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RESEARCH ARTICLE

EFFECT OF VARIOUS GRADED LEVELS OF TUBER AND TREATMENT WITH VARIOUS GROWTH REGULATORS ON SPROUTING PERCENTAGE AND GROWTH PARAMETERS OF GLORY LILY (*GLORIOSA SUPERBA* L.)

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ABSTRACT

The present investigation was carried out to study the Effect of various graded levels of tuber and treatment with various growth regulators on sprouting percentage and growth parameters of glory lily. A field trial was conducted in a Factorial randomized block design with various graded level of tuber based on the weight (100-125 g, 175-200 g and above 250 g) and different levels of growth regulators (GA_3 @ 250 ppm, cycocel @ 500 ppm and ethrel @ 500 ppm). The results of the present investigation revealed that tuber weighed more than 250 g treated with GA_3 @ 250 ppm was found to be superior in improving the sprouting percentage of tubers and other growth characters like plant height, stem girth, number of branches, number of leaves , days to first flowering and number of flowers per plant in glory lily.

Key words: Tuber weight, Growth regulator, Glory lily, Sprouting, Stem Girth.

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INTRODUCTION

Gloriosa superba L. is a native of tropical Africa belonging to liliaceae family and now found growing naturally in many countries of tropical Asia including Bangladesh, India, Srilanka, Malaysia and Myanmar. In India, it occurs commonly in tropical forests of Bengal and Karnataka (sivakumar and krishnamoorthy 2002). In Tamil Nadu, it is known as kalappaikilangu, kanvalikizhangu, kandhalmalar, karthigai kizhangu and is recognized as the state flower of Tamil Nadu. The medicinal properties of the drug is due to the presence of alkaloids, chiefly 'colchicine' and 'gloriosine' colchicines extracted from the tubers and seeds it used in the treatment of 'gout' and rheumatism, Besides colchicines is frequently used to induce polyploidy in crop plants. Glory lily is commercially propagated by 'V' or 'L' shaped tubers which sprout during the month of July under typical dry belt in Tamil Nadu. But the sprouting of tubers is irregular and in a period of 30 days they sprout to an extent of 60 per cent. The role of plant growth regulators in various physiological and biological processes in plants is well known, which enable a rapid change in the phenotype of the plant. Growth regulators are known for influence on vegetative growth, flowering, fruit set tuber yield and quality. In addition to that, *Gloriosa superba* and other tuberous annual plants have indicated the existence of a relationship between tuber weight with growth and productivity. The tubers obtained from medium and larger tubers may be expected to grow vigorously with higher production of flowers and pods (Farooqi and Sreeramu, 2004) Hence, there is an imperative need to standardize the optimum tuber weight and accurate quantity of growth regulator in *Gloriosa superba* for better sprouting and growth.

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MATERIALS AND METHODS

The present experiment was carried out in the Orchard Department of Horticulture, Faculty of Agriculture, Annamalai University during 2012. Healthy Gloriosa tubers of various size were procured from a farmer's field in Vedaranyam. The tubers were transported and stored temporarily in a thick layer of river sand under cool dry shady place. Tubers of various weights viz., 100-125 g, 175-200 g and above 250 g were soaked for 12 h in appropriate growth regulator solutions as per treatment schedule. For control treatment the tubers were immersed in water for 12 hours. Then the treated tubers were spread over a thick layer of moist river sand in a cool dry shady place and covered with gunny bag until 20 days for sprouting. The sprouted tubers were immediately planted in the experimental field. The experiment was laid out in factorial randomized block design with three replications. Regular cultural practices were adopted to raise the crop successfully. Observations were recorded on the sprouting percentage of

tuber and other growth parameters *viz.,* plant height, number of branches plant^{-1}, number of leaves plant^{-1}, stem girth, days taken for first flowering. The treatment details are as follows

Factor 1: Weight of the tuber (3 Levels)
W_1- 100 to 125 g
W_2-175 - 200 g
W_3-> 250 g

Factor 2:Tuber treatment with Growth regulators (4 Levels)
G_1- GA_3 @ 250 ppm
G_2-Cycocel @ 500 ppm
G_3-Ethrel @ 500 ppm
G_4-Control

Treatment details

T. No.	Treatment Details
T_1	$W_1 \times G_1$ - 100 to 125g of tuber + GA_3 @ 250 ppm
T_2	$W_1 \times G_2$ - 100 to 125g of tuber + Cycocel @ 500 ppm
T_3	$W_1 \times G_3$ - 100 to 125g of tuber + Ethrel @ 500 ppm
T_4	$W_1 \times G_4$ - 100 to 125g of tuber + water (control treatment)
T_5	$W_2 \times G_1$ - 175 - 200 g of tuber + GA_3 @ 250 ppm
T_6	$W_2 \times G_2$ - 175 - 200 g of tuber + Cycocel @ 500 ppm
T_7	$W_2 \times G_3$ - 175 - 200 g of tuber + Ethrel @ 500 ppm
T_8	$W_2 \times G_4$ - 175 - 200 g of tuber + water (control treatment)
T_9	$W_3 \times G_1$ - > 250 g of tuber + GA_3 @ 250 ppm
T_{10}	$W_3 \times G_2$ - > 250 g of tuber + Cycocel @ 500 ppm
T_{11}	$W_3 \times G_3$ - > 250 g of tuber + Ethrel @ 500 ppm
T_{12}	$W_3 \times G_4$ - > 250 g of tuber + water (control)

RESULTS AND DISCUSSION

In the present investigation, the effect of different weight of tubers treated with different growth regulators on sprouting of tubers and other growth characters are presented in the Table 1.

It was found that the sprouting percentage was more in the tubers treated with G_1 (GA_3 @ 250 ppm) (80.92 %) which was followed by G_3 (Ethrel @ 500 ppm). Tuber weighed above 250 g recorded more sprouting percentage W_3 (85.33 %) followed by W_2 (73.43 %). Similar trend was observed in interaction studies. Similar reports were earlier reported in Gloriosa (Rajaram *et al*., 2002) and Suh (1989) and Puja *et al*. (2003) The plant height was found to be more in tuber treated with G_1 142.80cm at 150 DAP which was followed by G_3 133.70 cm at 150 DAP. The interaction effect of tuber weight along with the growth regulator treatment recorded a plant height of 168.49cm at 150 DAP. The increased plant height recorded by GA3 250 ppm in the present study might be due to its role in cell division and cell enlargement and are largely controlled by endogenous level of gibberellic acid which has been proved in number of crops. The increased cell division and cell elongation reflected in increased plant height was observed in hybrid lilies (Gorden *et al*.,1980). Tallest plants with more number of leaves were produced in gladiolus when the corms were treated with 300 ppm GA3 as reported by Rajesh and Ajaykumar (2007). Similar results were obtained with GA3 in day lily (Das *et al*., 1992), Lilium longiflorum (Sujatha and Bhattacharjee, 1992), gladiolus (Bhattacharjee, 1984) and in Zephyranthes (Sujatha and Bhattacharjee, 1990).

Application of growth regulator G_1 (GA3 @ 250 ppm) recorded maximum number of branches (9.30) followed by G_3 (Ethrel @ 500 ppm) which recorded 8.56 number of branches. Tuber weight of W_3 (>250 g) recorded 10.06 number of branches. The number of branches was found to be more in the interaction W_3 x G_1 (11.38) with tuber weight of (>250 g) treated with GA_3 @ 250 ppm. The favorable effect of GA_3, and NAA on enhancing the number of branches could be attributed to the increased in GA_3 and auxin concentration in the auxiliary buds which might have triggered the activity leading to more number of branches as suggested by Malik (1999) and the

Table 1. Effect of various graded levels of tuber and treatment with various growth regulators on sprouting percentage and growth parameters of glory lily

Treatments	Sprouting percentage 20 DAT	Plant height(cm) 150 DAP	Stem girth(mm)	Number of branches	Number of leaves	Days to first flowering
W1 X G1	69.89	119.13	6.27	7.41	149.18	48.13
W1 X G2	61.64	101.03	6.06	5.93	119.84	52.68
W1 X G3	65.68	109.89	6.16	6.66	134.21	50.45
W1 X G4	54.47	84.56	5.98	4.54	92.13	58.57
W2 X G1	80.12	140.79	6.63	9.12	183.34	44.43
W2 X G2	70.96	120.94	6.37	7.52	151.45	48.86
W2 X G3	76.00	131.75	6.53	8.39	168.67	46.70
W2 X G4	66.66	111.54	6.26	6.76	136.22	51.21
W3 X G1	92.76	168.49	6.95	11.38	228.26	37.46
W3 X G2	84.46	150.31	6.74	9.90	198.77	42.03
W3 X G3	88.63	159.44	6.85	10.64	213.59	39.74
W3 X G4	75.47	130.83	6.48	8.33	167.48	46.37
SE(d)	1.18	3.70	0.04	0.30	5.99	0.93
CD (P=0.05)	2.45	7.65	0.09	0.62	12.40	1.92
W Mean						
W1	62.91	103.65	6.11	6.13	123.84	52.45
W2	73.43	126.25	6.44	7.94	159.92	47.79
W3	85.33	152.26	6.75	10.06	202.02	41.40
SE(d)	0.59	1.85	0.02	0.15	3.00	0.46
CD (P=0.05)	1.22	3.82	0.04	0.31	6.20	0.96
G Mean						
G1	80.92	142.80	6.61	9.30	186.93	43.33
G2	72.35	124.09	6.39	7.78	156.68	47.86
G3	76.77	133.70	6.51	8.56	172.15	45.63
G4	65.53	108.98	6.24	6.54	131.94	52.05
SE(d)	0.68	2.13	0.02	0.17	3.46	0.54
CD (P=0.05)	1.41	4.42	0.05	0.36	7.16	1.11

results are in consonance with the findings of present study.

Growth regulator G_1 (GA3 @ 250 ppm) application recorded maximum number of leaves (186.93) followed by G_3 (Ethrel @ 500 ppm) which recorded 172.15 numbers of leaves. Tuber weight W_3 (>250 g) recorded 202.02 number of leaves. The number of leaves was found to be more in the interaction W_3xG_1(228.26) with tuber weight (>250 g) treated with GA_3 @ 250 ppm. The production of leaves are directly correlated with the photosynthetic efficiency of the plant it forms an important parameters involved in enhancing the plant growth (Mukopadhyay and Roy, 1986). The stem girth was found to be insignificant it was more in tubers treated with G_1 (6.61 mm) which was followed by G_3 (6.51 mm). The interaction of tuber weight along with the growth regulator treatment recorded a stem girth of W_3G_1 (6.95 cm) followed by W_3G_3 (6.85 cm).

Days to first flowering was found to be more in the tubers treated with G_1 (GA_3 @ 250 ppm) (43.33 days)) which was followed by G_3 (Ethrel @ 500 ppm) recorded 45.63 days. Tuber weighed above 250 g recorded in early flowering of W_3 (41.40 days) followed by W_2 (47.79 days). Similar trend was observed in interaction studies. The hastening effect can be attributed to the suppression of vegetative growth by the growth retardants and diversion of food resources to the flowering sites leading to early flowering as suggested by Krishnamoorthy and Sandooja (1981); Srivastava (1996). In support of the findings, Sidhu *et al.* (1981) has reported early flowering due to application of MH and CCC. On the other hand, combination effect indicate the tuber weight has excreted marked influence in accelerating the flowering process, besides enhancing the flower production. This may be attributed to the growth of the plant and the accompanying physiological changes that had occurred due to growth regulator application, which have transformed the vegetative phase in to a reproductive phase.

Conclusion

The findings of this investigation clearly brought out that using tubers with a weight of more than 250g and treatment of tubers with growth regulator GA3 @ 250 ppm was found to be optimum for increasing the sprouting and growth characters in glory lily.

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