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ASSESSMENT OF RESIDUAL EFFECT OF ORGANIC NUTRIENT MANAGEMENT ON GROWTH AND YIELD OF SUMMER SESAME (*SESAMUM INDICUM* L.)

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ABSTRACT

A field experiment was carried out to study the residual effect of organic nutrient management treatments on growth, yield attributes and yield of sesame during summer, 2021-22 and 2022-23 at Research Farm, Nagarjun Medicinal Plants Garden, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra. The soil of the experimental site was moderately alkaline in reaction, low in available nitrogen, and medium in available phosphorus and high in available potassium. The objectives were to study the residual effect of FYM, vermicompost and foliar application of humic acid and fulvic acid to sesame. The experiment was laid out in randomized block design with 7 treatments replicated thrice. The results of experiment revealed that the residual effect of different organic nutrient sources applied to safed musli (*Kharif*) significantly influenced the growth attributes (plant height), yield attributes (number of branches plant^{-1}, number of capsules plant^{-1}, test weight) and seed yield of summer sesame. The maximum growth attributes and seed yield of sesame (590 kg/ha) was recorded by residual effect of vermicompost @ 2.5 t ha^{-1} + 0.5% fulvic acid at 45 DAP+0.5% humic acid spraying at 75DAP given to safed musli and it was statistically at par with residual effect of vermicompost @ 2.5 t ha^{-1} + 0.5% humic acid spraying at 45 &75DAP.

***Key words*:** Nutrient management, residual effect, growth, yield, sesame.

Introduction

The rainfed agro-ecosystem in India covers arid, semi-arid and sub humid zones which represents more than 70% of the geographical area. Most of the soils of arid region possess less than 0.5% organic matter (OM) which is below the optimum level. This low level of OM affects the physical, chemical and biological conditions of the soil. Many researchers reported that indiscriminate use of inorganic fertilizers deteriorates the chemical, physical, and biological properties of the soil. The negative effects of chemical fertilizers and escalating prices, have led to growing interests for use of organic manures in agriculture as a source of nutrients (Sangakkara,1993). The application of organic nutrients is a major component of organic farming practices (Berner, 2008). Organic manures can provide the essential plant nutrients and enhance crop productivity, but also leave a beneficial residual effect on succeeding crops (Ghosh, 2004). Incorporating organic materials into soil results in improved soil physical attributes viz., soil structure, soil aggregate stability, water holding capacity, soil drainage, soil aeration and root penetration, soil chemical attributes viz., soil macro and micro nutrient content, soil pH (Hegde, 2006). Application of organic manures on sesame in form

of residues would most likely improve its yields and seed quality (Anyanga, 2001).

Sesame (Sesamum indicum) belongs to the family Pedaliaceae and an important oilseed crops in Indian agriculture. It is also grown in many parts of the world for its insecticidal and medicinal properties as well as for its cosmetic and ornamental values. Its oil has excellent nutritional, medicinal, cosmetic, cooking qualities and its cake is a rich source of protein, carbohydrates and minerals, such as calcium and phosphorus for which it is known as 'the queen of oils'. It is cultivated on a large scale in the states of Maharashtra, Uttar Pradesh, Rajasthan, Orissa, Andhra Pradesh, Madhya Pradesh, Tamil Nadu, West Bengal, Gujarat, Karnataka, Kerala, Bihar, Assam and Punjab and to a limited extent, in Tripura and Himachal Pradesh (Ghosh, 2013). It ranks third and fourth in terms of total oilseed area and production in the country, respectively.

The crop is now grown in a wide range of environments, extending from semi-arid tropics and subtropics to temperate regions. This probably indicates a great opportunity for a prolonged and higher increase in productivity of sesame. But the productivity of sesame in country is much lower (274 kg ha^{-1}) than its potential yield (Anonymous, 2012). Lower productivity is due to use of sub-optimal rate of fertilizer, poor management and cultivation of sesame in marginal and sub-marginal lands where deficiency of macronutrients such as nitrogen, phosphorus, potassium and micronutrient is predominant (Sahu, 2017). Supply of nutrients through organic source of nutrients (farmyard manure, vermicompost) to the first crop in a cropping system and raising second crop on the residual fertility of those organic manures can help to maintain the soil nutrient reserves for attaining higher crop yields in sequence cropping system. With this background, the present investigation was carried out to study the effect of nutrient management practices in organic safed musli-sesame cropping system under hot arid condition and their residual effect on succeeding sesame.

A general view of experimental field

Materials and Methods

The field experiment was conducted at Research Farm, Nagarjun Medicinal Plant Garden & Department of Agronomy, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during *Kharif* season 2021-22 and 2022-23 which lies in the subtropical region at the latitude of 22° 42' 19.2" North and 77° 03' 43.2" East at the altitude of 30.78 (m) above mean sea level (MSL). The experiment was laid out in Randomized Block Design with seven treatments replicated in three replications. The treatments comprised of T_1-absolute control, T_2-Vermicompost @ 2.5 t ha^{-1}, T_3-FYM @ 5 t ha^{-1} ,T_4-Vermicompost @ 2.5 tha^{-1} + 0.5% humic acid spraying at 45 &75DAP, T_5- FYM @ 5.0 t ha^{-1} + 0.5% humic acid spraying at 45 &75DAP, T_6- Vermicompost @ 2.5 t ha^{-1} + 0.5% fulvic acid at 45 DAP+0.5% humic acid spraying at 75DAP, T_7- FYM @ 5 t ha^{-1}+ 0.5% fulvic acid at 45DAP+0.5% humic acid spraying at 75DAP. The humic acid and fulvic acid sprayed at 45 and 75 days after planting of safed musli in *Kharif*. Sesame (var. NT-11) was taken as a test crop to observe residual effect of these treatments. Sesame was sown in the same plots as a residual crop in summer after harvesting of safed musli. All the recommended package of practices was followed during the period of investigation. Growth parameters such as plant height, number of branches/ plant, yield attributes such as number of capsules/plant, test weight, seed and fodder yield of sesame were recorded at harvest stage of crop. Number of capsules per plant was counted from five randomly selected plants per plot. Plant height is one of the growth parameters that were measured from five plants per plot. Test weight was determined by counting 1000 seeds from each plot after threshing. Seed yield of each plot was weighed in grams and converted to area basis to determine the yield kg/ha.

Results and Discussion

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads:

Residual effect of organic nutrient management practices on plant height

The data pertaining to plant height of sesame revealed that treatments applied to preceding *Kharif* safed musli crop had a positive residual effect on growth parameters like plant height of summer sesame (Table 1). Residual treatment of T_6-vermicompost@2.5 t ha^{-1} + 0.5% fulvic acid at 45 DAS+0.5% humic acid spraying at 75DAP resulted in significantly taller plants (119.67cm) than all other treatments at harvest stage of crop. The height

Table 1: Residual effect of organic nutrient management practices on growth and yield of summer sesame.

Treatment	PH	NBP	NCP	TW	SY
T_1-Control	109.67	4.10	40.33	2.82	450
T_2-Vermicompost @ 2.5 t ha^{-1}	116.33	4.50	42.67	2.95	564
T_3-FYM @ 5 t ha^{-1}	111.67	4.30	41.67	2.85	510
T_4-Vermicompost @ 2.5 t ha^{-1} + 0.5% humic acid spraying at 45 &75DAP	117.33	5.20	43.33	2.96	584
T_5-FYM @ 5.0 t ha^{-1}+ 0.5% humic acid spraying at 45 &75DAP	112.67	4.38	42.07	2.93	551
T_6-Vermicompost @ 2.5 t ha^{-1} + 0.5% fulvic acid at 45 DAP+0.5% humic acid spraying at 75DAP	119.67	5.40	44.33	2.97	590
T_7-FYM @ 5 t ha^{-1}+ 0.5% fulvic acid at 45DAP+0.5% humic acid spraying at 75DAP	115.33	4.50	42.10	2.95	560
SE(m)±	1.11	0.27	1.44	0.07	20
CD at 5%	3.43	0.84	NS	NS	63

PH: Plant height (cm); NBP: Number of branches $plant^{-1}$; NCP: Number of capsules $plant^{-1}$; TW: Test weight (g); SY: Seed yield (kg ha^{-1})

was found to be lowest (109.67 cm) with control (T_1). The plant height might be due to residual effect of organic manure in combination of humic and fulvic acids because it reduces the nitrification processes and enhance nutrient use efficiency of manures (Santhi, 1986).

Residual effect of organic nutrient management practices on number of branches/plant

During the present investigation, it was observed that different nutrient management practices employed in safed musli-sesame cropping system had significant residual impact on number of branches $plant^{-1}$ of succeeding sesame crop. Among organic nutrient management treatments, residue of vermicompost @2.5 t ha^{-1} + 0.5% fulvic acid at 45 DAS+0.5% humic acid spraying at 75DAP recorded the maximum number of branches/plant (5.40) being at par with residue vermicompost @ 2.5 t ha^{-1} + 0.5% humic acid spraying at 45 &75 DAP. The addition of organic manures and foliar spray of humic and fulvic acid to preceding crop might have a positive impact on all the yield contributing characters of sesame. Vermicompost with neem leaf powder was found suitable for growth and yield of carrot (Ali, 2016).

Residual effect of organic nutrient management practices on number of capsules/plant

The number of capsule $plant^{-1}$ of sesame was not significantly influenced by the residual effect of nutrient management practices applied to preceding safed musli crop (Table 1). It is clearly indicated that highest number of capsule per plant was recorded in T_6 (44.0) which were at par with T_4 and T_2 and control (T_1) resulted in lowest number of capsule $plant^{-1}$ (20.33).

Residual effect of organic nutrient management practices on test weight and seed yield

It is noticed from the data presented in Table 1 that the treatments applied to safed musli did not able to produce significant effect on test weight of sesame. However, T_6 (vermicompost@2.5 t ha^{-1} + 0.5% fulvic acid at 45 DAP+0.5% humic acid spraying at 75DAP) recorded numerically higher test weight than other treatments. Residual effect of 75% RDNF+25% N through neem cake on greengram did not show significant effect on test weight (Dash, 2017). Whereas, the various sources of nutrition management practices applied to safed musli have significant residual impact on the seed yield of succeeding sesame (Table 1). From the data, it could be observed that T6 (Vermicompost @ 2.5 t ha^{-1}+ 0.5% fulvic acid at 45 DAP+0.5% humic acid spraying at 75DAP) resulted in significantly higher seed yield 590 $kgha^{-1}$ which was higher than the control (450 kg ha^{-1}). This might be attributed to the residual effect of the organics nutrient added to the wheat as it was reported that organic sources of nutrient applied to the preceding crops benefit the succeeding crops to a great extent (Hedge, 1998). Sorghum yield was increased when compost and neem leaf mulches were combined used (Tilander, 1997). Similarly, combined application of neem extract and nutrient sources enhances the growth and yield of okra (Sale, 2015).

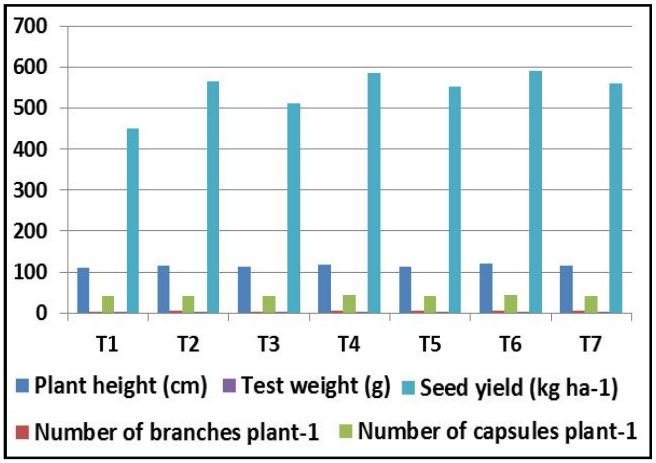

Fig. 1: Residual effect of organic nutrient management practices on growth and yield of summer sesame.

Conclusion

Nutrient management practices are one of the important issues for sustainable crop production. It can be concluded that application of Vermicompost @ 2.5 t ha^{-1} + 0.5% fulvic acid at 45 DAP+0.5% humic acid spraying at 75DAP to *Kharif* safed musli crop significantly increased growth parameters, yield attributes and seed yields of succeeding summer sesame crop.

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