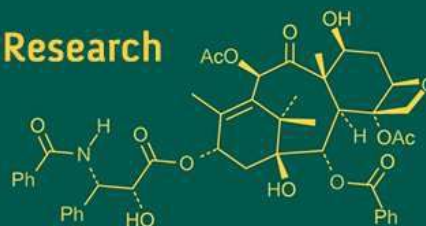


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2024; 8(10): 1136-1140
www.biochemjournal.com
Received: 24-07-2024
Accepted: 29-08-2024

Shubham S Palve
PG Scholar, Division of Soil
Science, Dr. Sharadchandra
Pawar College of Agriculture,
Baramati, Pune, Maharashtra,
India

Balasaheb N Tambe
Division of Soil Science, Dr.
Sharadchandra Pawar College
of Agriculture, Baramati,
Pune, Maharashtra, India

Reshma G Pondkule
Assistant Professor, Division of
Soil Science, Dr.
Sharadchandra Pawar College
of Agriculture, Baramati,
Pune, Maharashtra, India

Suyash C Gaikwad
PG Scholar, Division of Soil
Science, Dr. Sharadchandra
Pawar College of Agriculture,
Baramati, Pune, Maharashtra,
India

Rani D Gaikwad
Assistant Professor, Division of
Soil Science, Dr.
Sharadchandra Pawar College
of Agriculture, Baramati,
Pune, Maharashtra, India

Aishwarya V Balpande
PG Scholar, Division of Soil
Science, Dr. Sharadchandra
Pawar College of Agriculture,
Baramati, Pune, Maharashtra,
India

Corresponding Author:
Shubham S Palve
PG Scholar, Division of Soil
Science, Dr. Sharadchandra
Pawar College of Agriculture,
Baramati, Pune, Maharashtra,
India

Effect of vermiwash foliar sprays on yield contributing characteristics and quality of okra grown in inceptisol

Shubham S Palve, Balasaheb N Tambe, Reshma G Pondkule, Suyash C Gaikwad, Rani D Gaikwad and Aishwarya V Balpande

DOI: <https://doi.org/10.33545/26174693.2024.v8.i10o.2697>

Abstract

The present investigation entitled "Effect of vermiwash foliar sprays on Yield Contributing Characteristics and quality of okra grown in Inceptisol". The experiment was laid out during kharif 2023-24 at Research Farm of Division of Soil Science, Dr. Sharadchandra Pawar College of Agriculture, Baramati Maharashtra (India). This experiment was conducted with 8 treatment combinations of GRDF (General Recommended Dose of Fertilizers) and vermiwash sprays after 30, 38 and 46 DAS in Randomized Block Design with three replications. Seeds of Okra, Radhika (hybrid) were sown on plot size of 5.50 m x 1.2 m. The row to row and plant to plant spacing was maintained at 60 cm and 30 cm, respectively hence each plot accommodated 30 plants. The result indicated that the initial soil sample was prepared and analysed for its various chemical soil properties. The soil pH was moderately alkaline (8.4), normal in electrical conductivity (0.44 dS m⁻¹), medium in organic carbon (0.47%) and medium calcareous in nature (5.84%). The soil was low in available N, moderate in available P and moderately high in available K content. The micronutrient status in soil was sufficient. The treatment wise by selecting 5 random plants. The growth and yield contributing characters of the treatment were worked out. The treatment T₈ (100% GRDF + 30% Vermiwash spray) recorded maximum plant height (19.05 cm., 34.69 cm. and 72.66 cm.) at 25, 45 and 65 DAS, Leaf area (110. 57 dm² and 146.03 dm²) at 45 DAS and 65 DAS, chlorophyll content (52.55., 59.19 and 59.85 SPAD) at 35, 45 and 55 DAS, no of fruits per plant (32.53), fruit length (13.04 cm) and weight of fruits (24.32 g) respectively.

Keywords: Okra, vermiwash, foliar sprays, GRDF, growth and yield contributing characters

1. Introduction

Okra (*Abelmoschus esculentus*) is one of the significant vegetable crops in India. It is popularly known as Lady's finger or "Bhindi". Okra is generally self-pollinated belongs to the Malvaceae family native to Africa. It is grown all across the tropical and subtropical regions as well as in the warmer climates of temperate regions (Basavaraja *et al.*, 2009) [2].

Okra scientifically known as *Abelmoschus esculentus* is a vegetable crop that is economically important and grown in tropical and sub-tropical region across the world. The crop originates from West Africa and can be grown as either annual or perennial. Reaching a height of 0.5 to 4 meters. It is a heat and drought-tolerant crop, suitable both as a garden crop and on large commercial farms. Okra is grown commercially in India, Turkey, Iran, regions of Africa, the Southern United States and Japan countries. In England, it is known as Lady's Finger, in the U.S., it's called Gumbo and in India, it is referred to as Bhendi. Okra is rich in antioxidants and serves as primary source of Ca, K, vitamins and other minerals.

India is the world's largest producer of okra among vegetables (FAO 2021) [6]. The country's diverse climate supports the availability of a wide range of fresh produce throughout the year. Okra is high in minerals including Ca, K, Cu, Fe, P, Mg, Zn and Manganese these seeds are also high in alpha-tocopherol (Petropoulos *et al.*, 2018; Elkhailifa *et al.*, 2020) [9, 4].

Okra fruit has a high moisture content and is also rich in nutrients. It is an important source of vitamins, minerals, and carbohydrates, which are present in the form of mucilage (Tiwari *et al.*, 2014) [12].

2. Materials and Methods

This chapter comprises the details about the materials used and the methods adopted during the course of present investigation entitled as “Effect of Vermiwash Foliar Sprays on Growth and Yield contributing characteristics of Okra in Inceptisol”. The experiment was carried out during *Kharif* season 2023-24.

2.1 Materials

2.1.1 Experimental site and Location

The experiment was laid out during *kharif* 2023-24 at Research Farm of Division of Soil Science, Dr. Sharadchandra Pawar College of Agriculture, Baramati Maharashtra (India). The location of the experimental farm lies between 18.14° latitude and 74.54° longitude.

2.1.2 Climate and weather conditions

The climate was classified as semi-arid tropical, with an average annual precipitation of 408.3 mm. The rainfall was torrential, irregular, scanty and uneven distribution. The meteorological observation recorded during 2023-24. The numbers of rainy days were 26 days. The mean annual maximum and minimum temperatures were ranged from 28.48 °C to 37.45 °C and 15.27 °C to 22.17 °C respectively.

2.1.3 Soil

The soil of the experimental field was medium deep black, belonging to Inceptisol order. The soil samples were collected randomly with the help of auger at a depth of 0-20 cm before starting the experimental research work. The chemical analysis was done in the Division of Soil Science, Dr. Sharadchandra Pawar College of Agriculture, Baramati. A composite soil sample was prepared and analysed for its various soil properties. The soil pH was moderately alkaline (8.4), electrical conductivity is normal (0.44 dSm⁻¹), medium organic carbon (0.47%) and medium calcareous in nature (5.84%). The soil was low in available N, moderate in available P and moderately high in available K content. The micronutrient status in soil was sufficient in all micronutrients.

2.1.4 Design of Experiment

The field experiment was conducted in Randomized Block Design (RBD) with 3 replications and 8 treatments in each replication.

2.1.5 Treatment Details

The experimental details of treatments, which were comprised 8 treatments are presented in Table 2.1

Table 1: The details of treatments and checks used in the study are given below

Treatment No.	Treatments
T ₁	GRDF + Water spray
T ₂	100% GRDF 150:100:100 (N: P ₂ O ₅ : K ₂ O Kg ha ⁻¹)
T ₃	75% GRDF + 10% Vermiwash spray
T ₄	75% GRDF + 20% Vermiwash spray
T ₅	75% GRDF + 30% Vermiwash spray
T ₆	100% GRDF + 10% Vermiwash spray
T ₇	100% GRDF + 20% Vermiwash spray
T ₈	100% GRDF + 30% Vermiwash spray

Note: FYM- a common dose of FYM was applied @ 20 t ha⁻¹ to all the treatments.

GRDF- 150:100:100 (N: P₂O₅: K₂O) kg ha⁻¹ was be applied to all the treatments.

2.2 Fertilizer application

RDF of 150:100:100 (N: P₂O₅: K₂O) kg ha⁻¹ was applied with phosphorus given as a basal dose and nitrogen and potassium administered in three split doses. Additionally, three vermiwash sprays were applied treatment-wise at 30, 60 and 90 DAS.

2.3 Yield contributing characters

2.3.1 Plant Height (cm)

Height of plant was recorded from the base just above the soil surface to growing point of the plant after 25, 45 and 65 days after sowing.

2.3.2 Leaf Area (dm²)

Leaf area was recorded with the help of leaf area meter of 3rd top most leaf (i.e. photo synthetically active) in selected plants was recorded after 25, 45 and 65 days after sowing.

2.3.3 Fruit Length (cm)

The fruit length was measured from selected five plants of each treatment with the help of scale and then average was recorded.

2.3.4 Number of fruit plant⁻¹

The number of fruits harvested from five selected plants in each treatment was collected during each picking, counted and average fruits per plant was calculated.

2.3.5 Fruit weight (g)

The weight of five fruits was recorded separately with the help of digital weighing balance and average was worked out for each treatment.

2.3.6 Chlorophyll content

Chlorophyll content was determined from the plant's leaves by using an automatic SPAD meter. The SPAD values were recorded 5 days after vermiwash spray by clamping the SPAD sensor over the fully expanded five leaves from each tagged plant Shibaeva *et al.* (2020) ^[11].

2.3.7 Fruit yield per plant

The weight of fruits per plant harvested from randomly tagged five plants from each treatment and each replication was noted down at each picking. The total weight of fruits harvested in each picking was computed, averaged and expressed in weight per plant in grams.

2.3.8 Fruit yield per plot

The weight of fruits harvested from each picking was recorded from each plot (including the tagged plants) and total yield per plot estimated by adding the yield of all the harvest expressed in kilograms per plot.

2.3.9 Fruit yield

Every week marketable fruits were picked from each plot and total yield was noted and calculated on ha⁻¹ basis by using formulae given below.

$$\text{Fruit yield (ton ha}^{-1}\text{)} = \frac{\text{Fruit yield (Kg plot}^{-1}\text{)}}{\text{Net plot area (m}^2\text{)}} \times 10$$

2.4 Statistical Analysis

The data generated after the chemical and physical observations recorded from soil and plant as per the

scheduled plan mentioned above was statistically analysed by adopting Randomized Block Design (RBD) as suggested by Panse and Sukhatme (1985) [8].

3. Result and discussion

3.1 Effect of vermiwash foliar sprays on growth parameters of okra plant

3.1. Growth parameters

3.1.1 Plant height

Plant height was measured at 25, 45 and 65 DAS. At 25 DAS, there was non-significant variation in height. However, at 45 and 65 DAS, treatments with vermiwash, especially 100% GRDF + 30% vermiwash spray, significantly increased plant height compared to other treatments, with the highest heights recorded at 34.69 cm and 72.66 cm, respectively, while the control (water spray) showed the lowest growth at both stages. Similar result aligns with Ansari and Kumar (2010) [11] also reported that foliar spray of vermiwash and vermicompost increased the plant height.

3.1.2 Leaf area (dm²)

Leaf area in okra was measured at 25, 45 and 65 DAS. At 25 DAS, no significant differences were observed among the treatments. By 45 and 65 DAS, treatments with vermiwash, particularly 100% GRDF + 30% vermiwash spray, significantly increased leaf area, with the highest recorded values being 110.57 dm² at 45 DAS and 146.03 dm² at 65 DAS. The control treatment (GRDF + water spray) consistently showed the lowest leaf area at both stages. Similar result reported by Sanjutha *et al.* (2008) [10] and Yassen *et al.* (2020) [13].

3.1.3 Chlorophyll content (SPAD units)

Vermiwash foliar sprays significantly increased chlorophyll content in okra. T₈ (100% GRDF + 30% vermiwash spray) consistently recorded the highest chlorophyll content at all stages (52.55, 59.19 and 59.85), followed by T₇ and T₆. T₁ (GRDF + water spray) had the lowest chlorophyll content across all stages. Similar finding reported by Meghvansi *et al.* (2012) [7] found that the foliar spray of vermiwash increases chlorophyll content (SPAD value).

Table 1: Effect of vermiwash foliar sprays on growth parameter and chlorophyll content of okra

Sr. No.	Treatments	Plant Height (cm)			Leaf area (dm ²)			Chlorophyll content (SPAD units)		
		25 DAS	45 DAS	65 DAS	25 DAS	45 DAS	65 DAS	35 DAS	43 DAS	51 DAS
1	T ₁	19.18	26.57	60.45	28.31	100.85	122.85	39.22	40.83	41.12
2	T ₂	18.69	27.86	61.26	28.24	103.66	129.50	43.59	45.67	44.23
3	T ₃	18.79	27.95	62.69	28.54	105.03	131.55	45.62	49.59	49.92
4	T ₄	19.40	30.28	63.30	29.44	105.89	135.22	46.96	50.09	50.09
5	T ₅	19.36	30.55	67.30	29.33	107.83	139.65	48.41	53.29	53.82
6	T ₆	18.81	33.05	68.27	29.26	108.51	141.55	49.59	55.23	55.89
7	T ₇	18.28	33.40	69.87	29.36	109.05	144.82	51.46	56.34	57.01
8	T ₈	19.05	34.69	72.66	29.26	110.57	146.03	52.55	59.19	59.85
	SE (m) ±	1.01	1.382	1.818	0.52	1.294	2.274	1.58	2.11	2.31
	CD (0.05)	NS	4.191	5.514	NS	3.924	6.897	4.78	6.39	6.70

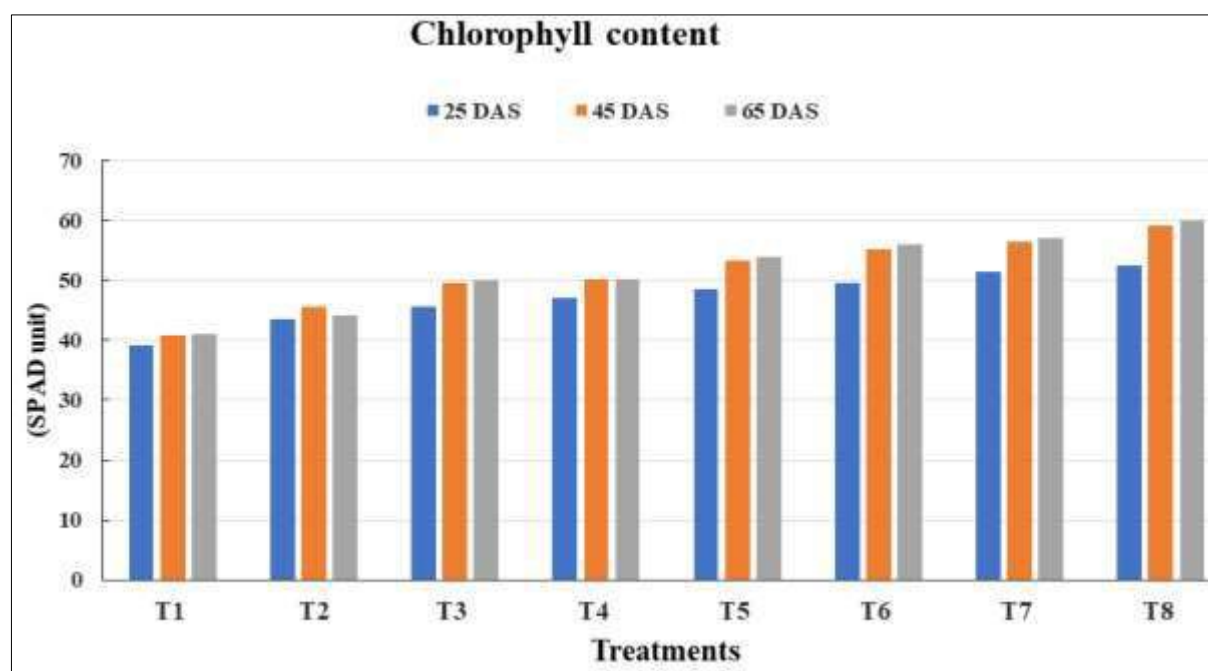


Fig 1: Effect of vermiwash foliar sprays on chlorophyll content of okra

3.2 Effect of vermiwash foliar sprays on yield contributing characters of okra

3.2.1 Fruit Length (cm): The result indicated that the effect of vermiwash foliar sprays on fruit length was between

10.82 cm and 13.04 cm with an overall average of 12.05 cm. Treatment T₈ recorded longest fruit length (13.04 cm) which was superior over all other treatments followed by T₇ (12.43 cm) and T₆ (12.37 cm) which was at par with T₅ (12.32 cm)

However, T₄ (12.01 cm) followed by T₃ (11.79 cm) was at par with T₂ (11.63 cm). T₁ (10.82 cm) measured the shortest fruit length among all treatments.

3.2.2 Number of fruits per plant

The T₈ (100% GRDF + 30% Vermiwash Spray) recorded the highest number of fruits plant⁻¹ (32.53), which was significant over all other treatments and was followed by T₇ (32.27) and T₆ (31.20) which were at par with T₅ (30.67). However, T₄ (29.27) followed by T₃ (29.13 cm) was at par with T₂ (27.80). T₁ (GRDF + water spray) (24.77) recorded the lowest number of fruits plant⁻¹.

3.2.3 Weight of fruits (g)

The highest fruit weight (24.32 gm) was recorded in the treatment with 100% GRDF + 30% vermiwash spray, followed by T₇ (24 gm) and T₆ (23.69 gm), which was on par with T₅ (21.85 gm). While the control treatment, T₁ (GRDF + water spray) recorded the lowest fruit weight at 16.54 gm.

Similar results were observed by Dwivedi *et al.* (2018) [3] found that the highest fruit length (17.96 cm) and fruit weight (18.16 g) were achieved by applying the recommended NPK and five vermiwash sprays at weekly intervals of 30 DAS.

Table 2: Effect of vermiwash foliar sprays on yield contributing characters of okra

Sr. No.	Treatments	Fruit Length (cm)	Number of fruits plant ⁻¹	Weight of fruits (g)
1	T ₁ (GRDF + Water spray)	10.82	24.77	16.54
2	T ₂ 100% GRDF 150:100:100 (N: P ₂ O ₅ : K ₂ O Kg ha ⁻¹)	11.63	27.80	18.86
3	T ₃ 75% GRDF + 10% Vermiwash spray	11.79	29.13	19.91
4	T ₄ 75% GRDF + 20% Vermiwash spray	12.01	29.27	20.40
5	T ₅ 75% GRDF + 30% Vermiwash spray	12.32	30.67	21.85
6	T ₆ 100% GRDF + 10% Vermiwash spray	12.37	31.20	23.69
7	T ₇ 100% GRDF + 20% Vermiwash spray	12.43	32.27	24.00
8	T ₈ 100% GRDF + 30% Vermiwash spray	13.04	32.53	24.32
	SE (m) ±	0.25	1.01	1.07
	CD (0.05)	0.74	3.05	3.25

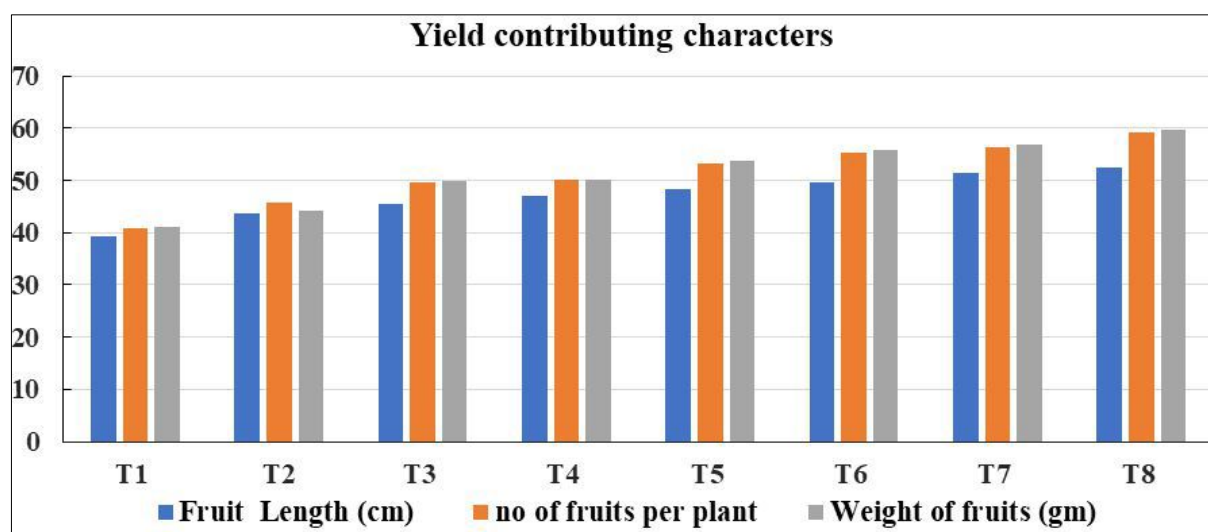


Fig 2: Effect of vermiwash foliar sprays on yield contributing characters

4. Conclusion

The application of vermiwash foliar sprays significantly influenced the growth and yield parameters of okra, including plant height, leaf area, number of fruits per plant, fruit length and fruit weight. Among the treatments, T₈ (100% GRDF + 30% Vermiwash Spray) showed the highest results, followed by T₇, T₆ and T₅, while T₁ (GRDF + Water Spray) exhibited the lowest growth and yield. Additionally, Chlorophyll content increased with the combined use of GRDF and vermiwash, with T₈ consistently having the highest chlorophyll levels across different growth stages (35, 45 and 55 DAS) whereas T₁ had the lowest. The overall effect of vermiwash foliar sprays on the growth and yield-contributing characteristics of okra demonstrated a significantly influenced. It is possible to reduce 25% GRDF for the okra crop due to the use of vermiwash foliar sprays to maximize benefits and achieve higher yields as well as saving 25% GRDF.

5. References

1. Ansari AA, Kumar S. Effect of vermiwash and vermicompost on soil parameters and productivity of okra (*Abelmoschus esculentus*) in Guyana. Afr J Agric Res. 2010;5(14):1794-8.
2. Basavaraja N. Influence of organic and inorganic sources of nutrients on growth and seed yield of okra (*Abelmoschus esculentus* L. Moench). In: Proceedings of International Conference on Horticulture; 2009; Bangalore. p. 1386-90.
3. Dwivedi M, Patel S, Dubey A, Mishra P, Sengupta SK. Response of vermiwash, vermicompost and NPK on growth and yield of okra (*Abelmoschus esculentus* L.) cv. VRO 6. Int J Chem Stud. 2018;6(3):3001-7.
4. Elkhailifa AEO, Alshammari E, Adnan M, Alcantara JC, Awadelkareem AM, Eltoum NE, *et al.* Okra (*Abelmoschus esculentus*) as a potential dietary medicine with nutraceutical importance for sustainable health applications. Molecules. 2020;26(3):696.

5. Fageria NK. Nutrient use efficiency in plants. CRC Press; 2014.
6. FAO. The State of Food and Agriculture. Food and Agriculture Organization of the United Nations; 2021.
7. Meghvansi MK, Prasad K, Mahna SK. Vermiwash: a promising strategy for crop improvement. J Plant Nutr. 2012;35(7):1063-76.
8. Panse VG, Sukhatme PV. Statistical methods for agricultural workers. 4th ed. New Delhi: ICAR; 1985.
9. Petropoulos S, Fernandes A, Barros L, Ferreira ICFR. Chemical composition, nutritional value and antioxidant properties of Mediterranean okra genotypes in relation to harvest stage. Food Chem. 2018;242:466-74.
10. Sanjutha S, Subramanian S, Indu R, Maheswari J. Integrated nutrient management in *Andrographis paniculata*. Res J Agric Biol Sci. 2008;4(2):141-5.
11. Shibaeva T, Mamaev A, Sherudilo E. Evaluation of a SPAD-502 Plus chlorophyll meter to estimate chlorophyll content in leaves with interveinal chlorosis. Russ J Plant Physiol. 2020;67:690-6.
12. Tiwari RB, Kumbhare V, Tiwari S, Mahak S. Nutritional content and health benefits of okra (*Abelmoschus esculentus*). Int J Nutr Agric Res. 2014;2(3):120-6.
13. Yassen AA, Essa EM, Marzouk NM, Zaghloul SM. Impact of vermicompost and foliar spray of vermiwash on growth, yield and nutritional status of lettuce plants. Plant Arch. 2020;20(1):449-55.