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RESEARCH ARTICLE

EFFECT OF GA3 AND FOLIAR ORGANICS ON YIELD AND QUALITY PARAMETERS OF TUBEROSE (*Polianthestuberosa* L.,) Cv. PRAJWAL

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ABSTRACT

An experiment was carried out to study the "Effect of GA_3 and foliar organics on yield and quality parameters of Tuberose (*Polianthes tuberosa* l.,) cv. Prajwal" in the department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai nagar during (2016 – 2018). The effect of twelve treatments includes GA_3 at various concentrations, along foliar organics viz., fish amino acid and panchakavya at the level of 3% were studied under randomized block design (RBD) with three replications. The various treatments significantly influenced the number of spikes per plant, length of spike, length of rachis, number of florets per spike, floret length, floret diameter and flower yield . Evaluation of twelve treatments using the cumulative yield obtained over a period of one year as the criterion revealed the treatment combination of fish amino acid @ 3% with 150 ppm of GA_3 produced the highest total flower yield 11.55 t ha^{-1}. Yield and economics showed the superiority of the treatments which result in a cost benefit ratio 1:4.16.

Key words: Prajwal,FAA, Panchakavya,Rachis length.

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INTRODUCTION

Bulbous plants constitute one of the most important groups of the floricultural crops in the world. Tuberose (*Polianthes tuberosa* L.) is one of the most important tropical bulbous flowering plants cultivated for production of long lasting flower spikes. It is popularly known as Rajanigandha. It belongs to family Amaryllidaceae and its native of Mexico. The florets are star shaped, waxy and loosely arrange on spike that can reach up to 30 to 45 cm in length. There is high demand for tuberose concrete and absolute in international market which fetch very good price. The absolute of tuberose is an expensive natural oil used in cosmetic industry. The flowers remain fresh for long time and withstand long distance transportation and find the useful place in the flower market.

Tuberose bloom profusely throughout the year and its considered as a potential money-spinner with immense export prospects especially to gulf countries. It has a good export potential to Europe, where flowers are not available during winter season. Dried tuberose bulb in the powdered form is used as remedy for gonorrhea. In India, commercial cultivation of tuberose is popular in west Bengal, Tamil Nadu, Maharastra, Andhra Pradesh, Karnataka, Assam, Rajasthan, Gujarat, Uttar Pradesh, Punjab and Chhattisgarh. There are four tuberose cultivars popularly grown in India viz., single, semi-double, double and variegated.

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The cultivar single occupies the foremost position than the others. In order to meet the demand of flowers in the market, efforts are needed to manipulate long vegetative phase and also to enhance the flower production and quality. The use of growth regulator has brought about a sort of revolution in the floriculture industry overwhelming importance of growth regulating chemicals in the field of floriculture is well recognized. Synthetic growth regulating chemicals especially GA_3 were reported to be very effective in manipulating growth, flowering and bulb production in tuberose (Rani and Singh, 2013). The foliar organics are often timed to coincide with specific vegetative and flowering stages of crop growth. Foliar organic fertilization such as the use of panchakavya and fish amino acid as liquid plant food is the most effective way to supplement the major and minor elements. This involves the combined use of growth regulator GA_3 together with foliar organics to promote N-fixation and P-mobilization.

MATERIALS AND METHODS

The present investigation entitled "Effect of GA3 and foliar organics on yield and quality parameters of tuberose (*Polianthes tuberosa* L.) *cv.* Prajwal" was carried out in the floriculture yard, Department of Horticulture, Annamalai University, Annamalai nagar, Tamil Nadu from 2016 to 2018. The experiment was laid out in Randomized block design with the plant spacing of 45 × 30 cm.. The treatments used in this

study is (T_1) GA_3 @ 50 ppm, (T_2) GA_3 @ 100 ppm, (T_3) GA_3 @ 150 ppm, (T_4) Fish amino acid (FAA) @ 3 %, (T_5) Panchakavya @ 3%, (T_6) GA_3 @ 50 ppm + fish amino acid @ 3 %, (T_7) GA_3 @ 50 ppm + Panchakavya @ 3 %, (T_8) GA_3 @100 ppm + fish amino acid @ 3 %, (T_9) GA_3 @100 ppm + Panchakavya @ 3 %, (T_{10}) GA_3 @150 ppm + fish amino acid @ 3 %, (T_{11}) GA_3 @150 ppm + Panchakavya @ 3 %, (T_{12}) control. Three replications were maintained for each treatment. Healthy and matured uniform sized bulbs were procured from Nattarasankottai village in Sivagangai district. A normal recommended fertilizer dose of FYM 25 tonnes and 200 kg of N, 200 kg of P and 200 kg of K per hectare was applied. Two third of nitrogen along with full doses of P and K were applied as basal at the time of planting. Growth regulator $GA_3$for foliar application as prepared by diluting one milligramof GA_3 dissolved in one litre of water. Stock solution was prepared by dissolving 1 gram in 1 litre water to obtain 1000ppm. The spray solution of 300 ppm of GA_3 was prepared and used as a stock solution for each spray. Fish amino acid is prepared by alternatively mixinxing a layer of powdered jaggery and chopped fish waste in acontainer and closed properly. After 60 days the fish waste mixture was decayed and turned into brown colour liquid. It had the odour of palm fruit and this solution was filtered in a wire mesh and stored ready to use. The growth regulator (GA_3) and foliar organics *viz.,* fish amino acid and panchakavya were given as per the treatments in individual plots and foliar spray was done at 30 days interval from 30 DAP onwards 480 DAP. Spraying was done with hollow cone pore size nozzle. At the time of spray, required quantity of GA_3 50, 100, 150 @ ppm and foliar organics *viz.,* fish amino acid and panchakavya @ 3% were prepared as per the treatment schedule.The observations on quality parameters such as number of spike per plant, length of the spike, number of florets per spike, foret length, floret diameter and flower yield per hectare. The data on various parameters were analysed statistically as per the procedure suggested by Panse and Sukhatme (1978). The ratio between gross returns and cost incurred in each treatment was calculated and expressed in pure numbers. The net return was worked out for different treatments by subtracting the cost of cultivation from the gross return.

Table 1. Effect of ga3 and foliar organics on yield and quality parameters of tuberose (*Polianthes Tuberosa* L.,) CV. Prajwal

TREATMENTS	Number of spikes/plant	1ength of spike(cm)	length of rachis (cm)	Number of florets per spike	Floret length	Yield /ha
T_1 GA_3 @ 50 ppm	3.65	89.19	30.75	45.66	5.32	13.89
T_2 GA_3 @100 ppm	3.95	93.06	32.69	48.05	5.84	14.43
T_3 GA_3 @150 ppm	4.05	94.33	33.32	48.84	6.01	14.61
T_4 Fish amino acid (FAA) @ 3 %	3.75	90.47	31.39	46.45	5.49	14.07
T_5 Panchakavya @ 3%	3.55	87.96	30.13	44.90	5.15	13.72
T_6 GA_3 @ 50 ppm + fish amino acid @ 3 %	3.94	92.90	32.61	47.95	5.82	14.41
T_7 GA_3 @ 50 ppm + panchakavya @ 3 %	3.84	91.69	32.00	47.20	5.65	14.24
$T_8$$GA_3$ @100 ppm + fish amino acid @ 3 %	4.24	96.80	34.56	50.36	6.34	14.96
T_9 GA_3 @100 ppm + panchakavya @ 3 %	4.14	95.54	33.93	49.58	6.17	14.78
T_{10} GA_3 @150 ppm + fish amino acid @ 3 %	4.35	98.21	35.26	51.23	6.53	15.16
T_{11} GA_3 @150 ppm + panchakavya @ 3 %	4.25	96.98	34.64	50.47	6.36	14.99
T_{12} Control	3.27	84.37	28.34	42.68	4.67	13.21
S. Ed	0.03	0.36	0.18	0.22	0.05	0.05
CD (P=0.05)	0.07	0.94	0.47	0.58	0.13	0.13

RESULTS AND DISCUSSION

The results of the experiment conducted on the "Effect of GA3 and foliar organics on yield and quality parameters of tuberose (*Polianthes tuberosa* L.) *cv.* Prajwal" revealed that the yield and quality characters such as number of spike per plant, length of the spike, number of florets per spike, foret length and floret diameter were influenced by the application of GA3 and foliar organics The data on estimated flower yield per hectare are furnished in Table 1. The estimated flower yield per hectare varied among the treatments. Among the various concentration of GA_3 and foliar organics on tuberose, the estimated flower yield per hectare was significantly increased in T_{10} GA_3 @ 150 ppm + fish amino acid @ 3% was recorded (15.16 t). It was followed by T_{11} GA_3 @ 150 ppm + panchakavya @ 3% which recorded (14.99 t) was on par with T_8 GA_3 @ 100 ppm + fish amino acid @ 3% (14.96 t). The minimum yield of (13.21 t) was recorded the treatment T_{12} (control). Similar effect has also been reported by Padaganur *et al.,* (2005) in his studies on effect of GA3 on tuberose. The data on the number of spikes production revealed that among all the treatments, T_{10} recorded the maximum number of spikes (4.35) followed by T_{11} (4.25), while the minimum number of spikes (3.27) was recorded in control. The treatments T_{11}, T_8, T_2 and T_6 (4.25, 4.24, 3.95 and 3.94) were found to be on par with each other, but significantly differed over the control. The data on the spike length revealed that significant differences were observed among the various treatments with respect to length of spikes.

The spike length showed an increasing trend with different level of GA_3 and foliar organics. The maximum spike length (98.21 cm) was recorded in T_{10}. The next best treatment was T_{11} (96.98 cm), while the treatment T_{12} These observations and findings in the present investigation are in conformity with those reported earlier Singh and Desai (2013) in tuberose. The data on length of the rachis showed significant variations among the treatments. The maximum length of rachis was recorded in T_{10} (GA_3 @ 150 ppm + fish amino acid @ 3%) (35.26 cm). It was followed by T_{11} (GA_3 @ 150 ppm + panchakavya @ 3%) (34.64 cm). Which was statistically different from T_{12} (28.34 cm) control. The treatment T_{11} was on par with T_8 (GA_3 @ 100 ppm + fish amino acid @ 3%) which recorded (34.56 cm). These finding were found to be in accordance with Sajjad *et al.,* (2015) studies on the effect of growth regulator in gladiolus. The results revealed that statistical differences in the number of florets per spike were observed among the various treatments up to final flower harvest from the per spike. In general, different level of GA_3 and foliar organics resulted in increase in the number of florets per spike.

The maximum number of florets per spike (51.23) was observed in GA_3 @ 150 ppm + fish amino acid @ 3% (T_{10}). It was followed by T_{11} (GA_3 @ 150 ppm + panchakavya @ 3%)

50.47. Which was on par with T_8 (GA_3 @ 100 ppm + fish amino acid) which recorded (50.36). The minimum number of florets per spike (42.68) was recorded in treatment T_{12} (control). Similar effects were recorded by Bhalla *et al.,* (2006) in Gladiolus var. Red Beauty. The data revealed that the floret length and floret diameter showed an increasing trend with different level of GA_3 and foliar organics. The maximum flower length (6.53 cm) was recorded in T_{10}. The next best treatment was T_{11} (6.36 cm), while the treatment T_{12} recorded the minimum flower length (4.67 cm). The treatments T_{11}, T_8, T_2 and T_6 were found to be on par with each other, but significantly differed over the control. Among the 12 treatments, the Flower diameter was found to be maximum in T_{10} (GA_3 @ 150 ppm + fish amino acid @ 3%) recorded the maximum diameter of flower (4.16 cm). It was followed by T_{11} (GA_3 @ 150 ppm + panchakavya @ 3%) which recorded (4.08 cm) was on par with T_8 (GA_3 @ 100 ppm + fish amino acid @ 3%) recorded (4.07 cm). The minimum diameter of flower (3.28 cm) was recorded in treatment T_{12} (control).

Similar results were reported by Bhosale *et al.,* (2014) in tuberose. In the present study, the yield parameters were significantly influenced by GA_3 and foliar organic treatments. The treatments received foliar organic supplements along with GA_3 outperformed the treatments received GA_3 alone. The earliest spike emergence, the maximum number of spikes per plant, length of spike, rachis length and number of florets per spike were recorded with the application of GA_3 @ 150 ppm + fish amino acid @ 3%, while the most delayed first spike emergence, the minimum number of spikes per plant, number of florets per spike and flower yield per plant were recorded with Control (Fig 3, 4 & 5). The highest yield obtained in treatment with the foliar application of GA_3 @ 150 ppm + fish amino acid @ 3% (11.55 t ha^{-1}) was more than 80 per cent when compared with the yield obtained in control treatment (6.09 t ha^{-1}).

Conclusion

GA_3 is known to regulate flower initiation, development and differentiation of floral organs (Ramwant gupta and Chakrabarty, 2013). Early flowering achieved in present study due to the application of GA_3 @ 150 ppm might be due to early flower primordial development, cell differentiation and early utilization of nutrients. Likewise, number of spikes per plant, length of spike and rachis length was recorded maximum in the fish amino acid treatment that triggered the vigorous vegetative growth of the plant.

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