

Full Length Research Paper

Propagation studies in *Gloriosa superba*

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Received 10 June, 2015; Accepted 18 June, 2015

Studies on seed germination in glory lily revealed that seeds soaked in hot water for one hour results in maximum germination of 32.75%, with earlier germination (48.35 days) and vigor index (565.92), when compared to other chemical treatments or growth regulator. Effect of certain growth regulators (GA_3 , Kinetin, Ethrel) on the sprouting of tuber was assessed and ethrel at 500 ppm recorded maximum sprouting percentage (100 %), earlier sprouting of tubers (6.33 days), maximum plant height (99.32 cm) and maximum number of leaves per plant (34.04) and plant girth (1.81 cm).

Key words: Glory lily, seed treatment, growth regulator, tuber, germination, sprouting.

INTRODUCTION

Gloriosa superba L. (Colchicaceae) is an important medicinal plant, native to Tropical Asia and Africa. It is highly valued in modern medicine due to the presence of Colchicine and Colchicoside which are used in treatment of gout and rheumatism (Farooqi et al., 1993). It is commercially propagated by 'V' or 'L' shaped tubers, sourced from the wild especially from the forest areas and hillocks. It is distributed throughout India and commercially cultivated in Tamil Nadu (Saxena and Brahman, 1995). It has been reported that more than 500 tonnes of wild tubers are collected every year and used for planting in Tamil Nadu alone. About 800 kg of tubers are required to plant in one acre. The cost involved towards planting material (Rs.250 to 300/kg of tubers), alone accounts to 2.0 lakhs at Rs 250 per kg of tuber prevailing for the last three years. Seed germination is erratic and takes three weeks to three months (Azhar and Sreeramu, 2004). But the sprouting of tubers is irregular and in a period of 30 days they sprout to an extent of 60%. Hence this experiment was aimed at standardizing the seed treatment methods and the effect

of growth regulators on sprouting of tubers of *G. superba*.

MATERIALS AND METHODS

Dried seeds of *G. superba* collected from Mulanur of Tirupur district were used for standardizing the seed treatment. To test the effect of hot water soaking on seed germination, 250 ml of water was heated up to 100°C and then taken away from the heat source. The seeds were immersed in hot water for an hour and then soaked in cold water for 12 h. Similarly, seeds were soaked in chemicals viz., GA_3 (100 and 250 ppm), Thiourea and Potassium nitrate at various concentrations (0.5, 1.0, and 1.5%) for an hour. Treated seeds were sown in the raised beds at a distance of 10 cm between the lines in the beds. Seeds of 100 numbers were sown in each treatment with the replication of four.

To standardize the effect of growth regulator on sprouting, healthy tubers of *G. superba* were collected from farmer's field, Mulanur of Tirupur district. These tubers were soaked in different growth regulators viz., Kinetin (25 and 50 ppm), GA_3 (100 and 200 ppm) and Ethrel (250 and 500 ppm) for one hour. Tubers were planted in the medium sized pot filled with pot mixtures containing sand, red earth and FYM (1:2:1). A completely randomized design with three replications was used, while the dependent variables

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Table 1. Effect of seed treatments on seedling characters of *Gloriosa superba*.

Seed treatment (one hour soaking)	Germination percentage (%)	Days for germination (days)	Shoot length (cm)	Root length (cm)	Vigour index
Control	0.00 (0.45)	0.00	0.00	0.00	0.00
Hot water soaking	32.75(34.88)	48.35	11.12	6.15	565.92
Thiourea - 0.5%	11.00(19.17)	52.95	10.51	5.48	175.94
Thiourea - 1.0%	7.50(15.88)	57.55	10.68	5.80	123.67
Thiourea -1.5%	8.00(16.16)	60.80	10.76	5.78	132.32
KNO ₃ - 0.5%	13.75(21.72)	55.00	10.62	5.78	225.63
KNO ₃ - 1.0%	16.25(23.57)	56.75	10.65	5.63	264.71
KNO ₃ - 1.5%	15.25(22.75)	49.80	10.84	5.43	248.27
GA ₃ - 100 ppm	12.20(20.47)	50.15	11.05	6.45	214.43
GA ₃ - 250 ppm	19.50(24.93)	48.45	11.78	6.94	365.23
Mean	13.47(20.00)	47.99	9.80	5.34	231.42
SE(d)	1.9905	0.9920	0.2186	0.1959	40.7236
CD(0.05)	4.0842	2.0356	0.4486	0.4020	83.5600

Values in parenthesis are arcsine transformed.

were measured for two months after planting.

RESULTS AND DISCUSSION

Dormancy is a condition where seeds will not germinate even when the environmental conditions (water, temperature and aeration) are favourable for germination. Poor and delayed seed germination in *G. superba* was reported and the germination was erratic which took three weeks to three months (Azhar and Sreeramu, 2004). The water impervious seed coat protects the plant from germination during the harsh condition until the rainy season. In the present study, various dormancy breaking treatments revealed that hot water treatment imposed for an hour recorded the higher germination percentage (32.75%), earlier germination (48.35 days), and vigor index (565.92) (Table 1). Soaking of seeds in hot water could have helped in enhancing the

seed germination by softening the hard seed coat and facilitating leaching out of the germination inhibitors. Similar increase in germination consequent to hot water soaking has been earlier reported in *Sesbania rostrata* (Sarker et al., 2000), *Tephrosia purpurea* and *Abrus precatorius* (Singh et al., 1984). Hot water treatments have been reported to enhance germination of hard coated seeds by elevating water and O₂ permeability of the testa (Aydin and Uzun, 2001).

Other treatments such as thiourea, KNO₃, GA₃ also increase the germination percentage, it was not as high as hot water treatment. This implies that hard seed coat is the prime factor for seed dormancy in glory lily. Further, hot water soaking treatments also enhanced the quality of seedlings as evidenced by higher shoot length, root length, vigour index besides recording lesser days for germination. Hence, this practice can be recommended to raise the nursery.

Treatment with growth regulators and other

chemicals on induction of better seed germination as compared to control where no germination was recorded might be due to the antagonistic effect on growth inhibitors and also enhancement of the rate of metabolism during germination (Verma and Tondon, 1988). Thus, among all the seed treatments, soaking the seeds in hot water for one hour was the most effective for inducing better germination of seeds in Glory lily.

G. superba is propagated mainly during the rainy season (June-July) by V-shaped tubers. Vegetative propagation is very slow as the maximum number of daughter tubers produced per year is two. Sprouting of the tubers is irregular and reaches about 60% in 30 days (Krause, 1988).

The effect of various growth regulators (GA₃, kinetin, ethrel) on sprouting of tubers were studied (Table 2). It was found that ethrel at 500 ppm gave the highest sprouting percentage (100%) and days for sprouting (6.33 days). Similar reports

Table 2. Effect of growth regulators on plant characters of *Gloriosa superba*.

Treatment	Sprouting percentage (%)	Days for sprouting (days)	Plant height (cm)	No. of leaves per plant	Stem girth (cm)
Kinetin 25 ppm	60.00(50.76)	7.22	39.11	24.5	0.93
Kinetin 50 ppm	73.33(59.20)	9.66	27.65	13.53	0.80
GA ₃ 100 ppm	80.00(67.85)	7.44	59.86	28.11	0.97
GA ₃ 200 ppm	86.66(72.07)	6.66	86.22	33.88	1.35
Ethrel 250 ppm	66.66(59.78)	6.88	56.87	26.11	0.57
Ethrel 500 ppm	100(89.37)	6.33	99.32	34.04	1.81
Control	53.33(46.91)	10.44	21.57	27.10	0.56
Mean	74.28(63.717)	7.8071	55.8019	27.74	0.99
SE(d)	11.5436	0.5483	20.4899	6.4551	0.3454
CD (0.05)	24.7613	1.1761	43.9513	13.8464	0.7408

Values in parenthesis are arcsine transformed.

were earlier reported in *Gloriosa* (Rajaram et al., 2002; Suh, 1989; Puja et al., 2003).

Treatment of tubers with GA₃ 200 ppm recorded higher sprouting rate of 86.66%, with earliness in sprouting (6.66 days). According to Groot and Karssen (1987), gibberellins either endogenous (or) exogenous was considered to be an important factor in inducing sprouting. The effect of gibberillic acid in inducing the formation of hydrolytic enzymes may be a factor which might have regulated the mobilization of reserves, ultimately resulting in early sprouting with GA₃. This is also in close conformity with reports of Bhattacharjee et al. (1994) who reported that GA₃ (10-100 ppm) at all concentrations recorded earlier sprouting of bulbs of tuberose.

The present investigation also shows that ethrel 500 ppm significantly increased the plant height, number of leaves and girth of the plant followed by GA₃ at 200 and 100 ppm. Similar findings were given by Puja (1999), who reported that tubers treated with 500 ppm ethrel gave better vegetative growth and tuber yield. Increased vegetative growth and tuber yield were observed in *G. superba* due to treatment with ethrel at 500 ppm.

The results are in accordance with the findings of Jayachandran and Sethumadhavan (1979) in ginger who reported that 200 ppm of ethrel resulted in maximum leaf production.

The increased plant height recorded by GA₃ 200 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 (Hanks and Menhennett, 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).

Conflict of Interest

The authors have not declared any conflict of

interest.

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