Effect Of Integrated Nutrient Management on Growth and Yield of Sesame (Sesamum Indicum)

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Abstract*— A field experiment was conducted during Rabi, 2023-24 on clayey soil at the Agronomy Farm, Department of Agronomy, School of Agricultural sciences, G. H. Raisoni University, Saikheda, Pandhurna (M. P.), to study the effect of integrated nutrient management on growth, yield and economics of sesame (Sesamum indicum). The experiment consisted of seven treatments which were replicated thrice in RBD Design. Result indicated that application of T2 (100% RDF + 1% foliar spray-humic acid) significantly increased growth and yield attributes and economics of sesame and was found to be on par with treatment T3 (100% RDF + 1% foliar spray-fulvic acid).

Index Terms- Sesame, Nutrients, RDF, Growth, Yield, FYM.

I. INTRODUCTION

To the family Pedaliaceae belongs sesame (*Sesamum indicum* L.). It has been cultivated for the longest period of time in India, making it the oldest native oilseed crop. It is mentioned in legendary texts. The seeds of immortality are known as sesame seeds. The contents of sesame seeds include 15% carbohydrates, 25% protein, and 50% oil. Its seeds are employed in the confectionery, baking, and other food sectors. In addition to being utilized in cooking, sesame oil is also made into paints, fragrances, soaps, medications, and pesticides. It can be successfully grown in the winter, spring/summer, late kharif, and kharif. In certain regions of the nation, it is grown across multiple seasons, while in other regions, it is grown throughout the year.

Sesame (*Sesamum indicum* L.), known as the "Queen of Oilseed Crop," is a premier and the oldest oilseed crop grown in the country. Besides its use for edible oil, sesame oil finds its use in the confectionary, pharmacy, perfumery (as a fixative), cosmetics, insecticides (synergist), and soap industries. Sesame seed has a high food value because of its higher contents of edible oil (48– 55%) and nutritious protein (20–21%). Sesame oil has high stability along with good nutritional characteristics.

India is the world leader in both area and production of sesame, accounting for 25.2% and 18.6% of global production and area, respectively. It is grown on over 1.63 million hectares of land in India, yielding 319 kg of seeds per hectare and 0.52 million metric tons of output annually. The states of Gujarat, Maharashtra, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal are the principal producers of sesame in the nation. With an 8.71 and 9.06% share of the nation's area and output, respectively, Madhya Pradesh comes in third place for area and fourth place for production. This crop is grown on 1.80 lakh hectares in Madhya Pradesh, where it yields 0.88 lakh metric tons of crop per year with a productivity of 475 kg/ha (Anonymous 2022).

The application of less fertilizer at an ideal rate, inadequate management, and the cultivation of sesame on marginal and sub-marginal lands—where macronutrient deficiencies such as those in potassium, phosphorus, nitrogen, and micronutrients are prevalent—all contribute to lower sesame output. As a component of proteins, glucosinolates, and other substances that are linked to numerous criteria influencing the nutritional quality of crops, sulfur plays a significant role in the metabolism of both primary and secondary plants. Extended application of chemical fertilizers exclusively in intensive cropping systems results in an unfavorable nutritional status of the soil and detrimental impacts on its

physicochemical and biological characteristics. Therefore, an integrated nutrient management strategy that emphasizes the prudent and efficient use of organic, chemical, and biological sources of plant nutrients in combination is necessary to increase productivity on a sustainable basis.

Bio-fertilizers play a vital role in the increasing availability of nitrogen and phosphorus. It increases the biological fixation of atmospheric nitrogen and enhances phosphorus availability for crops. Therefore, the introduction of the bio-NPK consortium (Azotobacter, Azospirillum, and 3 Bacillus species) may be helpful. It is a liquid bio-fertilizer that saves costly chemical fertilizers by 25–30% with a 10–15% increase in crop production. In organic and sustainable soil management, FYM is an essential fertilizer. Numerous components required for the growth and development of plants are present in it. Sesame seed yields can be increased by using fertilizers in conjunction with Azospirillum and FYM. (Jaishankar and Wahab, 2005).

Considering the importance of the effect of INM on succeeding crops with a view to sustainable utilization of resources and reducing the cost of cropping systems, the present investigation was carried out to study the effect of integrated nutrient management on yield and quality of sesame. A field experiment was carried out during the *rabi* season in the student research field of the agronomy department at the school of agricultural sciences of G. H. Raisoni University in Sausar, Pandhurna, Madhya Pradesh, with the following objectives in mind:

II. MATERIAL AND METHODS

The field experiment was conducted during *Rabi* 2023-2024 at the Agronomy Farm,
Department of Agronomy, School of Agricultural sciences, G.H. Raisoni University, Saikheda, Pandhura (M. P.). The experiment was laid out in Randomized Block Design (RBD) with 7 treatments and three replications. The treatment consists of T_1- 100% RDF, T_2- 100% RDF +1% foliar spray- Humic acid, T_3- 100% RDF +1% foliar spray- Fulvic acid, T_4- 75% RDF +25% RDF through FYM, T_5- 75% RDF +25% RDF through vermicompost, T_6- 75% RDF +25% RDF through poultry manure, and T_7- 50% RDF + 50% RDF through FYM.

III. RESULT AND DISCUSSION

- Growth attributes

Growth attributes like plant height, number of branches and dry weight plant^{-1} recorded significantly higher at application of 100% RDF + 1% foliar spray-humic acid (T_2). The data found on plant height recorded and analyzed is presented in Table 1. At harvest stage plant height showed that was significant. Application of 100% RDF + 1% foliar spray-humic acid (T_2) recorded higher plant height (100.20 cm). It was at par with application of 100% RDF + 1% foliar spray-fulvic acid (T_3). This could be the result of greater amino acid synthesis, a rise in the amount of chlorophyll in the growing area, improved photosynthetic activity, and eventually improved cell division, which would raise the rate of crop development. This was demonstrated by the research done by Narkhede *et al.* (2001).

The data on number of branches/plant were recorded and presented in Table 1. At harvest, 100% RDF + 1% foliar spray-humic acid (T_2) recorded significantly higher number of branches per plant (5.96). It was at par with application of 100% RDF + 1% foliar spray-fulvic acid (T_3). It's possible that adding organic manure to chemical fertilizer to increase its nitrogen content also produced a rich supply of potassium. These findings concur with those of Imayavaramban *et al.*
(2002), Deshmukh *et al.* (2002), and Verma *et al.* (2012).

Table 1: Growth attributes of sesame influenced by integrated nutrient management

Treatments		Plant height (cm)	No. of branches plant^{-1}	Dry matter production plant^{-1}
T_1	100% RDF	95.35	5.30	20.15
T_2	100% RDF +1% foliar spray- Humic acid	100.20	5.96	21.23

T_3	100% RDF +1% foliar spray- Fulvic acid	98.23	5.60	20.89
T_4	75% RDF +25% RDF through FYM	86.47	4.11	16.29
T_5	75% RDF +25% RDF through vermicompost	91.54	4.90	18.91
T_6	75% RDF +25% RDF through poultry manure	89.23	4.51	17.64
T_7	50% RDF + 50% RDF through FYM	80.23	3.80	15.08
	SE (m) ±	2.63	0.43	4.05
	CD at 5%	7.97	1.30	11.54
	GM	91.60	4.88	18.59

The data found on dry matter production plant^{-1} recorded and analyzed is presented in Table 1. At harvest, application of 100% RDF + 1% foliar spray-humic acid (T_2) recorded significantly maximum (21.23). It was at par with application of 100% RDF + 1% foliar sprayfulvic acid (T_3). It's possible that adding organic manure to chemical fertilizer to increase its nitrogen content also produced a rich supply of potassium. These findings concur with those of Imayavaramban *et al.* (2002), Deshmukh *et al.* (2002), and Verma *et al.* (2012).

- Yield attributes

Yield attributes *viz.*, number of capsules plant^{-1} and grain yield kg ha^{-1} and straw yield kg ha^{-1} was recorded significantly higher at application of 100% RDF + 1% foliar spray-humic acid (T_2) but at par with 100% RDF +1% foliar spray- fulvic acid (T_3) (Table 2).

The maximum number of capsules plant^{-1} were recorded with application of 100% RDF + 1% foliar spray-humic acid (T_2) (60.5). It was at par with 100% RDF +1% foliar spray- fulvic acid (T_3) (Table 2).

The data found on yield recorded and analyzed is presented in Table 2. The maximum grain yield was recorded significantly with application of 100% RDF + 1% foliar spray-humic acid (T_2) (922 kg ha^{-1}). It was at par with 100% RDF +1% foliar spray- fulvic acid (T_3) (Table 2). The findings unambiguously show that the integrated use of organic and inorganic fertilizers, either alone or in different combinations, outperformed other methods in terms of sesame seed yield, stover yield, and biological yield. Sahu and associates, 2017.

Table 2: Yield attributes of sesame influenced by integrated nutrient management

Treatments		No. of capsules plant^{-1}	Grain yield ha^{-1} (kg)	Straw yield ha^{-1} (kg)
T_1	100% RDF	55.61	838	4085
T_2	100% RDF +1% foliar spray- Humic acid	60.5	922	4190
T_3	100% RDF +1% foliar spray- Fulvic acid	58.48	878	4160
T_4	75% RDF +25% RDF through FYM	45.12	698	3520
T_5	75% RDF +25% RDF through vermicompost	53.12	776	3745
T_6	75% RDF +25% RDF through poultry manure	49.25	715	3548
T_7	50% RDF + 50% RDF through FYM	40.75	654	3420
	SE (m) ±	0.67	29	129
	CD at 5%	1.88	62	260
	GM	51.83	783	3809

Significantly highest straw yield kg ha^{-1} were recorded with application of 100% RDF +1% foliar spray-humic acid (T_2) (4190 kg ha^{-1}). It was at par with 100% RDF +1% foliar spray- fulvic acid (T_3) (Table 2). The findings unambiguously show that the integrated use of organic and inorganic fertilizers, either alone or in different combinations, outperformed other methods in terms of sesame seed yield, stover yield, and biological yield. Sahu and associates, 2017.

CONCLUSION

Application of 100% RDF +1% foliar spray- humic acid (T_2) recorded higher the growth attributes *viz.*, plant height, number of branches plant^{-1} and dry matter accumulation plant^{-1} of sesame and yield attributes of sesame *viz.*, number of capsules plant^{-1}, grain yield kg ha^{-1} and straw yield kg ha^{-1} over all other treatments but was at par with 100% RDF +1% foliar spray- fulvic acid (T_3).

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