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STUDIES ON THE EFFECT OF ORGANIC MANURES, BIOSTIMULANTS AND MICRONUTRIENTS ON CERTAIN GROWTH AND YIELD PARAMETERS OF TUBEROSE (*POLIANTHES TUBEROSA* L.) CV. PRAJWAL

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Abstract

The present investigation entitled "studies on the effect of organic manures, biostimulants and micronutrients on certain growth and yield parameters of tuberose (*Polianthes tuberosa* L.) Cv. Prajwal" was carried out in the Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalainagar during 2017-2018. The different treatments included the combinations of vermicompost, poultry manure, neem cake, humic acid, seaweed extract, zinc and boron in different ratios. The data was analyzed statistically which showed significant effect of organic manures, biostimulants and micronutrients over control values. The maximum values of plant height, number of leaves plant^{-1} and number of sideshoots plant^{-1}, flower yield plant^{-1}(g), flower yield plot^{-1}(g) and flower yield ha^{-1}(t) were observed in 50% RDF @ 100: 100: 100 kg of NPK ha^{-1}+ vermicompost @ 5 t ha^{-1} + humic acid @ 0.2% + boron @ 1%. These findings lead towards beneficial and commercially feasible for the effective cultivation of tuberose (*Polianthestuberosa* L.) cv. prajwal under open field conditions in the coastal ecosystems.

Key words : Tuberose, organic manures, biostimulants, micronutrients, growth characteristics.

Introduction

Tuberose (*Polianthus tuberosa* L.) is one of the most important tropical bulbous flowering plants cultivated for the production of long lasting flower spikes. It is popularly known as Rajanigandha. It belongs to the family Amarylliaceae and it is native of Mexico. Commercial importance of tuberose is due to beauty of the flower, longer vase-life of spikes and aromatic oil extracted from its fragrant white flower (Alan *et al.,* 2007). The tuberose blooms throughout the year, florets are star-shaped, waxy and loosely arranged on spike that can reach up to 30 to 45 cm in length. There is high demand for tuberose concrete and absolute in international markets which fetch very good price. Flowers of the Single type (single row perianth) are commonly used as loose flowers, making garlands and essential oil etc, while the double varieties (more than two rows of perianth) are used as cut flowers, garden display and interior decoration (Anonymous 2016).

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Organic manures not only provide major nutrients but micronutrients as well to the growing plants. It increase the organic matter content and hence improve the physical properties of soils including water holding capacity in sandy soils and drain ability in clayey soils. Organic materials are the safer sources of plant nutrients which have no detrimental effect to crops and soil. Cow dung, farm yard manure, poultry manure, vermicompost and green manure are excellent sources of organic matter as well as primary plant nutrients (Pieters, 2005). Organic materials are the safer sources of plant nutrients which have no detrimental effect to crops and soil. Cow dung, farm yard manure, poultry manure, vermicompost and green manure are excellent sources of organic matter as well as primary plant nutrients. Among all the animal manures, poultry manure has the highest amount of NPK content. Optimal storage conditions for chicken manure includes it being kept in a covered area and retaining its liquid, because a significant amount of nitrogen exists in the urine. Tuberose is a gross feeder and requires a large quantity of NPK both in the form of organic and inorganic fertilizers (Amarjeet *et al.,* 2000). A plant biostimulant is any substance or microorganism applied to plants with the aim to enhance nutrition efficiency, abiotic stress tolerance and/or crop quality traits, regardless of its nutrients content (Jardin, 2015). Micronutrients are essential for better growth of tuberose. The micronutrients are responsible in activating several enzymes (catalase, peroxidase, alcohol dehydrogenase, carbonic dehydrogenase, tryptophan synthease, etc.) and involve them self in chlorophyll synthesis and various physiological activities by which plant growth and development are encouraged (Kumar and Arora, 2000). The use of growth stimulants, organic manures and micronutrients has brought about a sort of revolution in the floriculture industry. Present research work was planned to investigate the best effect of organic manures, biostimulants and micronutrients of tuberose under open field conditions in the coastal ecosystems.

Materials and Methods

The experiment was conducted in the agro-climatic conditions of Annamalai Nagar at floriculture yard, Department of Horticulture, Annamalai University, Chidambaram region features a hot summer climate with maximum temperature of 38°C and minimum of 17.5 °C with annual average rainfall of 1235 mm and consider good for tuberose cultivation. The corms of the single variety of tuberose were sown after dipped in carbendazim fungicide 2 g litre^{-1} of water for 15 minutes. The treatments were replicated three times during the month of February. The certain growth parameters including plant height, number of leaves plant^{-1} and number of sideshoots plant^{-1}and yield parameters like flower yield plant^{-1}(g), flower yield plot^{-1}(g) and flower yield ha^{-1}(t)were observed by using organic manures and foliar application of biostimulants and micronutrients. Randomized block design was used to evaluate the results statistically and LSD (least significant difference) at 5% were calculated according to the method described by Panse and Sukhatme (1978).

Results and Discussion

Growth characteristics

Plant height (cm): The data on plant height are shown in table 1. The plant height at different stages of growth differed significantly. Among various treatments, the maximum plant height was observed in T_4 (50 % RDF@ 100: 100: 100 kg NPK ha^{-1} +vermicompost @ 5 t ha^{-1} + humic acid @ 0.2 % + boron @ 1%) at 60 DAP (22.88 cm), 90 DAP (48.78 cm) and 120 DAP (64.84 cm). It was followed by T_8 (50% RDF @ 100: 100: 100 kg NPK ha^{-1}+ poultry manure @ 10 t ha^{-1} + seaweed extract @ 2000 g sq.m^{-1} + zinc sulphate @ 0.5%), whereas the minimum was found to be in T_{13} (control) at 60 DAP (15.52 cm), 90 DAP (39.62 cm) and 120 DAP (54.79 cm).

Number of leaves plant^{-1}: The data with respect to number of leaves plant^{-1} are presented in table 2. Among the treatments, plants treated with 50 % RDF@ 100: 100: 100 kg NPK ha^{-1}+ vermicompost @ 5 t ha^{-1} + humic acid @ 0.2 % + boron @ 1% (T_4) showed the highest number of leaves plant^{-1} at 60 DAP (28.71), 90 DAP (44.65) and 120 DAP (51.72), it was followed by T_8 (50% RDF @ 100: 100: 100 kg NPK ha^{-1}+ poultry manure @ 10 t ha^{-1} + seaweed extract @ 2000 g sq.m^{-1} + zinc sulphate @ 0.5%). The minimum number of leaves plant^{-1} at 60 DAP (21.42), 90 DAP (36.47) and 120 DAP (42.27) was found in T_{13} (control).

Flower yield plant^{-1}(g): The data regarding flower yield plant^{-1} are presented in Table 4.The treatments differed significantly for this trait. Among the treatments, T_4 (50 % RDF@ 100: 100: 100 kg NPK ha^{-1}+vermicompost @ 5 t ha^{-1} + humic acid @ 0.2 % + boron @ 1%) recorded the highest flower yield (206.67 g plant^{-1}), which was followed by T_8 (204.32 g plant^{-1}) and the lowest yield (177.34 g plant^{-1}) was observed in T_{13} (control).

Flower yield plot^{-1}(g): The data regarding flower yield plot^{-1} are presented in Table 4. The treatments differed significantly for this trait. Among the treatments, T_4 (50 % RDF @ 100: 100: 100 kg NPK ha^{-1} + vermicompost @ 5 t ha^{-1} + humic acid @ 0.2 % + boron @ 1%) recorded the highest flower yield plot^{-1}(3248.06 g), which was followed by T_8 (3210.86 g) and the lowest flower yield plot^{-1}(2829.46 g) was observed in T_{13} (control).

Flower yield ha^{-1}(t): The data regarding flower yield ha^{-1} are presented in Table 4. The treatments differed significantly for this trait. Among the treatments, T_4 (50 % RDF @ 100: 100: 100 kg NPK ha^{-1} + vermicompost @ 5 t ha^{-1} + humic acid @ 0.2 % + boron @ 1%) recorded the highest flower yield ha^{-1}(17.16 t ha^{1}), which was followed by T_8 (16.99 t ha $^{-1}$) and the lowest flower yield ha^{-1}was observed in T_{13} (13.21 t ha^{-1}).

Better results in vegetative characters like plant height, plant spread, number of leaves per plant and leaf area might be due to application of vermicompost which might have helped to make the availability of plant nutrients effectively to crop plant which made it possible for the plants to grow and put forth luxuriant growth.

Hence these results were supported by the previous findings of Patil (2004) in tuberose; Bhalla *et al.* (2006) in gladiolus; Suseela *et al*., (2016), Yathindra *et al*. (2016) and Pal *et al*. (2017) in tuberose for better growth parameters like plant height, number of leaves plant^{-1} and number of sideshoots plant^{-1}and yield parameters like flower yield plant^{-1}(g), flower yield plot^{-1}(g) and flower yield ha^{-1}(t).The general lookout of the treated plot was also observed to be better as per the farmer's observation. Early flowering and high yield are considered as important criteria to choose the best treatment.

Conclusion

In light of the above discussions, it could be concluded that foliar application of 50 % RDF @ 50: 50: 50 kg NPK ha^{-1} + vermicompost @ 5 t ha^{-1} along with foliar

Table 1: Effect of organic manures, biostimulants and micronutrients on plant height (cm) in tuberose (*Polianthes tuberosa* L.) cv. Prajwal.

Treatments	Plant height (cm)		
	60 DAP	90 DAP	120 DAP
T_1- 50% RDF + vermicompost@ 5 t ha^{-1} + seaweed extract @ 2% sq.m^{-1} + boron @ 1%	21.65	47.21	63.10
T_2- 50% RDF + poultry manure@ 10 t ha^{-1} + seaweed extract@ 2% sq.m^{-1} + boron@ 1%	20.44	45.65	61.37
T_3- 50% RDF + neem cake@ 1t ha^{-1} + seaweed extract@ 2% sq.m^{-1} + boron@ 1%	18.73	43.46	58.94
T_4- 50% RDF + vermicompost@ 5 t ha^{-1} + humic acid@ 0.2% + boron@ 1%	22.88	48.78	64.84
T_5- 50% RDF + poultry manure@ 10 t ha^{-1} + humic acid + boron@ 1%	21.10	46.50	62.31
T_6- 50% RDF + neem cake@ 1t ha^{-1} + humic acid@ 0.2% + boron@ 1%	19.89	44.94	60.58
T_7- 50% RDF + vermicompost@ 5 t ha^{-1} + seaweed extract@ 2% sq.m^{-1} + zinc sulphate@ 0.5%	18.17	42.73	58.13
T_8- 50% RDF + poultry manure@ 10 t ha^{-1} + seaweed extract@ 2% sq.m^{-1} + zinc sulphate@ 0.5%	22.31	48.05	64.03
T_9- 50% RDF + neem cake@ 1t ha^{-1} + seaweed extract@ 2% sq.m^{-1} + zinc sulphate@ 0.5%	20.52	45.75	61.48
T_{10}- 50% RDF + vermicompost@ 5 t ha^{-1} + humic acid@ 0.2% + zinc sulphate@ 0.5%	19.32	44.22	59.78
T_{11}- 50% RDF + poultry manure@ 10 t ha^{-1} + humic acid@ 0.2% + zinc sulphate@ 0.5%	17.61	42.00	57.32
T_{12}- 50% RDF + neem cake@ 1t ha^{-1} + humic acid@ 0.2% + zinc sulphate@ 0.5%	22.23	47.95	63.92
T_{13}- Control	15.52	39.62	54.79
CD (0.05)	0.54	0.70	0.76
S.Ed	0.27	0.35	0.38

NOTE: RDF- Recommended dosage of fertilizer @ 100:100:100 kg of NPK ha^{-1}, humic acid, seaweed extract , boron and zinc as foliar application.

Table 2: Effect of organic manures, biostimulants and micronutrients on number of leaves plant^{-1} in tuberose (*Polianthes tuberosa* L.) cv. Prajwal.

Treatments	Plant height (cm)		
	60 DAP	90 DAP	120 DAP
T_1- 50% RDF + vermicompost@ 5 t ha^{-1} + seaweed extract @ 2% sq.m^{-1} + boron @ 1%	27.50	43.27	50.09
T_2- 50% RDF + poultry manure@ 10 t ha^{-1} + seaweed extract@ 2% sq.m^{-1} + boron@ 1%	26.30	41.90	48.48
T_3- 50% RDF + neem cake@ 1t ha^{-1} + seaweed extract@ 2% sq.m^{-1} + boron@ 1%	24.61	39.97	46.21
T_4- 50% RDF + vermicompost@ 5 t ha^{-1} + humic acid@ 0.2% + boron@ 1%	28.71	44.65	51.72
T_5- 50% RDF + poultry manure@ 10 t ha^{-1} + humic acid + boron@ 1%	26.95	42.64	49.35
T_6- 50% RDF + neem cake@ 1t ha^{-1} + humic acid@ 0.2% + boron@ 1%	25.75	41.27	47.74
T_7- 50% RDF + vermicompost@ 5 t ha^{-1} + seaweed extract@ 2% sq.m^{-1} + zinc sulphate@ 0.5%	24.05	39.33	45.46
T_8- 50% RDF + poultry manure@ 10 t ha^{-1} + seaweed extract@ 2% sq.m^{-1} + zinc sulphate@ 0.5%	28.15	44.01	50.97
T_9- 50% RDF + neem cake@ 1t ha^{-1} + seaweed extract@ 2% sq.m^{-1} + zinc sulphate@ 0.5%	26.37	41.98	48.58
T_{10}- 50% RDF + vermicompost@ 5 t ha^{-1} + humic acid@ 0.2% + zinc sulphate@ 0.5%	25.19	40.64	47.00
T_{11}- 50% RDF + poultry manure@ 10 t ha^{-1} + humic acid@ 0.2% + zinc sulphate@ 0.5%	23.49	38.64	44.71
T_{12}- 50% RDF + neem cake@ 1t ha^{-1} + humic acid@ 0.2% + zinc sulphate@ 0.5%	28.07	43.92	50.86
T_{13}- Control	21.42	36.47	42.27
CD (0.05)	0.53	0.60	0.72
S.Ed	0.27	0.30	0.36

NOTE: RDF- Recommended dosage of fertilizer @ 100:100:100 kg of NPK ha^{-1}, humic acid, seaweed extract , boron and zinc as foliar application.

Table 3: Effect of organic manures, biostimulants and micronutrients on Flower yield plant^{-1}(g), flower yield plot^{-1}(g) and Flower yield ha^{-1}(t)in tuberose (*Polianthes tuberosa L.*) cv. Prajwal.

Treatments	Flower yield plant^{-1}(g)	Flower yield plot^{-1}(g)	Flower ha^{-1}(t)
T_1- 50% RDF + vermicompost@ 5 t ha^{-1} + seaweed extract @ 2%+ boron @ 1%	201.60	3167.58	16.78
T_2- 50% RDF + poultry manure@ 10 t ha^{-1} + seaweed extract@ 2%+ boron@ 1%	196.57	3087.86	16.41
T_3- 50% RDF + neem cake@ 1t ha^{-1} + seaweed extract@ 2%+ boron@ 1%	189.51	2975.87	15.89
T_4- 50% RDF + vermicompost@ 5 t ha^{-1} + humic acid@ 0.2% + boron@ 1%	206.67	3248.06	17.16
T_5- 50% RDF + poultry manure@ 10 t ha^{-1} + humic acid + boron@ 1%	199.30	3131.13	16.61
T_6- 50% RDF + neem cake@ 1t ha^{-1} + humic acid@ 0.2% + boron@ 1%	194.27	3051.41	16.24
T_7- 50% RDF + vermicompost@ 5 t ha^{-1} + seaweed extract@ 2%+ zinc sulphate@ 0.5%	185.16	2938.66	15.72
T_8- 50% RDF + poultry manure@ 10 t ha^{-1} + seaweed extract@ 2%+ zinc sulphate@ 0.5%	204.32	3210.86	16.99
T_9- 50% RDF + neem cake@ 1t ha^{-1} + seaweed extract@ 2% sq.m^{-1} + zinc sulphate@ 0.5%	196.88	3092.79	16.43
T_{10}- 50% RDF + vermicompost@ 5 t ha^{-1} + humic acid@ 0.2% + zinc sulphate@ 0.5%	191.95	3014.59	16.07
T_{11}- 50% RDF + poultry manure@ 10 t ha^{-1} + humic acid@ 0.2% + zinc sulphate@ 0.5%	180.81	2901.45	15.00
T_{12}- 50% RDF + neem cake@ 1t ha^{-1} + humic acid@ 0.2% + zinc sulphate@ 0.5%	203.99	3205.54	16.96
T_{13}- Control	177.34	2829.46	13.21
CD (0.05)	2.10	35.00	0.14
S.Ed	1.05	17.50	0.07

NOTE: RDF- Recommended dosage of fertilizer @ 100:100:100 kg of NPK ha^{-1}, humic acid, seaweed extract , boron and zinc as foliar application.

application of humic acid @ 0.2 % + boron @ 1% at 60 days interval from 60 DAP onwards was found better in increasing growth and yield of tuberose cv. Prajwal.

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