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SHORT COMMUNICATION

ORGANIC NUTRIENT MANAGEMENT TECHNIQUE FOR ENHANCING GROWTH AND PHYSIOLOGICAL PARAMETERS IN RADISH (*RAPHANUS SATIVUS* L.)

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ABSTRACT

Among the various technologies that boost the production of crop, nutrient management has got an important impact in maximizing the yield. Application of balanced fertilizers alone is not only the solution for this problem, application of residue free nutrients that protects the soil health and environment is very important. Here comes the concept of organic farming. Hence, a field experiment was conducted in the Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar to study the effect of organic nutrients on growth and physiological parameters of radish. The experiment was conducted with eighteen treatments in three replications and laid out in FRBD design. The treatment includes various sources of organic manures *viz.*, FYM, vermicompost, enriched manure along with and without use of consortium biofertilizer. Biostimulants *viz.*, buttermilk solution and EMI were given as foliar spray at 15 d interval as 2 sprays. The intercultural operations and plant protection measures were carried out as per the recommendation. The results of the experiment revealed that application of farm yard manure @ 25 t ha⁻¹ along with consortium biofertilizer @ 2 Kg ha⁻¹ and EMI @ 1:1000 dilution ha⁻¹ as foliar application recorded the highest growth parameters *viz.*, shoot length, number of leaves and shoot weight. The physiological parameters *viz.*, leaf area and chlorophyll content were recorded the highest in the same treatment T₆.

Keywords: Organic nutrients, Growth parameters, Radish

INTRODUCTION

Radish (*Raphanus sativus* L.) is the most important root vegetable crops grown in India. It is consumed as a cooked vegetable or raw as a salad which is rich in calcium, potash, phosphorus, vitamin C and variety of mineral salts. It also has got various medicinal properties *viz.*, refreshing, diuretic and used against various diseases. The crop can be cultivated throughout the year and fit very well under different cropping systems. There is a heavy demand for this crop throughout the year. Hence yield has to be increased further more. Organic agriculture mainly focuses on utilization of plant residues and manures in agriculture [1-3]. The organic manuring has positive influence on soil texture and water holding capacity. Hence changing trends towards increased environmental sensitivity, changing food habits, consumers demand for organic food products and supplements are to be considered. The aims of this study was to analyse the influence of various sources of organic nutrients on yield and quality parameters of radish.

MATERIALS AND METHODS

Experimental site

The experiment was conducted in the Department of

Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu, India.

Crop and variety

The radish variety Pusa Chetki popularly grown in this region was utilized for the present study.

Experimental design

There were eighteen treatments which were laid out in Factorial Randomized Block Design with three replications.

Methods

The field was thoroughly ploughed and divided into plots of 2mX2m. then the various sources of organic manures *viz.*, FYM @ 25 t ha⁻¹(O₁), vermicompost @ 5 t ha⁻¹(O₂) and enriched organic manure 1t ha⁻¹ (O₃) were incorporated at the time of last ploughing as per the treatments. The seed were sown by means of dibbling two seeds per hill at a spacing of 30 cm X 10 cm and watering was done. Life irrigation was done on the third day and subsequent irrigations were carried out as per the requirement. The consortium biofertilizer was applied in two levels *viz.*, (B₀)-without consortium biofertilizer and (B₁)-with consortium biofertilizer @ 2 kg ha⁻¹. Thinning was done on tenth day of sowing. Foliar application of biostimulants in three forms, *viz.*, without biostimulant application (F₀),

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application of buttermilk solution @ 3% (F₁) and application of effective microbial inoculants-EMI @ 1:1000 dilution (F₂) were given as foliar spray at 15 d interval as 2 sprays starting from fifteen days after sowing. Intercultural operations were done as per the recommendations.

Treatment details

Treatment combinations

Treatments	Combinations
T ₁	O ₁ F ₀ B ₀
T ₂	O ₁ F ₀ B ₁
T ₃	O ₁ F ₁ B ₀
T ₄	O ₁ F ₁ B ₁
T ₅	O ₁ F ₂ B ₀
T ₆	O ₁ F ₂ B ₁
T ₇	O ₂ F ₀ B ₀
T ₈	O ₂ F ₀ B ₁
T ₉	O ₂ F ₁ B ₀
T ₁₀	O ₂ F ₁ B ₁
T ₁₁	O ₂ F ₂ B ₀
T ₁₂	O ₂ F ₂ B ₁
T ₁₃	O ₃ F ₀ B ₀
T ₁₄	O ₃ F ₀ B ₁
T ₁₅	O ₃ F ₁ B ₀
T ₁₆	O ₃ F ₁ B ₁
T ₁₇	O ₃ F ₂ B ₀
T ₁₈	O ₃ F ₂ B ₁

Observations on growth parameters *viz.*, shoot length, number of leaves and shoot weight and physiological parameters *viz.*, leaf area and chlorophyll content were recorded. Six plants were randomly selected and tagged for recording observations. The physico-chemical properties of the soil and organic components were analyzed as per the standard procedure [4]. The enriched manure, EMI and buttermilk solutions were prepared as per the procedure given by TNAU (2016). The mean was worked out and the data were statistically analysed as per the procedure [5].

RESULTS

Application of various forms of organic manures combined with consortium biofertilizers and various biostimulants significantly influenced the growth parameters *viz.*, shoot length, number of leaves and shoot weight. The physiological parameters *viz.*, leaf area and chlorophyll content of radish cv. Pusa Chetki. The growth and physiological parameters like shoot length, number of leaves, shoot weight, leaf area, chlorophyll content were significantly influenced by various treatments. The highest shoot length (35.21 cm), number of leaves (9.90 on 25th day and 20.42 on 45th day), shoot weight (59.23g), leaf area (101.31 sq cm) and chlorophyll content (28.39) were recorded the highest in the treatment combination of farm yard manure @ 25 t ha⁻¹ along with consortium biofertilizer @ 2 Kg ha⁻¹ and EMI @ 1:1000 dilution ha⁻¹(T₆). The lowest shoot length (17.32 cm), number of leaves (4.72 on 25th day and 8.10 on 45th day), shoot weight (37.58 g), leaf area (83.14 sq m) and chlorophyll content

(14.09) were recorded in the treatment T₁ which received the application of FYM @ 25 t ha⁻¹ alone.

DISCUSSION

In the present study the shoot length, number of leaves, shoot weight, leaf area, chlorophyll content are the most important traits in determining the growth and physiological parameters and these traits were greatly influenced by the application of organic manures. increased shoot length in the farmyard manure treated plots were earlier reported [6, 7] in radish. The reason could be due to the application of organic manures, improves the soil physical conditions and promotes microbial and soil organic matter, which in turn produces organic acids, which inhibits particularly IAA oxidase enzyme, resulted in enhancing the promotive effect on plant growth [8].

The increased growth parameters due to the application of farmyard manure could be due to the presence of growth substances, [9], nitrogen fixers [10], other essential nutrients [11] and also due to higher P fertilization by a symbiotic mycorrhizae association as reported [12]. Further, application of FYM would have helped in the plant metabolic activity through the supply of such important macro and micronutrients necessary for increased weight of shoots as reported [13].

In the present study, all the growth parameters were recorded the best in the treatment that received combined application of FYM+CBF+EMI. The reason could be due to addition of FYM, increased the soil organic carbon by 0.03% and improved the physical properties of the soil. The results are in line with the findings of [14, 15]. Further, in recent years, application of biofertilizers *viz.*, *Azospirillum* and Phosphobacteria have received considerable attention in the production of horticulture crops. *Azospirillum* is to enhance the plant growth by contributing growth hormones such as cytokinins and auxins as suggested by [16]. In the present study, application of EM played an important role in production of growth enhancing compounds such as indole acetic acid and gibberellins which may have positively influenced the plant growth [17]. Another reason might be due to enriched manure provided adequate supply of macro and micronutrients to the metabolic activities of plants. Indirectly it increases the photosynthetic activities of plants and ultimately increased growth and physiological characters of plant. The findings are in agreement with [18] in radish. Application of enriched compost with auxin precursor L-tryptophan plus 50% recommended nitrogen fertilizer produced significantly better results in almost all the parameters including number of leaves plant⁻¹ and root length in radish.

CONCLUSION

Based on the present investigation, it can be concluded from the present study, soil application of farm yard manure @ 25 t ha⁻¹ along with consortium biofertilizers @ 2 Kg ha⁻¹ and EMI @ 1:1000 dilution found to have beneficial effects growth and physiological parameters of radish var. Pusa Chetki.

Table 1: Influence of various sources of organic nutrients on yield and quality parameters of radish

Treatments	shoot length (cm)	Number of leaves 25 th day	Number of leaves 45 th day	Shoot weight (g)	Leaf area (sq cm)	Chlorophyll content index
T ₁	17.32	4.72	8.10	35.78	83.14	14.01
T ₂	19.18	6.72	10.72	39.21	87.42	15.73
T ₃	21.92	5.00	11.99	41.18	93.00	16.74
T ₄	24.03	7.31	13.10	47.31	92.59	20.81
T ₅	30.41	6.51	19.61	51.81	92.12	23.92
T ₆	35.21	9.90	20.82	59.23	101.31	28.39
T ₇	18.93	4.90	8.31	38.27	86.29	15.19
T ₈	20.22	6.83	10.12	40.81	88.31	16.32
T ₉	22.41	5.53	12.47	45.33	93.22	18.32
T ₁₀	24.11	9.57	13.14	48.13	93.58	20.93
T ₁₁	28.33	6.11	16.31	50.32	96.01	24.03
T ₁₂	32.38	8.50	18.31	52.38	98.72	27.43
T ₁₃	21.33	6.31	9.37	39.18	87.32	16.38
T ₁₄	23.21	6.54	11.51	41.10	90.89	18.10
T ₁₅	25.83	5.20	12.32	48.97	93.19	20.81
T ₁₆	27.70	8.20	15.16	50.37	94.69	21.72
T ₁₇	29.40	5.99	17.41	52.18	97.43	24.17
T ₁₈	33.43	9.08	19.57	56.27	100.01	26.10
SED	1.04	0.52	0.68	0.98	1.82	1.80
CD(p=0.05)	2.12	1.07	1.39	1.96	3.70	3.67

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