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Growth and flowering parameters of tuberose (*Polianthes tuberosa* L.) cv. phule rajani influenced by organic manures

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Abstract

An investigation was carried out to find out the response of organic manures on growth and flowering parameters of tuberose (*Polianthes tuberosa* L.) cv. Phule Rajani at BTCC, Orissa University of Agriculture and Technology, Bhubaneswar, Odisha during the period 2015 to 2016. The trial was conducted with ten treatments viz. T₁ (Control), T₂ (Vermicompost @ 2 kg/ m²), T₃ (Mustard oil cake @500g/m²), T₄ (Karanja oil cake @500g/m²), T₅ (Neem oil cake @ 500g/ m²), T₆ (Groundnut oil cake @500g/m²), T₇ (Vermicompost @ 1Kg/m²+Mustard oil cake @ 250g/m²), T₈ (Vermicompost @ 1Kg/m² + Karanja oil cake @250g/m²), T₉ (Vermicompost @ 1Kg/m² + Neem oil cake @250g/m²) and T₁₀ (Vermicompost @ 1Kg/m² + Groundnut oil cake @250g/m²). The experiment was laid out in Randomized Block Design with three replications. The result of the study revealed that, application of organic manures obtained significant differences in vegetative and flowering parameters of the plant. Among all the organic manures and their combinations treatment T₇ (Vermicompost @ 1Kg/m² + Mustard oil cake @250g/m²) recorded the maximum value for vegetative growth parameters like, plant height, plant spread, number of leaves per plant, leaf length, breadth and leaf area; Maximum value for floral characteristics like, number of spike per plant and number of florets per spike were recorded in treatment T₈ (Vermicompost @ 1Kg/m² + Karanja oil cake @250g/m²) compared to other treatments. It is therefore suggested that better quality spikes under organic farming can be obtained with application of T₇ (Vermicompost @ 1Kg/m² + Mustard oil cake @250g/m²) and T₈ (Vermicompost @ 1Kg/m² + Karanja oil cake @250g/m²) respectively in tuberose cv. Phule Rajani.

Keywords: Organic manures, growth, flowering, tuberose, phule rajani

Introduction

Tuberose (*Polianthes tuberosa* L.) is in great demand for its attractive and fragrant flower spikes. It is one of the most important bulbous ornamentals of tropical and subtropical areas. It is commercially cultivated for cut and loose flower trade, and also for extraction of its highly valued natural flower oil. The serene beauty of the flower spikes, bright snow white flowers, sweetness of blooms and delicacy of fragrance of this ornamental crop, transform the entire area into a nectarine and joyous one. The long spikes of tuberose are used for vase decoration, bouquet preparation and the florets for making artistic garlands, ornaments and button holes. The flowers emit a delightful fragrance and are the source of tuberose oil. The natural flower oil of tuberose is one of the most expensive raw material of perfume industry.

For commercial flower production, the important objectives are increased growth, flower production, quality of flowers and perfection in the form of plants. The quality of cut flowers is greatly influenced by climatic, geographical and nutritional factors. Tuberose requires high nutrient for proper growth and development and to achieve the escalating target of good quality tuberose production proper fertilization is the prime need. On the other hand, continuous use of inorganic fertilizers in crop field not only deteriorates the soil health but also reduces the soil microbial activities, soil organic content and may cause environmental imbalance (Alan *et al.*, 2007) [1]. In contrast, to inorganic fertilizer the use of green manures and other organic matter can improve soil structure, improve nutrient exchange and maintain soil health and that is why interests have been raising in organic farming (Mitra, 2010) [8]. In the present investigations, studies have been made to know the effect of organic manures on growth and flowering parameters of tuberose (*Polianthes tuberosa* L.) cv. Phule Rajani.

Material and Methods

The experiment was carried out at Biotechnology-cum-Tissue Culture Centre,

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Orissa University of Agriculture and Technology, Bhubaneswar, Odisha during 2015 to 2016. The experiment was laid out in Randomized Block Design with ten treatments and three replications. Bulbs of tuberose cv. Phule Rajani were planted in a spacing 30 cm × 30 cm, in plots of size 1.5m x 1.5m each *i.e.* twenty five bulbs were planted per plot. The different treatments were T₁: (Control), T₂: (Vermicompost @ 2 kg/ m²), T₃: (Mustard oil cake @500g/m²), T₄: (Karanja oil cake @ 500g/m²), T₅: (Neem oil cake @500g/ m²), T₆: (Groundnut oil cake @ 500g/m²), T₇: (Vermicompost @ 1Kg/m² + Mustard oil cake@250g/m²), T₈: (Vermicompost @ 1Kg/m² + Karanja oil cake @ 250g/m²), T₉: (Vermicompost @ @ 1Kg/m² + Neem oil cake @250g/m²), T₁₀: (Vermicompost @ 1Kg/m² + Groundnut oil cake @250g/m²). Manures were applied and mixed into the soil thoroughly. The amount and type of manure applied was as per the treatments of respective plots. Cultural practices were kept uniform for all the treatments and standard practices were adopted to raise the crop successfully. Observation on growth attributes *i.e.* plant height (cm), plant spread (cm), number of leaves per plant, leaf length (cm), leaf breadth (cm) and leaf area (cm²); floral attributes, *i.e.* number of spike per plant and number of florets per spike were recorded from five randomly selected plants of each replication using standard procedure.

Result and discussion

Among the ten treatments, T₇ (Vermicompost @ 1Kg/m² + Mustard oil cake @250g/m²) showed highest plant height (54.54 cm) followed by treatment T₈ (Vermicompost @ 1Kg/m² + Karanja oil cake @250g/m²) (51.68 cm) and the treatments were statistically at par. Similar findings were reported by Shankar *et al.* (2010) [13]; Kabir *et al.* (2011) [6] and Munikrishnappa *et al.* (2011) [9] in tuberose.

Maximum plant spread (N-S) (44.84 cm) was recorded in treatment T₇ (Vermicompost @ 1Kg/m² + Mustard oil cake @ 250g/m²) followed by treatment T₂ (Vermicompost @2kg/m²) (44.16 cm) which was statistically at par; Maximum plant spread (E-W)(43.63 cm) was recorded in treatment T₇ (Vermicompost @ 1Kg/m² + Mustard oil cake @250g/m²) followed by treatment T₈ (Vermicompost @ 1Kg/m² + Karanja oil cake @ 250g/m²) (41.33 cm) and the treatments were statistically at par. Significantly maximum number of leaves (64.22) was recorded in treatment T₇ (Vermicompost @ 1Kg/m² + Mustard oil cake @250g/m²) followed by treatment T₉ (Vermicompost @ 1Kg/m² + Neem oil cake @250g/m²) (53.11). The results were related to the findings of Shankar *et al.* (2010) [13]; Kabir *et al.* (2011) [6] and Munikrishnappa *et al.* (2011) [9] in tuberose and Tripathy *et al.* (2012) [16] who also reported the more number of leaves with the application of Vermicompost @ in tuberose.

Highest leaf length (48.67 cm) was recorded in treatment T₇ (Vermicompost @ 1Kg/m² + Mustard oil cake @250g/m²) followed by treatment treatment T₄ (Karanja oil cake @500g/m²) (47.74 cm) and the treatments were statistically at par. The improvement in leaf length in tuberose with the application of organic manures was also reported by Shankar *et al.* (2010) [13]; Kabir *et al.* (2011) [6] and Munikrishnappa *et al.* (2011) [9] in tuberose. Maximum leaf width (1.66 cm) was recorded in treatment T₇ (Vermicompost @ 1Kg/m² + Mustard oil cake @ @ 250g/m²) followed by treatment T₈ (Vermicompost @ 1Kg/m² + Karanja oil cake @250g/m²) (1.54 cm) and the treatments were statistically at par. The increase in leaf breadth with the application of Vermicompost

@ was also reported by Shankar *et al.* (2010) [13]; Kabir *et al.* (2011) [6] and Munikrishnappa *et al.* (2011) [9] in tuberose.

Significantly highest leaf area (80.16 sq cm) was recorded in treatment T₇ (Vermicompost @ 1Kg/m² + Mustard oil cake @250g/m²) followed by treatment T₂ (Vermicompost @ 2 kg/ m²) (71.75 sq cm). The given results revealed that organic manures showed significant effect on growth of the plant.

Among all the organic manures and their combinations T₇ (Vermicompost @ 1Kg/m² + Mustard oil cake @250g/m²) showed better results compared to other treatments. This improvement in vegetative characters like plant height, plant spread, number of leaves per plant, leaf length, leaf breadth and leaf area might be due to application of Vermicompost to the soil. It significantly increased in soil enzyme activity such as urease, phosphomonoesterase, phosphodisterase and sulphatase (Albiach *et al.*, 2000) [2] and also, stimulated plant growth promoting bacteria (Gupta and Prasad, 1991) [5]. It not only provide nitrogen, phosphorus and potash, but also is a good source of micro nutrient. The contents of Vermicompost 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 (Padaganur *et al.*, 2005) [10]. Similar findings were also reported by Kulkarni (1994) [7] in China aster; Patil (1999) [11] in tuberose; Bhalla *et al.* (2006) [3] in gladiolus; Renukaradya *et al.* (2011) [12] in carnation and Tripathi *et al.* (2012) [16] in tuberose. Highest number of spike per plant (5.77) was recorded in treatment T₈ (Vermicompost @ 1Kg/m² + Karanja oil cake @250g/m²) followed by treatment T₄ (Karanja oil cake @500g/m²) (5.55) and the treatments were statistically at par; Significantly highest number of florets per spike (50.88) was recorded in treatment T₈ (Vermicompost @ 1Kg/m² + Karanja oil cake @250g/m²) followed by treatment T₄ (Karanja oil cake @500g/m²) (47.77). Similar improvement in number of florets per spike obtained by application of Vermicompost with other organic manures were also reported by Padaganur *et al.* (2005) [10]; Kabir *et al.* (2011) [6] and Munikrishnappa *et al.* (2011) [9] in tuberose. Significant effect of Vermicompost @ on all the above mentioned characteristics is due to the fact that Vermicompost provided better nutrition as it contains all the major nutrients besides micro-nutrients, it also has some beneficial micro-organisms which results in improved chemical, physical and biological properties of soil, with supply of organic carbon, improved nutrient and water use efficiency, water holding capacity and porosity of soil. The obtained results are in accordance with the earlier findings of Bhalla *et al.* (2006) [3] in gladiolus; (Singh *et al.*, 2006) [14] in rose; Bhalla *et al.*, 2007) [4] in carnation and (Sunitha *et al.*, 2007) [15] in African marigold.

Conclusions

Based on the result of the present study it was concluded that application of organic manures obtained significant differences in vegetative and flowering parameters of the plant. Among all the organic manures and their combinations treatment T₇ (Vermicompost @ 1Kg/m² + Mustard oil cake @ 250g/m²) recorded the maximum vegetative parameters compared to other treatments and Maximum flower parameters were recorded in treatment T₈ (Vermicompost @ 1Kg/m² + Karanja oil cake @ 250g/m²) compared to other treatments. It is therefore suggested that for getting better quality of spike under organic farming, treatment T₈ (Vermicompost @ 1Kg/m² + Karanja oil cake @ 250g/m²) are recommended under Bhubaneswar condition in tuberose cv. Phule rajani.

Table 1: Effect of organic manures on growth and flowering parameters of tuberose (*Polianthes tuberosa* L.) cv. Phule Rajani

Treatments		Plant height (cm)	Plant spread (N-S) (cm)	Plant spread (E-W) (cm)	Number of leaves/plant	Leaf breadth (cm)	Leaf area (sq cm)	Leaf length (cm)	No. of spikes/Plant	No. of florets/spike
T ₁	Control (no organic manure)	40.23	33.42	30.03	47.22	1.16	46.62	39.32	4.00	36.22
T ₂	Vermicompost @ 2 kg/m ²	45.27	44.16	36.22	48.55	1.52	71.75	46.84	4.22	39.33
T ₃	Mustard oil cake @ 500g/m ²	45.58	34.00	40.64	50.11	1.24	52.76	41.78	4.66	46.22
T ₄	Karanja oil cake @ 500g/m ²	51.41	36.02	37.22	48.66	1.32	64.21	47.74	5.55	47.77
T ₅	Neem oil cake @ 500g/m ²	43.63	34.62	35.47	47.66	1.16	54.56	45.35	4.44	43.00
T ₆	Ground nut oil cake @ 500g/m ²	45.04	37.63	34.92	47.77	1.20	57.56	47.43	4.00	38.88
T ₇	Vermicompost @ 1Kg/m ² + Mustard oil cake @ 250g/m ²	54.54	44.84	43.63	64.22	1.66	80.16	48.67	4.77	41.77
T ₈	Vermicompost @ 1Kg/m ² + Karanja oil cake @ 250g/m ²	51.68	40.98	41.33	48.55	1.54	69.28	44.27	5.77	50.88
T ₉	Vermicompost @ 1Kg/m ² + Neem oil cake @ 250g/m ²	43.51	39.07	35.36	53.11	1.21	52.83	43.59	4.00	42.66
T ₁₀	Vermicompost @ 1Kg/m ² + Ground nut oil cake @ 250g/m ²	45.41	42.63	35.51	52.44	1.37	62.57	45.20	5.11	43.22
C.D. at 5%		6.193	2.388	2.755	1.700	0.137	2.213	3.679	0.995	2.347
SE(m) ±		2.949	1.137	1.311	0.809	0.065	1.053	1.751	0.473	1.117

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