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EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON THE GROWTH OF TUBEROSE (*POLIANTHES TUBEROSA* L.) CV. PRAJWAL

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Abstract

The investigation entitled "Effect of integrated nutrient management in tuberose (*Polianthes tuberosa* L.) cv. Prajwal" was carried out in the Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalainagar. The experiment was laid out in randomized block design comprising of eleven treatment combinations of different nutrients with three replications. The treatments consisted of foliar spray of panchagavya, humic acid and EM with a combination of FYM and vermicompost. Among the various treatments, the plants receiving a combination of 75 % RDF + Vermicompost @ 5 t ha^{-1} + Humic Acid @ 0.2 % (T_9) was found to be best in all the growth characters *viz.*, plant height (65.45 cm); number of side shoots $plant^{-1}$ (9.19), number of leaves $plant^{-1}$ (95.34), leaf area (65.85 cm^2), chlorophyll content (0.921 mg g^{-1}) and dry matter production (28.75 g $plant^{-1}$).

Key words : Tuberose, Farm yard manure, Panchagavya, Humic acid, Effective microorganisms

Introduction

Tuberose (*Polianthes tuberosa* L.) is an ornamental bulbous plant belongs to the family Amaryllidaceae. It is an important, popular flower crop being cultivated on a large scale for its scented flower in many parts of the world and in plains of India. Among the ornamental bulbous plants valued for their beauty and fragrance of the flowers, the tuberose occupies a very selective and special position. The flowers remain fresh for long time and withstand long distance transportation and find the useful place in the flower market. In this modern world, indiscriminate use of chemical fertilizers, pesticides and herbicides has led to the deterioration of soil health, ground water quality, soil microbial population, atmospheric constituents, quality of the agricultural production and thereby the health of animals, and humans. Therefore to avoid the above-mentioned problems associated with modern agriculture, emphasis is now laid on the use of organic inputs. With this background, the present investigation was taken up with a view to elicit and elucidate the information on the above said facts.

Materials and methods

The study was taken up in a randomized block design with eleven treatments and three replications in the Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalainagar. The treatments consisted of T_1 (100% RDF *i.e.*, 200:200:200 kg NPK ha^{-1}); T_2(T_1 + FYM @ 25 t ha^{-1}); T_3(75% RDF + FYM @ 25 t ha^{-1}); T_4(T_1 + Vermicompost @ 5 t ha^{-1}); T_5(75% RDF + Vermicompost @ 5 t ha^{-1}); T_6(75% RDF + FYM @ 25 t ha^{-1} + Panchagavya @ 3%); T_7(75% RDF + Vermicompost @ 5 t ha^{-1} + Panchagavya @ 3%); T_8 (75% RDF + FYM @ 25 t ha^{-1} + Humic Acid @ 0.2%); T_9 (75% RDF + Vermicompost @ 5 t ha^{-1} + Humic Acid @ 0.2%); T_{10}(75% RDF + FYM @ 25 t ha^{-1} + EM @ 1: 1000 dilution); T_{11}(75% RDF + Vermicompost @ 5 t ha^{-1} + EM @ 1: 1000 dilution).

The experimental area was ploughed thoroughly with tractor drawn disc plough and cultivator to bring it to a fine tielth. Basal dose of fertilizers and organic manures were incorporated during land preparation. The recommended dose of fertilizers was applied to selective plots according to the treatments. Two third of nitrogen along with full doses of P and K were applied as basal at the time of planting. One thirds of nitrogen was top dressed at one month after planting. Urea, super phosphate and muriate of potash were used to supply N, P and K respectively. The organic inputs such as the Farmyard manure, vermicompost, pancahagavya, humic acid and Effective microorganisms were applied according to the

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treatments. Farmyard manure and vermicompost was obtained from the Orchard, Department of Horticulture, Faculty of Agriculture, Annamalai University. Panchagavya was prepared by a slightly modified method as mentioned in Vrikshayurveda. Humic acid was obtained from the research wing of Neyveli Lignite Corporation. The EM was procured from M/s. ECO-PRO, Aurosarjan complex, Auroshilpam, Auroville-605101. Three foliar sprays of panchagavya, humic acid and effective microorganisms were given during the period of experimentation.

Results and discussion

Growth is one of the essential parameter for the attribution of yield. The biometric components like plant height, number of leaves and dry matter production have direct relationship with yield in tuberose (Kannan *et al*., 2003). The plants receiving the treatment consisting of 75 % RDF + Vermicompost @ 5 t ha^{-1} + Humic Acid @ 0.2 % (T_9) recorded the maximum plant height (65.45 cm), number of side shoots $plant^{-1}$(9.19), number of leaves $plant^{-1}$(95.34), leaf area (65.85 cm^2), chlorophyll content (0.921 mg g^{-1}) and dry matter production (28.75 g $plant^{-1}$) (table 1. & table 2.). Among the various treatments, the plant height was greatly influenced by the combination of 75 % RDF, vermicompost @ 5 t ha^{-1} and humic acid @ 0.2 % when compared to 100 % RDF alone. Similar findings were reported earlier by Mamta Bohra and Ajit Kumar (2014) by using vermicompost in chrysanthemum. The increase in the vegetative growth may due to better flow of various macro and micro nutrients along with plant growth substances into the plant system in the plots applied with vermicompost in Jasmine (Vijayananthan *et al*., 2007). The number of side shoots $plant^{-1}$ was influenced greatly by using vermicompost and humic acid along with 75 % RDF. The present results are in concordance with findings by Verma *et al*. (2011) in chrysanthemum, where vermicompost application has increased the number of side shoots. Similar results have been reported by Nagalakshmi *et al*. (2010) in Anthurium. The same treatment *i.e.* 75 % RDF, vermicompost @ 5 t ha^{-1} and humic acid @ 0.2 % also increased the number of leaves $plant^{-1}$. Similar results was reported by Behnam Khodakhah *et al*. (2014) and Verlinden *et al*. (2010) by using humic acid in tuberose and by Mamta Bohra and Ajit Kumar (2014) by using vermicompost in chrysanthemum.

The treatment with vermicompost, humic acid and panchagavya has also significantly influenced the leaf area when compared to control. However, the maximum leaf area was observed in the treatment with 75 % RDF, vermicompoost @ 5 t ha^{-1} and humic acid @ 0.2 %. The results have been earlier found out by Nagalakshmi *et al*. (2010) in Anthurium and Ahmad *et al*. (2013) in Gladiolus. Patil *et al*. (2004) confirmed that using organic, inorganic and *in situ* vermiculture in *Jasminium sambac* increased the number of flowers $plant^{-1}$ by increasing the leaf area and chlorophyll content.

The chlorophyll content in the leaves has been influenced by the combination of 75 % RDF, vermicompost @ 5 t ha^{-1} and humic acid @ 0.2 %. In tune with this finding, Liu *et al*. (2002) and Neilsen *et al*.

Table 1 : Effect of integrated nutrient management on plant height in tuberose cv. Prajwal

Treatments	Plant height (cm)	No. of side shoots / plant	No. of leaves / plant
T_1	50.21	4.58	64.21
T_2	53.89	6.67	71.45
T_3	52.63	6.31	66.74
T_4	57.22	7.40	82.62
T_5	56.37	7.28	78.18
T_6	60.81	8.13	87.36
T_7	63.27	8.83	93.75
T_8	61.73	8.46	90.41
T_9	65.45	9.19	95.34
T_{10}	55.73	7.03	75.32
T_{11}	58.76	7.76	85.74
S.E. ±	0.39	0.14	0.71
C.D.(P=0.05)	0.82	0.29	1.49
C.V.%	0.83	2.29	1.08

Table 2: Effect of integrated nutrient management on leaf area, chlorophyll content and dry matter production in tuberose cv. Prajwal

Treatments	Leaf area (cm^2)	Chlorophyll content(mg g^{-1})	Dry matter production (g $plant^{-1}$)
T_1	39.72	0.604	18.75
T_2	45.84	0.708	21.67
T_3	42.46	0.681	19.54
T_4	53.28	0.774	24.96
T_5	49.44	0.731	24.18
T_6	57.86	0.832	26.49
T_7	64.22	0.896	27.54
T_8	60.71	0.867	27.12
T_9	65.85	0.921	28.75
T_{10}	46.77	0.713	22.86
T_{11}	56.35	0.795	25.67
S.E. ±	0.67	0.01	0.15
C.D.(P=0.05)	1.41	0.02	0.32
C.V.%	1.56	1.69	0.77

(2005) has reported that the use of humic acid lead to increased amount of chlorophyll in plant leaves. The results from correlation analysis indicated that the responses of the foliar humic acid fertilizer on growth and development of chrysanthemum could be related with a constitutive increased net photosynthetic rate due to the high content of chlorophyll and the improved chloroplast ultra structure (Hong-mei Fan *et al*., 2014).

Among the treatments, the treatment including vermicompost @ 5 t ha^{-1} and humic acid @ 0.2 % along with 75 % RDF had significantly influenced the dry matter production. In chrysanthemum, similar findings were reported by Verma *et al*. (2011) that the dry matter production was influenced by the effect of vermicompost and the influence of humic acid on the dry matter production was reported by Hong-mei Fan *et al*. (2014).

Vermicompost is rich sources of micro and macro nutrients, Fe and Zn might have enhanced the microflora and enzymatic activity which might have augumented the plant growth. The positive effect of vermicompost of plant growth has been reported in china aster (Nethra *et al*., 1999) and in golden rod (Kusuma, 2001).

In the case of humic acid, there are ample reports concerning the effect of humic acid, but its effect can be divided into two categories: direct effect as a hormone-like compounds (Zhang *et al*., 2004) and indirect effect by increasing nutrient uptake through chelate and renewal effects, and retaining microorganisms membrane permeability, improving the physical condition of the soil, and increasing root and shoot growth (Atiyeh *et al*., 2002).

Conclusion

On the basis of the above results, it can be concluded that the application of 75% RDF + vermicompost @ 5 t ha^{-1} + humic acid @ 0.2 % was found to have beneficial effect on the growth of tuberose.

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