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INFLUENCE OF NITROGEN LEVELS AND *G-AMRUT* ON GROWTH, YIELD ATTRIBUTES AND YIELD OF SUMMER SESAME UNDER ORGANIC FARMING

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ABSTRACT

A field experiment entitled "Influence of nitrogen levels and *G-amrut* on growth, yield and yield attributes of summer sesame under organic farming" was conducted at Organic Farm, Navsari Agricultural University, Navsari (Gujarat) during the year 2022-23. The field experiment consisted treatments *viz.,* T_1: Control, T_2: 100% RDN through Bio-compost, T_3: 100% RDN through Bio-compost + 2% *G- amrut,* T_4: 75% RDN through Bio-compost + 2% *G-amrut*, T_5: 50% RDN through Bio-compost + 2% *G-amrut*, T_6: 100% RDN through Bio-compost + 500 l/ha *G-amrut*, T_7: 75% RDN through Bio-compost + 500 l/ha *G-amrut* and T_8: 50% RDN through Bio-compost + 500 l/ha *G-amrut* to sesame in *summer* season and replicated three times in randomized block design. On the basis of results, the growth attributes *viz.,* Plant height (103.33 cm), number of capsules per plant (34.80), capsule length (2.75 cm), capsule yield per plant (15.06 g), seed yield (1426 kg/ha) and stover yield (2096.63 kg/ha) at harvest were found to be superlative with the treatment (T_3) soil application of 100% RDN through Bio-compost and foliar spray of 2% *G-amrut*. Among all the treatments, the treatment T_3) soil application of 100% RDN through Bio-compost and foliar spray of 2% *G-amrut* was found to be significantly superior with respect to growth, yield attributes and yield as compared to rest of the treatments while, the lowest values were obtained under the treatment T1 (Control). Almost all these growth, yield attributes and yield remained in the $T_3 > T_4 > T_6 > T_7 > T_2 > T_5 > T_8 > T_1$ order of their significance.

Keywords **:** Sesame, Biocompost, *G-amrut.*

Introduction

In organic farming, it is important to work constantly to build a healthy soil that is rich in organic matter and has all the nutrients that the plants need. Several methods *viz.,* green manuring, addition of manures and biofertilizers *etc.* can be used to build up soil fertility. These organic sources not only add different nutrients to the soil but also help to prevent weeds and increase soil organic matter to feed soil microorganisms. Oilseeds are backbone of agriculture economy of India since long and considered as the second largest agricultural commodity after cereal. With an annual average yield of about 29 million tons, India stands as fourth leading oilseeds producing countries, next only to the USA, China, Brazil.

Sesame plant is an important and ancient oil-yielding seed crop. It is belonging to the family *Pedaliaceae* (Boghdady *et al.,* 2012) which consist of 16 genera and about 60 species. The genus *sesamum* consist of 35 recognized species. Out of these, *Sesamum indidicum* L. is cultivated extensively. Africa is considered as the primary center of origin for sesame, while India is the secondary centre of origin and India is one of the major exporters of a sesame seeds. The area under oilseeds in India is 28.79 million hectares, the oilseed production is exceeding 40 million tonnes in 2022-23 and productivity is 400-500

kg/ha in 2024-25. The production of sesame in India was 8.29 lakh tonnes in 2024-25 (Anon., 2024). In India, it is mainly grown in west Bengal, Uttar Pradesh, Andhra Pradesh, Madhya Pradesh, Rajasthan and Gujarat. Sesame is an important oilseed crop cultivated mainly during rainy season and sometimes as *rabi* and summer crop. Sesame being an important oilseed crop as it has its own merits like its fast growth rate, short duration, less water requirement and wide adaptability under varying soil type. There for it is cultivated in different agro climatic region of India.

The combine use of compost and *G-amrut* helps to restore and sustain soil fertility and crop productivity. It favorably affects the physical, chemical and biological environment of soil. Adoption of appropriate integrated nutrient management strategies holds a great potential in boosting the sesame production. Therefore, combine use of compost and *G-amrut* is crucial not only for increasing the yield but also for the improvement of soil health.

Material and Methods

A field experiment was carried out on "Influence of nitrogen levels and *G-amrut* on growth, yield and soil properties of summer sesame under organic farming" at Organic Farm, ASPEE College of Horticulture, Navsari Agricultural University, Navsari (Gujarat) during the year 2022-23. The data of soil analysis revealed that the soil of experimental plot was clay in texture, the soil of experimental field was clayey in texture, medium in available nitrogen (302 kg/ha) and available phosphorus (48kg/ha) and high in available potassium (511 kg/ha). The soil reaction was slightly alkaline (7.60 pH) with normal electric conductivity (0.39 dS/m). The field experiment consisted of combine use of compost and *G-amrut viz*., T_1: Control, T_2: 100% RDN through Bio-compost, T_3: 100% RDN through Bio-compost + 2% *G-amrut,* T_4: 75% RDN through Bio-compost + 2% *G-amrut*, T_5: 50% RDN through Bio-compost + 2% *G-amrut*, T_6: 100% RDN through Bio-compost + 500 l/ha *G-amrut*, T_7: 75% RDN through Bio-compost + 500 l/ha *G-amrut* andT_8: 50%RDN through Bio-compost + 500 l/ha *G-amrut.* The recommended dose of nitrogen for summer sesame is 50 kg/ha.

The sesame *cv.* Gujarat Til-3 was sown with spacing 45 cm between two rows. The required quantity of well decomposed bio-compost was incorporated and mixed well within the soil at the time of land preparation. The sowing was done by line sowing method on 15th February in 2022 using seed rate 2.5 kg/ha. The plots were irrigated immediately after sowing to ensure uniform germination. The foliar spraying and drenching with irrigation 'water.

Methodology

The *G-amrut* for foliar spraying and drenching with irrigation water were prepared by mixing fresh ground leaves with cow urine in 1:1 ratio followed by fermentation. This mixture was kept for anaerobic decomposition for 45 days and was shaken well every day in morning or evening. While spraying residue and extract of formulation were separated by passing the mixture through a sieve cloth. The extract was collected into flask. The formulation prepared was fermented 45 days before spraying and drenching. The spraying was done at 30, 45 and 60 DAS and the extract was prepared every time using fresh leaves. In order to record various quantitative observations, five plants were selected from each net plot by using random table for periodical observations. The selected plants were labelled with proper notations and observations on growth and yield attributing characters were recorded. Total biological yield, seed yield and stover yield were recorded from net plot area.

Table 1: Properties of Biocompost and G-*amrut*

Sr. No.	Parameter	Biocompost	*G-amrut*		
			At 30 DAS	At 45 DAS	At 60 DAS
1.	N (%)	1.4	0.142	0.151	0.134
2.	P (%)	0.61	0.1749	0.12455	0.4849
3.	K (%)	0.83	4.866	3.085	2.822
4.	Fe (ppm)	3513	8.74	7.89	6.04
5.	Mn (ppm)	657.4	1.91	1.71	1.54
6.	Zn (ppm)	155.3	0.76	0.82	0.62
7.	Cu (ppm)	50.5	0.33	0.29	0.52

Results and Discussion

Effect of treatments on plant height, number of capsules per plant, capsule length and capsule yield per plant of sesame

Among the treatments, the highest plant height (103.33 cm) was observed under treatment T_3 (100 per cent RDN through Bio-compost + 2% *G-amrut*) and remained at par with, T_4 (75% RDN + 2% *G-amrut*), T_6 (100% RDN + 500 l/ha *G-amrut*) and T_7 (75% RDN + 500 l/ha *G-amrut)* treatments measuring the plant height as 100.81 cm, 103.07cm, and 92.19cm, respectively. Likewise, highest plant height, number of capsules/plant, capsule length, capsule yield per plant were also obtained in the same treatment i.e. treatment T_3 (100 per cent RDN through Bio-compost + 2% *G-amrut*). Despite this, treatment T1 reported lower values in all the yield attributes. This similar results were found by reported by Choudhary *et al.* (2014) in groundnut, Choudhary *et al.* (2017) in sesame, Bhutadiya *et al.* (2019) in groundnut and Venkata *et al.* (2022) in groundnut.

Almost all these growth and yield attributes remained in $T_3 > T_4 > T_6 > T_7 > T_2 > T_5 > T_8 > T_1$ order of their significance. Significantly higher plant height due to integrated use of *G-amrut* with RDN. This showed that sesame crop responded well to *G-amrut*. This might be due to *G-amrut* may be attributed to the presence of growth promoting substances in *G-amrut* like IAA and GA that enhance the cell elongation and adequate supply of nutrients in sufficient amount required by plant throughout the growing season and improved the soil physical and biological properties and increase the availability of nutrients throughout the growth period specially at critical growth periods and thus favorable influence of nutrients to produce larger cells with thinner cell walls and its contribution in cell division and cell elongation which improved vegetative growth and ultimately increased plant height. The results support to the earlier findings of Choudhary *et al.* (2017) in sesame and Patel *et al.* (2018) in groundnut.

The positive response to combine application of RDN and *G-amrut* might be attributed to the better nutrient availability and its favourable effect on soil physical and biological properties resulting increased yield attributes. Moreover, the glyricidia extract has growth promoting substances. Smaller quantities of IAA and GA present in panchagavya when foliar sprayed could have created stimuli in the plant system wrist in turn increased the production of growth regulator in cell system and the action of growth regulators in plant system stimulated the necessary growth and development, leading to better yield and secondly, better growth of plants and higher yield by slow release of nutrients for absorption with additional nutrients like gibberellins, cytokinin, and auxins, by the application of organic inputs reported by Choudhary *et al.* (2014) in groundnut, Choudhary *et al.* (2017) in sesame, Bhutadiya *et al.* (2019) in groundnut and Venkata *et al.* (2022) in groundnut.

Table 2: Effect of treatments on plant height, number of capsules per plant, capsule length and capsule yield per plant

Treatments	Plant Height (cm)	Number of capsules per plant	Capsule length (cm)	Capsule yield per plant (g)
T_1: Control	70.57	23.40	2.17	10.99
T_2: 100% RDN	84.29	31.60	2.45	12.34
T_3: 100% RDN + 2% *G-amrut*	103.33	34.80	2.75	15.06
T_4: 75% RDN + 2% *G-amrut*	100.81	33.40	2.61	14.24
T_5: 50% RDN + 2% *G-amrut*	83.39	28.00	2.37	11.89
T_6: 100% RDN + 500 l/ha *G-amrut*	103.07	34.20	2.65	14.94
T_7: 75% RDN + 500 l/ha *G-amrut*	92.19	33.20	2.53	12.40
T_8: 50%RDN + 500 l/ha *G-amrut*	72.04	26.20	2.34	11.34
SEm±	3.73	1.47	0.08	0.62
CD at 5%	11.32	4.46	0.26	1.88
CV (%)	7.21	8.32	6.06	8.35

Effect of treatments on seed yield and stover yield of sesame

Among the different treatments, significantly higher seed yield under treatment T_3 (100% RDN + 2% *G-amrut*) was obtained 1426.87 kg/ha and remained statistically at par with the T_6 (100% RDN + 500 l/ha *G-amrut*), T_4 (75% RDN + 2% *G-amrut*) and T_7 (75% RDN 500 l/ha *G-amrut)* treatments and they recorded the seed yield of 1403.50 kg/ha, 1348.91kg/ha and 1265.67 kg/ha, respectively. Significantly lower seed yield (1054.53 kg/ha) was recorded in the control

treatment (T_1). These results are in close vicinity with the finding Takar *et al.* (2017) and Bhutadiya *et al.* (2019) in groundnut. In case of stover yield, significantly higher stover yield under treatment T_3 (100% RDN + 2% G- *amrut*) 2096.63 kg/ha was obtained, but it was statistically similar to T_2, T_4, T_5, T_6 and T_7 with stover yield of 1963, 2030, 1960, 2041 and 2025, respectively. The results are substantiated with the studies conducted by Patra *et al.* (2011) in groundnut, Choudhary *et al.* (2017) in sesame, Takar *et al.* (2017) in sesame and Bhutadiya *et al.* (2019) in groundnut.

The reason for the higher seed yield reported by Choudhary *et al.* (2017) that the greater production of metabolites and their translocation to various sinks specially the reproductive structures (capsules, seeds and stalk) might have in increasing number of capsules per plant and number of seed per capsule in sesame. Another probable reason for enhance the seed yield have been reported to be associated with the release of macro and micro nutrients during the course of decomposition of organic sources. Takar *et al.* (2017) reported that, application of oranic sources combination leads to increase availability of nitrogen, phosphorus, potassium and other nutrients. This results in increased photosynthetic activity and dry matter partitioning at time of reproductive stage which in turn increases accumulation of photosynthates in capsule of sesame. These results are in close vicinity with the finding Bhutadiya *et al.* (2019) in groundnut. The positive influence of production of stover yield might be due to slow and steady availability of nutrient and supply of nutrients through organic throughout the crop growth period, increased the supply of easily assimilated major as well as micronutrients to plant, increased biomass production thus increasing stover yield reported by Chirde *et al.* (2017).

Table 3: Effect of treatments on seed yield and stover yield of sesame.

Treatments	Seed yield (Kg/ha)	Stover yield (Kg/ha)
T_1: Control	1054	1523
T_2: 100% RDN	1209	1963
T_3: 100% RDN + 2% *G-amrut*	1426	2096
T_4: 75% RDN + 2% *G-amrut*	1349	2030
T_5: 50% RDN + 2% *G-amrut*	1184	1960
T_6: 100% RDN + 500 l/ha *G-amrut*	1403	2041
T_7: 75% RDN + 500 l/ha *G-amrut*	1265	2025
T_8: 50%RDN + 500 l/ha *G-amrut*	1160	1644
SEm±	65.6	88.2
CD at 5%	199.2	267.7
CV (%)	9.05	8.00

Conclusion

To achieve above, the crop should be applied *G-amrut* either as 2% foliar spray or 500 l/ha drenching through irrigation water with 100% RDN or 75% RDN in terms of compost gave higher growth and yield. This finding underscore the potential of G-*amrut* and compost to provide essential plant nutrients and enhance crop productivity, and also leaves a beneficial residual effect on succeeding crops.

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