Research Article

Response of tuberose to different levels of nitrogen, phosphorus and potassium fertilizers

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Abstract

Fertilizers are food for plants and they replace the nutrients that crops remove from the soil. Without the addition of fertilizers, crop yields and agricultural productivity would be significantly reduced. Keeping in view the importance of fertilizers, an experiment "Response of tuberose to different levels of nitrogen, phosphorus and potassium fertilizer" was conducted at Agricultural research institute Tarnab, Peshawar during summer 2018. The experiment was laid out in randomized complete block design with one factor with three replications (NPK control, 5 g m⁻², 10 g m⁻², and 15 g m⁻²). The data were recorded on days to flowering, days to sprouting, spike length (cm), number of leaves per spike, number of flowers per spike. All the parameters were non-significantly affected by nitrogen, phosphorus, and potash. Although the overall result was non-significant but still the maximum number of flowers per spike (22.667) at 15 g/m², maximum spike length (3.6667 ft.) at 15 g/m² and early flowering (88.667 days) was observed in 10 g/m². On the other hand, the maximum early sprouting was recorded maximum (85.667) at 10 g/m² and followed by 15g/m², the number of leaves per spike show that maximum number of leaves per spike (8.0) were recorded at control and maximum length of flowers per spike (12.677) was recorded at control followed by level 15 (21.333), while the late emergence (98.333) observed in 10 g/m², minimum number of flowers (20.000) were recorded at control and minimum length of flowers (8.8333) were recorded at 5 g/m² another parameters the minimum number of leaves per spike (5.0000) were recorded at 15 g/m², minimum spike length (2.7233ft) value of mean was recorded at 10 g/m² and the minimum day to sprouting (22.333) mean value was recorded at control. All the results are recorded maximum as well as minimum at different level of NPK in this experiment.

Keywords: Tuberose; Nitrogen; Florets; Mineral nutrition

Introduction

Tuberose is a dazzling bulbous, perennial and day neutral plant. The Botanical name of tuberose is *Polianthes tuberosa* L.

belonging to family *Asparagaceae*. Its origin in Mexico and during the 16th century is spread to different parts of the world. Tuberose consists of almost twelve

species. Tuberose is commercially cultivated throughout the world and have a special position among ornamental flowers for its fascinating and long-lasting qualities. The popularity of tuberose is increasing day by day due to its adorable cut flowers. It occupies a very selective and special position to flower lovers as attractiveness, prettiness and enjoyable fragrance. Traditionally tuberose have enormous economic potential as cut flowers and in the field of the essential oil industry [1]. Tuberose flowers can be kept for a considerably prolonged period and remain fresh when cut and thus it has occupied a prominent place in flowers market. Due to its prolonged vase life, it is used for cutting flowers and is ideally cultivated in subtropical regions [2].

Nitrogen has an important role in the production of tuberose. Nitrogen influences certain attributes of tuberose plants, such as plant height, leaves quantity, number of spike, yield and flowering [3-5]. Cirrito [5] observed that nitrogen and potassium can together enhance the growth and development of tuberose. Nitrogen fertilizer is one of the most important factors in canopy formation and its deficiency leads to a decrease in photosynthesis [6]. Nitrogen and phosphorus are necessary elements for growth [7]. Gangwar and Singh [8] mentioned N: P: K at 100: 150:150 kg ha⁻¹ led to maximum growth and yield of the flowers. Nitrogen has a significant effect on tuberose bulb production. It has a good effect on increasing length of spike. Phosphorus involve in many enzymatic reactions such as phosphorylation, energy transfer and some biochemical process [9]. Phosphorus is best for the growth, flowering and bulbs production of tuberose and due to its deficiency, the flowering and production. Potassium on the other hand also plays vital role in venous plant processes such as physiology and biochemistry, which are important for growth, quality, yield and stress resistance of the plant [10]. Moreover, potassium has

an essential role in regulation of stomata involved in photosynthesis and transpiration, photophosphorylation, translocation of photosynthetic to the sink tissue, activation of enzymes, maintenance of turgor and tolerance to stress [11, 12].

The present study was conducted to determine optimum dose of nitrogen, phosphorus and potassium on growth, production and flowering of tuberose.

Materials and Methods

The experiment "Response of tuberose on different level of nitrogen, phosphorus and potassium fertilizers" was conducted at Floriculture Section, Agriculture Research Institute Tarnab, Peshawar (ARI Tarnab) during summer 2018. The experiment was laid out in Randomized Complete Block Design with split plot arrangement and there were four treatments and replicated three times.

Factors

Single factor (NPK)

To = Control

T1 = 5g m⁻²

T2 = 10g m⁻²

T3 = 15g m⁻²

PARAMETERS

The following parameters were studied during the research project.

Days to sprouting

The number of days the date of sowing to date of sprouting was counted for each treatment in each replication and average was calculated.

Days to flowering

Number of days from the date of sowing to date of emergence was counted for each treatment in each replication and average was calculated.

Spike length (cm)

From each treatment in each replication five spikes were randomly selected, and their length was measured through measuring tape from soil surface to the tip of the plant and then average was calculated.

Number of leaves per spike

Leaves of five randomly selected spikes from each treatment in each replication

were counted and then average was calculated.

Number of flowers per spike

From each treatment in each replication five spikes were randomly selected, flowers were counted, and average was calculated.

Flower length per spike (ft.)

From each treatment in each replication five spikes were randomly selected, and their flower length was measured through measuring tape first flower to last top flower and then average was calculated.

Results and Discussion

Days to sprouting

Table 1 shows that days to sprouting were non-significantly affected by different levels of nitrogen phosphorus and potash. Regarding the mean value of days to sprouting was recorded maximum (85.667) at 10 g/m² and followed by 15g/m² and 5g/m² of NPK, while the minimum mean value was recorded at control however the mean of each level was different from one another. The same result was done by [13], according to her experiment days to sprouting is not significant affected by different levels of nitrogen phosphorus and potash.

Days to flowering

Mean data publicized that days to flowering were non-significantly affected by different levels of nitrogen phosphorus and potash. The mean value for days to flowering showed that early flowering (88.667 days) was observed in 10g/m² and followed by control and 5 g/m² of NPK while late flowering (98.333 days) was observed at 15 g/m². However, the mean of each level was different from one another. The result agrees with [14] who reported non-significant effect by different levels of nitrogen, phosphorus and potash.

Spike length (FT)

Data analysis proved that spike length (ft.) were non-significantly affected by different levels of nitrogen phosphorus and potash. The mean values for spike length show that maximum spike length (3.6667 ft.) were

recorded at 15 g/m² of NPK and followed by control and 5g/m² of NPK, while the minimum value of mean was recorded at 10 g/m². It is the conformation of result obtained by Kabir *et al.* [15] who reported that spike length is not affected by different levels of nitrogen, phosphorus and potash.

Number of leaves per spike

Number of leaves per spike were non-significantly affected by different levels of nitrogen phosphorus and potash. In case of NPK, the mean values for number of leaves per spike show that maximum number of leaves per spike (8.0) were recorded at control and followed by 5 g/m² and 10 g/m² and the minimum were recorded at 15 g/m². The same result was obtained by Khaliji *et al.* [16], who were reported that vegetative attribute of tuberose is not significantly affected by different levels of nitrogen, phosphorus and potash.

Number of flowers per spike

Data regarding mean number of flowers per spike shown in Table- 1. Number of flowers per spike were insignificantly affected by different levels of nitrogen phosphorus and potash LSD test shows that maximum number of flowers per spike (22.667) was recorded at level 15g/m² followed by level 10g/m² (21.333) while lowest mean was recorded at control however all the means were non-significant different from one another. The result show similarity with Larson [17] who reported non-significant effect of potash on number of flowers per spike.

Length of flower (cm)

Data regarding mean length of flowers per spike shown in (Table 1). It is clear from the data that length of flowers per spike were non-significantly affected by different levels of nitrogen phosphorus and potash. LSD test shows that the maximum length of flowers per spike (12.677) was recorded at control followed by level 15g/m² (21.333) while lowest mean was recorded at level 5 however all the means were non-significant different from one another.

Table 1. Responses of tube rose at different levels of nitrogen phosphorus and potassium fertilizer

Treatment	Days to sprouting	Days to flowering	Spike length (ft.)	Number of leaves spike ⁻¹	Number of flowers spike ⁻¹	Length of flower (cm)
NPK (g.m ⁻²)						
0 (Control)	22.33A	91.00A	2.83A	8.00A	20.00A	12.67A
5	24.66A	90.66A	2.93A	7.00AB	20.00A	8.83A
10	26.42A	88.66A	2.72A	5.66BC	21.33A	11.00A
15	27.00A	92.33A	3.66A	5.00C	22.66A	10.33A

Mean values followed by different letter differ from each other at 5% level of significance

Conclusion

From the experiment it is concluded that the overall effect of different levels of nitrogen, phosphorus and potash is found non-significant on the all parameters during the study. It may be due to the following factors i.e. Bulb size, soil fertility status, weeding competition, early harvesting and nutrient imbalance etc.

Authors' contributions

Conceived and designed the experiments: H Mukhtar & F Wahid, Performed the experiments: H Mukhtar & F Noor, Analyzed the data: HM Qureshi, S Zaman & Z Ahmad, Contributed reagents/materials/ analysis tools: I Qazi, MU Khan & MF Malik, Wrote the paper: F Noor & Fa Bibi.

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