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Effect of foliar application of vermiwash and potassium nitrate on flower yield and quality of tuberose var. Prajwal

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Abstract

An experimental study was conducted to evaluate the importance of foliar application of vermiwash and potassium nitrate on flower yield and quality of tuberose var. Prajwal at Horticulture Section, College of Agriculture, Nagpur, Dr. PDKV, Akola, India, in 2022- 2023. The experiment was laid out in Factorial Randomized Block Design consisting of sixteen treatments replicated thrice over fertile soil. The results of present investigation included maximum number of spikes⁻¹ plant (3.25); spikes plot⁻¹ (62.81), spikes ha⁻¹(6.23), florets spike⁻¹ (46.61); length of floret (6.40 cm) and diameter of floret (4.69 cm) in tuberose var. Prajwal were recorded maximum with the treatment of V₄P₃- 150 ml/lit Vermiwash +1.5% KNO₃. It can be recommended that to produce high quality of flowers and commercial production of tuberose var. Prajwal; Vermiwash @ 150 ml/lit of water along with 1.5% KNO₃ is most beneficial for the crop.

Keywords: Foliar spray, flower yield, quality, Vermiwash, KNO₃

Introduction

Tuberose (*Polianthes tuberosa* L.) is one of the most significant bulbous ornamental plants belongs to the Amaryllidaceae family and is native to Mexico. It is highly prized for its beauty, elegance, and smell. Due to its appeal as both a cut flower and a loose bloom, tuberose holds a prominent position among the flowers that are commercially grown in India. It goes by the names Rajanigandha, Nishigandha, Sugandharaja, Gulchadi, and Gul-e-Shahu in India.

The primary goal of cultivating tuberose is to use blooms for ornamentation, Gajra, garlands, and the extraction of essential oils. All of these items require high- quality, long-lasting flowers, which may be grown using a variety of organic and inorganic fertilizers. The importance of nutrition for the growth, development, and output of nutrition has long been recognized as critical to the growth, development, and production of high-quality flowers. A lack of one or more of the major nutrients can severely limit plant growth, resulting in decreased productivity and quality of flower production.

One of the most crucial methods for doing this is the foliar application of fertilizers, which releases vital plant nutrients at the leaf surface, where they are quickly absorbed and efficiently utilized by the plant system. This study aims to establish suitable doses of foliar treatment; because it is applied depending on crop requirements.

Vermiwash is an organic liquid bio-fertilizer that is typically produced from a vermicomposting unit as a drainage which includes GA₃, cytokinins and many growth promoting substances similarly potassium nitrate is an inorganic fertilizer that is utilized in this experiment in various concentrations to study the effects on plant growth and development which is crucial in increasing tuberose yield, because potassium is significant for plant growth in terms of promoting blooming and also giving the plant with resilience.

Materials and Methods

The present experiment "Effect of foliar application of vermiwash and potassium nitrate on flower yield and quality of tuberose var. Prajwal" was conducted at Horticulture section, College of Agriculture, Nagpur, India, in 2022-2023. The experiment was carried out with sixteen treatment combinations viz; *V₁P₁ - Absolute control (water spray); V₁P₂- Control (0 ml/lit)+1% KNO₃, V₁P₃ - Control (0 ml/lit)+1.5% KNO₃; V₁P₄ - Control (0ml/lit) +2% KNO₃; V₂P₁ - 50 ml/lit Vermiwash + 0% KNO₃; V₂P₂ - 50 ml/lit Vermiwash +1% KNO₃; V₂P₃ - 50 ml/lit Vermiwash +1.5% KNO₃; V₂P₄ - 50ml/lit Vermiwash +2% KNO₃; V₃P₁ - 100 ml/lit Vermiwash + 0% KNO₃; V₃P₂ - 100 ml/lit Vermiwash +1% KNO₃; V₃P₃ - 100 ml/lit Vermiwash +1.5%

KNO₃; V₃P₄ -100 ml/lit Vermiwash +2% KNO₃; V₄P₁-150ml/lit Vermiwash + 0% KNO₃; V₄P₂ - 150 ml/lit Vermiwash + 1% KNO₃; V₄P₃-150ml/lit Vermiwash + 1.5% KNO₃; V₄P₄-150 ml/lit Vermiwash +2% KNO₃*.

The experimental plot was ploughed thrice and subsequent harrowing was done. After clod crushing the soil was brought to a fine tilth. At the time of land preparation well-rotten FYM @ 20 t ha⁻¹ was mixed uniformly in the soil before the last harrowing. As per the recommendation of Dr. Panjabrao Deshmukh Krishi Vidyapeeth, the fertilizer dose (NPK) 200:300:200 kg ha⁻¹ was applied. The field was laid out into plots with raised beds of 0.6m x 1.8m in size; with 20 x 20 cm spacing.

The data were examined in accordance with the steps outlined by Panse and Sukhatme (1967) [10] for the study with factorial randomized block design under three replications at 5% level

of significance.

The factors vermiwash and potassium nitrate of different concentrations are mixed in 1 lit of water and performed foliar application at different intervals over the tuberose plants viz. at 30, 45, 60 days after planting. After flowering the yield and quality parameters are recorded.

Results and Discussion

a) Yield parameters

The data regarding the effect of foliar application of Vermiwash and KNO₃ on yield and quality of tuberose are presented in table 1. Showed that, the interaction effect of foliar spray of Vermiwash and KNO₃ on yield parameters *i.e.* spike plant⁻¹, spike plot⁻¹, spike ha⁻¹, florets spike⁻¹ were found significant.

Table 1: Interaction effect of foliar spray of Vermiwash and KNO₃ on yield and quality of tuberose

Treatments	Spikes plant ⁻¹	Spikes plot ⁻¹	Spikes ha ⁻¹ (lakh)	Florets spike ⁻¹	Length of floret(cm)	Diameter of floret(cm)
V ₁ P ₁	1.71	36.17	3.81	34.25	4.34	2.99
V ₁ P ₂	1.65	41.14	4.06	41.24	4.87	3.29
V ₁ P ₃	1.72	40.90	4.56	37.71	5.10	3.73
V ₁ P ₄	1.88	48.27	4.75	35.35	4.87	3.59
V ₂ P ₁	1.74	43.17	5.21	38.35	5.22	3.31
V ₂ P ₂	1.78	43.37	4.65	40.04	5.13	3.62
V ₂ P ₃	2.01	49.14	4.58	40.12	5.33	3.82
V ₂ P ₄	1.79	43.67	4.26	40.32	4.77	3.30
V ₃ P ₁	1.73	42.07	4.77	39.41	5.19	3.68
V ₃ P ₂	1.91	47.27	4.82	40.43	5.43	3.58
V ₃ P ₃	2.46	55.97	5.47	43.93	5.82	4.08
V ₃ P ₄	1.85	45.67	4.24	41.82	5.31	3.53
V ₄ P ₁	1.66	41.64	4.50	40.66	5.08	3.47
V ₄ P ₂	2.04	55.20	5.21	41.96	5.43	3.78
V ₄ P ₃	3.25	62.81	6.23	46.61	6.40	4.69
V ₄ P ₄	1.68	48.82	5.26	40.47	5.35	4.33
F test	Sig	Sig	Sig	Sig	Sig	Sig
S.E(m) ±	0.14	3.31	0.30	1.62	0.28	0.20
CD at 5%	0.40	9.57	0.86	4.70	0.78	0.56

The number of spikes plant⁻¹ was found maximum (3.25) in the treatment V₄P₃ i.e. vermiwash @ 150 ml/lit and KNO₃ @ 1.5% which was followed by the treatment V₃P₃ (2.46) *i.e.* vermiwash @ 150ml/lit and KNO₃ @ 1.5% and recorded lowest in control V₁P₁ i.e. water spray (1.71). Interaction effect of vermiwash and potassium nitrate is might be due to as vermiwash comprises of auxins, cytokinins, humic and fulvic acid which improves plant vigor and increment in the crop yield (Aghamohammadi *et al.*, 2016) [3]. Potassium nitrate enhances availability of phosphorus and micronutrients, the nitrate in potassium nitrate enhances the formation of organic acids which causes increase in spikes plant⁻¹. Similar results were reported in Mahajan, Y. *et al.* (2010) [7] and Dhanshri *et al.* (2019) [5] in tuberose.

The same pattern like spike plant⁻¹ was observed in spikes plot⁻¹; here significantly maximum number of spikes plot⁻¹ was found (62.81) in V₄P₃ *i.e.* vermiwash @ 150 ml/lit and KNO₃ @ 1.5% which was followed by the treatment V₃P₃ (55.97) *i.e.* vermiwash 150ml/lit and KNO₃ @ 1.5% and recorded lowest in control V₁P₁ (36.17) *i.e.* water spray. Interaction effect of vermiwash and potassium nitrate is might be due to as vermiwash contains enzymes, secretions of earthworms that stimulates the growth and yield of crops and even develop resistance in crops through foliar spray. (Sivasubramanyan and

Ganesh Kumar 2004) [13]. Similar results were recorded by Pathak and Prabhat Kumar (2009) [9] in gladiolus. cv. White Prosperity, Siddappa and Hegde (2011) [12] in curry leaf var. Suvasini and Nagalakshmi *et al.* (2016) [16] in anthurium.

The number of spikes ha⁻¹ in lakh was found maximum (6.23) in the treatment V₄P₃ i.e. vermiwash @ 150 ml/lit and KNO₃ @ 1.5% which was at par with the treatment V₃P₃ (5.47) *i.e.* vermiwash @ 100 ml/lit and KNO₃ @ 1.5% and recorded lowest (3.81) in control V₁P₁ *i.e.* water spray. The interaction effect of vermiwash and potassium nitrate is might be due to as vermiwash comprises of auxins, cytokinins, humic and fulvic acid which improves plant vigor and it is also known to increase leaf chlorophyll content photosynthesis, which explains the increment in the crop yield, flower and fruit quality. (Aghamohammad *et al.* 2016) [3]. Potassium nitrate enhances the availability of phosphorus and micronutrients. The nitrate in potassium nitrate enhances the formation of organic acids, thus leading increased in spikes, yield of crops; Similar results were recorded in Mahajan Y. *et al.* (2014) [7] and Dhanshri *et al.* (2019) [5] in tuberose.

The number of florets spike⁻¹ was found maximum (46.61) in the treatment V₄P₃ *i.e.* vermiwash @ 150 ml/lit and KNO₃ @ 1.5% which was followed by the treatment V₃P₃ (43.93) *i.e.* vermiwash 100ml/lit and KNO₃ @ 1.5% and recorded lowest

(34.25). in control V₁P₁ i.e. water spray. The interaction effect of vermiwash and potassium nitrate is might be due to as vermiwash is a worm coelomic fluid extract containing several enzymes, plant growth hormones (IAA, Cytokinin, GA₃), mucus secretion of earthworms and humic acid from soil and organic waste materials which can be easily absorbed by plant tissues which increase the plant growth and yield, as it contains phosphorus which enhances the number of flowers per plant and yield of plants. Similar results were reported in Buckerfield *et al.* (1999)^[4] in yield of radish, Pathak and Prabhat Kumar (2009)^[9] in gladiolus cv. White Prosperity.

b) Quality parameters

The data regarding the effect of foliar application of Vermiwash and KNO₃ on flower yield and quality of tuberose revealed that, the effect of foliar spray of Vermiwash and KNO₃ on quality parameters like length of floret and diameter of floret were found significant.

The length of floret of tuberose was found significantly maximum (6.40 cm) in the treatment V₄P₃ i.e. vermiwash @ 150 ml/lit and KNO₃ @1.5% which was at par with the treatment V₃P₃ (5.82 cm) i.e. vermiwash 100 ml/lit and KNO₃ @1.5% and recorded lowest (4.34 cm) in control V₁P₁ i.e. water spray. Interaction effect of vermiwash and potassium nitrate is might be due to; as the vermiwash is coelomic fluid extraction contains several enzyme, plant growth hormones like cytokinins, GA₃ and vitamins along with micro and macro nutrients that would stimulate the growth and yield of crops Buckerfield *et al.* (1999)^[4] in radish. Potassium nitrate generally increases the dry matter ratio reducing the storage losses and increases the amount of flower quality. It is used safely in all flowers. It also directly affects flower quality with elements such as color and smoothness; similar results were reported by Memon *et al.* 2013^[8] in tuberose.

The diameter of floret of tuberose was found significantly maximum (4.69 cm) in the treatment V₄P₃ i.e. vermiwash @150ml/lit and KNO₃ @1.5% which was followed by the treatment V₃P₃ (4.08 cm) i.e. vermiwash 150ml/lit and KNO₃ @1.5% and recorded lowest in control V₁P₁ i.e. water spray (2.99 cm). Vermiwash is coelomic fluid extraction contains several enzyme, plant growth hormones like cytokinins, GA₃ and vitamins along with micro and macro nutrients that would stimulate the growth and yield of crops. (Rajan and Murugesan, 2012)^[11]. Potassium nitrate generally increases the dry matter ratio by reducing the storage losses and increases the amount of flower quality. It is used safely in all flowers. It also directly affects flower quality with elements such as color and smoothness.

These results are similar with research findings of chrysanthemum, Zaller (2012)^[15] in tomato, Karaguzel *et al.* (1999)^[6] in gladiolus, Mahajan *et al.* (2012)^[7] in tuberose and Memon *et al.* (2013)^[8] in tuberose.

Conclusion

From the above investigation it is concluded that maximum number of spikes⁻¹ plant, spikes plot⁻¹, spikes ha⁻¹, florets spike⁻¹; length of floret and diameter of floret in tuberose var. Prajwal were recorded maximum with the treatment of V₄P₃-150 ml/lit Vermiwash +1.5% KNO₃. Hence, interaction of vermiwash @150ml/lit of water and 1.5% KNO₃. can be used to obtain maximum yield and better quality flowers in tuberose var. Prajwal.

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