International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
www.chemijournal.com
IJCS 2020; 8(5): 2353-2355

Received: 22-07-2020
Accepted: 26-08-2020

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Influence of plant growth regulators and tuber weight on sprouting and flower number of glory lily [*Gloriosa superba* (L.)]

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DOI: https://doi.org/10.22271/chemi.2020.v8.i5af.10672

Abstract
The research work was carried out to induce the sprouting percentage and number of flowers plant^{-1} through different growth regulators in glory lily. Before planting tubers are treated with different concentrations of growth regulators concentration *viz.*, GA_3 (250 and 500 ppm), CCC (500 and 1000 ppm), Ethrel (250 and 500 ppm), NAA (50 and 100 ppm), MH (500 and 1000 ppm) with control were applied on two different tuber sizes *viz.*, W_1 (average weight of 90-100 g tubers) and W_2 (average weight of 140-150 g tubers). Among the various treatments were used, GA_3 @ 500 ppm with an average weight of 140-150 g tubers was found to influence sprouting percentage (85.90 per cent) followed by GA_3 @ 250 ppm with an average weight of 140-150 g tubers. Ethrel @ 500 ppm with an average weight of 140-150 g tubers was found to have highest number of flowers plant^{-1} (41.50).

Keywords: Glory lily, plant growth regulators, tuber weight, medicinal plant, yield

Introduction
Glory lily [*Gloriosa superba* (L.)] is an important medicinal plant native to tropical Africa and can grow in India widely used for its traditional system of medicine. Glory lily endangered medicinal plant commercially propagated through tubers. Generally a single bud is produced from the tuber and grows rapidly with soft stemmed tipped with tendrils. Glory lily is one of the important species among the medicinal plants, which is a striking tuberous climbing plant with brilliant wavy edged yellow and red flowers that appears from November to March every year. 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. Treatment with growth regulators is the fruitful access for improvement of different features included with sprouting percentage, number of flowers and days to first flowering and postponement of flowering and also enhancement of yield (Malabug *et al.*, 2010) [3]. Hence, there is an imperative need to standardize the optimum quantity of the growth regulator and tuber weight in glory lily for better growth and yield. Growth Regulators widely used for the economically important medicinal plants but their efficacy depends on different plant species (Dole and Wilkins, 1999) [2]. Hence, there is an imperative need to standardize the optimum quantity of growth regulator and tuber weight in glory lily for better growth and yield.

Materials and Methods
The present investigation was carried out in the field unit of Department of Horticulture, Faculty of Agriculture, Annamalai University, Chidambaram, Tamil Nadu. Healthy and uniform size (90-100 and 140-150 g) were procured from a farmer cultivating glory lily at Markampatti village, Moolanur Taluk of Tiruppur District, Tamil Nadu. The tubers were stored temporarily in a thick layer of moist river sand in a cool and dry place. The experiment was contacted with two factors *viz.*, growth regulators and tuber weight. The data were statistically analyzed by adopting the standard procedure of Panse and Sukhatme (1978) [4] and using AGRISTAT software, whatever the results were found significant, critical differences were computed at 5 per cent level of probability to draw statistical conclusion.

Results and Discussion

In this investigation the effect of GA_3 @ 500 ppm with an average weight of 140-150 g tuber was significantly superior to all the treatments. The sprouting percentage of the crop was studied at three stages *viz.*, 10, 20, 30 days after planting. The sprouting percentage varied significantly

Table 1: Effect of growth regulators and tuber weight on sprouting percentage in glory lily

Treatments	Sprouting percentage								
	10 days			20 days			30 days		
	W_1	W_2	Mean	W_1	W_2	Mean	W_1	W_2	Mean
GR_1	3.50	5.25	4.37	32.45	35.55	34.00	54.30	57.20	55.75
GR_2	26.95	30.95	28.95	57.50	60.90	59.20	77.60	81.95	79.77
GR_3	27.40	34.65	31.02	58.00	64.60	61.30	78.20	85.75	81.97
GR_4	8.60	23.20	15.90	39.40	53.60	46.50	61.40	73.55	67.47
GR_5	8.20	19.80	16.00	39.00	50.20	44.60	60.80	70.00	65.40
GR_6	12.20	23.70	17.95	42.65	53.95	48.30	65.00	74.00	69.50
GR_7	12.70	24.25	18.47	43.20	54.45	48.82	65.50	74.45	69.97
GR_8	15.45	27.95	21.70	46.20	58.50	52.35	66.05	78.70	72.37
GR_9	16.20	31.50	23.85	46.70	61.60	54.15	66.50	82.50	74.50
GR_{10}	9.05	20.30	14.67	39.75	51.80	45.77	61.95	71.50	66.87
GR_{11}	7.60	19.25	13.42	38.60	49.80	44.20	60.25	69.50	64.87
Mean	13.44	23.70		43.95	54.08		65.23	74.49	

	S.Ed	CD(0.05)	S.Ed	CD(0.05)	S.Ed	CD(0.05)
W	0.010	0.02	0.10	0.22	0.11	0.24
T	0.02	0.05	0.25	0.52	0.27	0.56
WxT	0.04	0.08	0.35	0.74	0.38	0.80

GR_1 - Control, GR_2 - GA_3 @ 250 ppm; GR_3 - GA_3 @ 500 ppm; GR_4 - CCC @ 500 ppm; GR_5 - CCC @ 1000 ppm; GR_6 - ethrel @ 250 ppm; GR_7 - ethrel @ 500 ppm; GR_8 - NAA @ 50 ppm; GR_9 - NAA @ 100 ppm; GR_{10} - MH @ 500 ppm; GR_{11} - MH @ 1000 ppm; W_1 - Average tuber weight (90-100 g); W_2 - Average tuber weight (140-150 g)

among the treatments (Table 1). Between the tubers, an average weight of 140-150 g (W_2) tuber recorded the highest sprouting percentage (23.70, 54.08 and 74.79 per cent) at all the three stages *viz.*,10, 20 and 30DAP, respectively whereas, the lowest sprouting percentage was recorded in untreated with an average weight of 90-100 g (W_1) tuber at all the three stages of growth. Among the growth regulators, the tubers treated with GA_3 @ 500ppm (GR_3) registered the highest sprouting percentage (31.02, 61.30 and 81.97 per cent) at all the three stages *viz.*, 10, 20 and 30 DAP, respectively followed by GA_3 @ 250 ppm (GR_2) and NAA @ 100 ppm (GR_9). On the other hand, lowest sprouting percentage (4.37, 34.00 and 55.75 per cent) was observed in control (GR_1) at all the growth stages *viz.*, 10, 20 and 30 DAP, respectively. The interaction effect on sprouting percentage was also found significant at all the three stages. Among the interaction treatments, GA_3 @ 500ppm combination with an average weight of 140-150 g of tuber ($GR_3 W_2$) recorded the highest sprouting percentage of 85.75 (30 DAP) followed by $GR_9 W_2$ (82.50 per cent) and GR_2W_2 (81.95 per cent) and these treatments were on par with each other. While, control ($GR_1 W_1$) recorded minimum sprouting percentage (54.30 per cent) as compared to other treatments. These results clearly indicate that combination of GA_3 with medium sized tubers may be ideally suited and also these tubers might have been adequate enough as compared to either lowest or highest tuber weight. In tuberose, Ramesh (2004) [6] has reported that higher sprouting percentage in medium sized bulbs compared to large and small sized bulbs, which support the finding of the present study. Baskaran and Misra (2007) [1] have reported that dipping of gladiolus corms with GA_3 @ 500 and 1000 ppm caused early sprouting of 4.67 and 5.16 days, respectively.

The number of flowers produced during the entire crop duration varied significantly among the different treatments and can be evinced from the Table 2. Different tubers taken for the Investigation, W_2 (average weight of 140-150 g tubers)

Table 2: Effect of growth regulators and tuber weight on number of flowers plant^{-1} in glory lily

Treatments	Number of flowers plant^{-1}		
	W_1	W_2	Mean
GR_1	8.50	10.50	10.00
GR_2	23.50	30.50	27.00
GR_3	35.50	39.50	38.00
GR_4	20.50	28.50	25.00
GR_5	21.50	30.50	26.00
GR_6	25.50	31.50	29.00
GR_7	38.50	41.50	40.00
GR_8	28.50	30.50	30.00
GR_9	25.50	32.50	29.00
GR_{10}	16.50	29.50	23.00
GR_{11}	18.50	28.50	24.00
Mean	24.00	30.00	

	S.Ed	CD(0.05)
W	1.21	2.52
T	2.84	5.91
WxT	4.02	8.35

GR_1 - Control, GR_2 - GA_3 @ 250 ppm; GR_3 - GA_3 @ 500 ppm; GR_4 - CCC @ 500 ppm; GR_5 - CCC @ 1000 ppm; GR_6 - ethrel @ 250 ppm; GR_7 - ethrel @ 500 ppm; GR_8 - NAA @ 50 ppm; GR_9 - NAA @ 100 ppm; GR_{10} - MH @ 500 ppm; GR_{11} - MH @ 1000 ppm; W_1 - Average tuber weight (90-100 g); W_2 - Average tuber weight (140-150 g)

produced more number of flowers plant^{-1} (30.00) whereas W_1 (average weight of 90-100 g tubers) recorded the least number of flowers plant^{-1} (24.00). Among the growth regulators, GR_7 (ethrel @ 500 ppm) registered the highest number of flowers plant^{-1} (40.00) followed by GR_3 (GA_3 @ 500 ppm) which recorded 38.00 flowers plant^{-1}. While, control (GR_1) produced the least number of flowers plant^{-1} (10.00). Among the interaction effects, $GR_7 W_2$ recorded the highest number of flowers plant^{-1} (41.50) followed by G_3W_2 (39.50) and $G_9 W_2$ (32.50). This finding was supported by the earlier reports of Sathyanarayana Reddy and Singh (1994) [7] in favour of

medium sized bulbs inducing the number of flowers in tuberose. In this context, the reduction in vegetative growth by virtue of height reduction due to growth retardants might have helped in enhanced utilization of the photosynthates for inducing early reproductive phase leading to higher flowering. In glory lily, Pavitra (1989) [5] recorded higher number of flowers due to ethrel treatment which supports the finding of the present study.

Acknowledgement
Author is thankful to Department of Horticulture, Faculty of Agriculture, Annamalai University, Chidambaram, Tamil Nadu, India for the assistance during the research programme.

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