.2 Rs. $ha^{-1}$) and BC ratio (1.359) when compared with RDF alone (T1).

**Key words:** *Foliar spray, Gross returns, $KNO_3$, Sesame and Yield.*

Sesame (*Sesamum indicum* L.) is the oldest and important indigenous oilseed crop mainly cultivated in the tropics. It belongs to the family pedaliaceae and its centre of origin is South Western Africa (Indu and Savithri, 2003). It is also known as til (or) gingelly, in India. By roasting the sesame seeds sesamolin is transformed into sesamol. Which has been shown to have anti-oxidative properties and cause growth arrest and apoptosis in cancer cells (Elleuch *et al*., 2011). Sesame oil is referred as "poor man's substitute for ghee" owing to its superior quality attributes.

Sesame cultivation is limited by a number of physiological factors, including high flower drop, low dry matter buildup, and inefficient assimilate partitioning from source to sink. By applying nutrients by foliar spray which are crucial for plant growth and development it can be resolved.

Foliar application of macro and micro nutrients at critical stages of crop growth facilitates for quick supply of nutrients, there by promoting photosynthesis and mobilization of assimilates to sink and ultimately the yield (Sharma *et al.,* 2013). Furthermore, the increasing crop demand frequently exceeds the amount of fertilizers applied to the soil. In order to maximize sesame yield, foliar application of important nutrients in conjunction with soil application is crucial. As it promotes energy transformation, a variety of metabolic processes, plant translocation activity, and increased capsule setting. Among the various technologies for high crop productivity, a suitable and balanced fertilizer schedule is equally crucial for the supply of nutrients in turn to increase the yield and quality of the produce.

To enhance the efficiency of absorption of nitrogen and potash, foliar sprays at critical stages of crop growth is need of the hour under changing climate which helps in quick regain under drought and prevents loss of nutrients through leaching during irrigation. (Sujata and Rao,2019). Thus the present study was planned to know the effects of foliar nutrition on seseme.

## MATERIAL AND METHODS

A field experiment was conducted during *rabi* 2023-24 at Agricultural College Farm, Bapatla, Andhra Pradesh, India. The experiment was laid- out in a randomized block design with seven treatments and replicated thrice on sandy loam soils with $P^H$ 6.65, EC 0.34 $dSm^{-1}$,Organic cabon 0.43 % and available N, $P_2O_5$, $K_20$- 245,35,215 kg $ha^{-1}$. The treatements

were RDF- 40:20:20 N: $P_2O_5$: K20 kg $ha^{-1}$ (T1), T1+ foliar spray of 2% urea at early budding stage (T2), T1 + foliar spray of 1.5 % KNO3 at early budding stage (T3), T1+ foliar spray of 1% 19:19:19 at early budding stage (T4), T1+ foliar spray 1% DAP at early budding stage (T5) ,T1+ foliar spray of 2.5 ml per litre nano DAP at early budding stage (T6), T1+ foliar spray of 4 ml per litre nano urea at early budding stage (T7). The Gross plots size was 4.8 m× 4.0 m and spacing adopted was 30 cm × 10 cm. The test variety used in the present experiment was Sarada (YLM-66). The data on plant height, drymatter, number of capsules per plant , number of seeds per capsule, seed yield , gross rerurns, net returns and B:C ratio were recorded.

The experimental data on various growth and yield parameters were analyzed by using Fisher´s method of analysis of variance. The level of Significance of the treatments was tested by 'F' test at 0.05 level of probability and critical differences were worked out for the Significant effects. The treatment differences that were not significant were denoted by 'NS'.

## RESULTS AND DISCUSSION

### Plant height (cm)

Among the different treatments tested, application of RDF along with foliar spray of 1% 19:19:19 (T4) recorded higher plant height (95.2 cm) at maturity and was on par with application of RDF along with foliar spray of 1.5 % KNO3 (T3) (85.0 cm). This might be due to complementation of NPK through foliar application by 19:19:19 or KNO3 which increases vegetative growth and photosynthetic activity in the plants. These finding are in agreement with Harisudan *et al* (2023), Hoque and Sarkar (2022) and Basu *et al.* (2019).

### Dry matter production (kg $ha^{-1}$)

The production of drymatter is an essential prerequisite for higher yields in any crop, because it signifies the photosynthetic potential of the crop During the initial stage of the crop growth, the production of drymatter was slow but enhanced rapidly with the progression of age up to harvesting. The higher dry matter production (2435.4 kg $ha^{-1}$) was registered in T4 and was on par with RDF+1.5 % KNO3 (T3). The lowest dry matter production (1692.1 kg $ha^{-1}$) was recorded with application of RDF alone (T1). This might be due to timely and adequate supply of NPK through foliar feeding that helped in better retention and filling of capsules till maturity and encourages vegetative growth which boosts the rate of photosynthesis and it is crucial for enhancing the dry matter accumulation in crop plants. The present findings are in conformity with those reported by Kumar *et al.* (2023) , Swain *et al*. (2020) and Kiruthika *et al*.(2019).

### Number of capsules $plant^{-1}$

Among the foliar application treatments, significantly higher number of capsules $plant^{-1}$ (49. 3) were obtained with foliar application of 19:19:19 @ 1.0% at early budding stage along with RDF (T4) which is on par (42.7) with (T3) RDF along with 1.5% KNO3. This might be due to adequate and balanced nutrition enhanced the vegetative growth leading to improved fruiting. Liberal supply of NPK through soil application together with foliar feeding of major nutrients at the peak physiological demand of sesame might be responsible for producing high yield structure due to application of 19:19:19 @ 1.0% at early budding stage. While, the lower number of capsules $plant^{-1}$ (29.3) was noticed under T1(100 % RDF).

### Number of seeds $capsule^{-1}$

Foliar application of nutrients to sesame found to exert significant influence on number of seeds $capsule^{-1}$. Maximum number of seeds per capsule (71.0) were noticed with application of RDF along with foliar feeding of 19:19:19 @ 1.0% at early budding stage (T4) and was on par with application of RDF along with Foliar spray of KNO3 @ 1.0% at early budding stage (T3) (63.3). Number of seeds $capsule^{-1}$ were significantly lower (51.3) with RDF alone (T1). These findings are in conformity with Krishnaveni *et al.* (2024), Harisudan *et al.* (2023), Basu *et al* (2019), Deepthi *et al* (2018), Alex *et al* (2017) and Sujatha *et al.* (2021) .

### Seed yield (kg $ha^{-1}$)

The response of sesame in terms of high seed yield due to foliar feeding of nutrients, was recorded with application of RDF + foliar spray of 19:19:19 @ 1.0% at early budding stage (T4)(782.3 kg $ha^{-1}$) and was similar with application of RDF + foliar application of KNO3 @ 1.5 % at early budding stage

**Table 1. Plant height (cm) and dry matter production (kg ha$^{-1}$) of sesame as influenced by different nutrient foliar sprays**

| Treatments | Plant height (cm) | Dry matter production (kg ha-1) |
|---|---|---|
| T1: RDF(40:20:20 Kg N:P:K) | 67.3 | 1692.1 |
| T2: RDF+ foliar application of urea @ 2%at early budding stage | 83.6 | 2199.1 |
| T3: RDF+ foliar application of KNO3 @1.5% at early budding stage | 85 | 2393.5 |
| T4: RDF+ foliar application of 19:19:19@1% at early budding stage | 95.2 | 2435.4 |
| RDF+ foliar application of DAP@1% at early budding stage | 74.8 | 2113.4 |
| T6: RDF+ foliar application of nano DAP @ 2.5 ml/l at early budding stage | 83.3 | 1998.5 |
| T7: RDF+ foliar application of nano urea@4ml/l at early budding stage | 83 | 2014.5 |
| S.Em ± | 3.6 | 64.71 |
| CD (p=0.05) | 11.11 | 199.39 |
| CV(%) | 7.64 | 5.28 |

**Table 2. Number of capsules per plant, number of seeds per capsule and seed (kg ha$^{-1}$) as influenced by different nutrient foliar sprays**

| Treatments | No of capsules plant$^{-1}$ | No of seeds capsule$^{-1}$ | Seed yield (kgha$^{-1}$) |
|---|---|---|---|
| T1: RDF(40:20:20 Kg N:P:K) | 29.3 | 51.3 | 509.3 |
| T2: RDF+ foliar application of urea @ 2%at early budding stage | 37.4 | 59.7 | 663.6 |
| T3: RDF+ foliar application of KNO3 @1.5% at early budding stage | 42.7 | 63.3 | 745.9 |
| T4: RDF+ foliar application of 19:19:19@1% at early budding stage | 49.3 | 71 | 782.3 |
| T5: RDF+ foliar application of DAP@1% at early budding stage | 36.3 | 57.7 | 535 |
| T6: RDF+ foliar application of nano DAP@2.5 ml/l at early budding stage | 36.7 | 57.3 | 622.4 |
| T7: RDF+ foliar application of nano urea@4ml/l at early budding stage | 32.1 | 58.7 | 607 |
| S.Em+ | 2.35 | 2.73 | 26.93 |
| CD (p=0.05) | 7.14 | 8.41 | 82.99 |
| CV(%) | 11.1 | 7.9 | 7.31 |

**Table 3. Economics of sesame as influenced by different nutrient foliar sprays**

| Treatments | Gross returns (Rs.ha-1) | Net returns (Rs.ha-1) | BC ratio |
|---|---|---|---|
| T1: RDF(40:20:20 Kg N:P:K) | 43974.3 | 16342.1 | 0.591 |
| T2: RDF+ foliar application of urea @ 2%at early budding stage | 57299.8 | 29161.6 | 1.036 |
| T3: RDF+ foliar application of KNO3 @1.5% at early budding stage | 64406.7 | 35524.5 | 1.23 |
| T4: RDF+ foliar application of 19:19:19@1% at early budding stage | 67552.4 | 38920.2 | 1.359 |
| T5: RDF+ foliar application of DAP@1% at early budding stage | 46195.2 | 17928 | 0.634 |
| T6: RDF+ foliar application of nano DAP@2.5 ml/l at early budding stage | 53746.3 | 24614.3 | 0.845 |
| T7: RDF+ foliar application of nano urea@4ml/l at early budding stage | 52413.8 | 22681.6 | 0.763 |
| S.Em+ | 2325.58 | 2325.58 | 0.0806 |
| CD (p=0.05) | 7165.82 | 7165.82 | 0.2483 |
| CV(%) | 7.31 | 15.23 | 15.23 |

(T3). While, application of RDF with no foliar spray (T1) resulted in the lowest seed yield (697 kg ha$^{-1}$). which might be due to lack of availability of nutrients at peak physiological demand.

These results were in agreement with those reported by Krishnaveni *et al.* (2024), Deshmukh *et al* (2023), Basu *et al.* (2019), Sujatha and Rao (2019) and Deepthi *et al.* (2018).

**Gross returns (Rs. ha$^{-1}$)**

Regarding different nutrient treatments applied to sesame, significantly higher gross returns (Rs. 67552.4 ha$^{-1}$) were obtained with application of RDF along with foliar spray of 19:19:19 @ 1.0 % at early budding stage (T4) and is on a par with application of RDF along with foliar spray RDF along with 1.5% KNO3 (T3) (Rs.64406.7 ha$^{-1}$) while it was minimum (Rs. 43974.3 ha$^{-1}$) with RDF alone (T1).

**Net returns (Rs. ha$^{-1}$)**

Application of RDF along with foliar spray of 19:19:19 @ 1.0 % at early budding stage (T4) recorded the highest net returns (Rs. 38920.2 ha$^{-1}$) and was on par with application of RDF along with foliar spray of 1.5% KNO3 (T3) (Rs. 35524.5 ha$^{-1}$) while, (control) the lower net returns (Rs. 16342.1ha$^{-1}$) registered with RDF alone (T1).

**B:C ratio**

B:C The ratio was found to be higher (1.35) with application of RDF along with foliar spray of 19:19:19 @ 1.0 % at early budding stage (T4) and was on par with application of RDF along with foliar spray RDF along with 1.5% KNO3 (T3)(1.230). The B-C ratio was low (0.59) with RDF alone (T1).

This might be due to the fact that the seed yield obtained with this treatments were significantly higher over rest of the other and thus enabled in realizing escalated values of these economic parameters (gross returns, net returns and B:C ratio).

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Received on 13.06.2024 and Accepted on 10.07.2024