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Effect of dormancy breaking treatments on germination in glory lily tuber

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Abstract

Tuber is the propagating material of glory lily. The sprouting of tubers is irregular and in a period of 30 days they sprout to an extent of 60%. A pot culture study was conducted at Department of Seed Science and Technology during August 2015 with six treatments along with control. Results revealed that tubers treated with GA₃ 500 ppm with the soaking duration of 15 min showed early sprouting (3.3 days) and higher germination (98%).

Keywords: Glory lily, tuber, sprout, germination, dormancy

Introduction

Gloriosa superba L. is a medicinal climber belonging to the family Colchicaceae. Glory lilies have assumed an important place in flower trade and are widely grown for cut flower and tuber production both in USA and Europe (Singh, 2006) [18]. *Gloriosa* derives its name from the Latin word 'gloriosus', which means handsome and *superba* from the word 'superb' means splendid or majestic. It is commonly known as Glory lily, creeping lily or flame lily. In Tamil, it is referred as Kanvali kilangu, Kalappai kilangu, Thanthondri kilangu and Venthathi kilangu, which is one of the endangered species among the medicinal plants (Badola, 2002) [3]. It is extensively scattered in the tropical and subtropical parts of India.

The tuber is used for the treatment of bruises and sprains, colic and chronic ulcers, haemorrhoids, cancer, impotence, nocturnal seminal emission and leprosy (Kala, 2011) [8]. In the Indian systems of medicine, the tubers are used as tonic, antiperiodic, antihelmenthic and also against snake bites (Gupta *et al.*, 2005) [7]. It is commercially propagated by tubers which are 'V' or 'L' shaped sourced from the wild especially from the forest areas and hillocks. It has been reported that more than 500 tonnes of wild tubers are collected every year and used for planting in Tamil Nadu alone. It has now been listed as endangered species due to its overexploitation or over-collection (Badola, 2002) [3].

Tubers are used for planting. About 800 kg of tubers are required to plant in one acre. The cost involved towards planting material alone accounts to 2.0 lakhs at Rs 250 per kg of tuber (Anandhi *et al.*, 2013) [2]. Tuber yield is poor and it takes 2 or 3 seasons to get required size of the tubers. The sprouting of tubers is also irregular and in a period of 30 days they sprout to an extent of 60%. Major problems in cultivation of Glory lily were scarcity of planting material, low productivity due to lack of good management and lack of information on tuber dormancy (Paramasivam and Arumugam, 1991) [11]. The colchicine content varies from 0.15 to 0.3% in the rhizomes.

Materials and methods

Glory lily crop was raised in pot culture at Department of Seed Science and Technology, TNAU, Coimbatore. The experiment consisted of six treatments along with control viz.

a) Chemical

T₀-Control

T₁- GA₃ 300 ppm

T₂- GA₃ 500 ppm

T₃- Ethrel 100 ppm

T₄- Ethrel 200 ppm

T₅- KNO₃ 250 ppm

T₆- KNO₃ 500 ppm

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b) Duration- Tubers were soaked at different durations viz., 5 min, 10 min and 15 min.

Results and discussion

Glory lily tuber sprouting is irregular and in a period of 30 days they sprout to an extent of 60 per cent. Plant growth regulators (PGR) have considerable effects on tuber fertility and it is highly related to hormonal balance (Stuart and Cathey, 1961; Vreugdenhil and Struik, 2006) [19, 24]. By treating the tubers using gibberellic acid, the tubers will sprout faster and the tubers treated with GA₃ produce more number of seed tubers (Rehman *et al.*, 2001; Burton, 1989) [16, 4]. Gibberellins are able to break dormancy of potato tubers by sinking (pre - soaking) the seed tubers or spraying on the potato plants (Garcia-Torres and Gomez-Campo, 1973; Lorreta *et al.*, 1995; Rappaport *et al.*, 1957; Vreugdenhil and Sergeeva, 1999) [6, 9, 15, 23]. More buds will be generated per unit area by using gibberellic acid (GA₃) in potatoes because the GA₃ can increase the number of stems or stolons in plant (Mikitzel, 1993) [10].

Xu *et al.* (1998) [26] indicated that GA is a dominant regulator in tuber formation and promoted stolon elongation and inhibited tuber formation. Timm *et al.* (1962) [22] treated dormant or sprouted seed potatoes with various concentrations of gibberellic acid and indicated that emergence of plants from treated seed was more rapid than from untreated. Wareing and Jennings (1980) [25] proved that the growth of secondary buds in potato stolons, has been

intrigued and this phenomenon should predominate final dominancy. Racca and Tizio (1968) [13] found that before tuberization, the shoots contained large quantities of gibberellin-like substances which decreased after tuberization and it is suggested that these substances are of importance in the control of tuberization. Also, GA₃ leads to smaller tubers resulting in increased bud numbers and stolons by removing of apical dominance. Foliar application of GA₃ (5 and 10 ppm) increased the length of stems and stolons, and decreased the tuber fertility, but causes elongation of the stolons (Burton 1989; Chapman, 2006) [4, 5].

In the present study, tubers treated with GA₃ 500 ppm for 15 minutes sprouted earlier (3.3 days) and higher germination (98 %) than other treatments. Gibberellins stimulate growth, break dormancy and delay senescence. According to (Salisbury and Ross, 1978) [17], gibberellins overcome the seed dormancy and promote the germination. According to Suresh *et al.* (2009) [21], gladiolus corms of cultivar American Beauty dipped in the solution of GA₃ at 125 ppm sprouted with less number of days (17 days) and 50% sprouting in 29 days.

Anandhi and Rajamani (2012) [1] reported that ethrel at 500 ppm concentration gave the highest sprouting percentage (100 %) and days for sprouting (6.33 days). Similar reports were earlier reported in *Gloriosa* by Rajaram *et al.*, 2002) [14], Suh (1989) [20] and Puja *et al.* (2003) [12].

From this study it is concluded that GA₃ induce the early sprouting with high germination rate.

Table 1: Effect of dormancy breaking treatments on days to first sprouting and germination % in glory lily tuber

Treatments (T)	Days to first sprouting				Germination %			
	(D1)	(D2)	(D3)	Mean	(D1)	(D2)	(D3)	Mean
T1	8.0	7.7	8.0	7.9	80 (63.45)	84 (66.42)	88 (69.73)	84 (66.42)
T2	5.0	4.3	4.0	4.4	87 (68.87)	90 (71.57)	93 (74.65)	90 (71.56)
T3	3.7	3.7	3.3	3.6	90 (71.57)	96 (78.46)	98 (81.87)	95 (77.07)
T4	6.0	5.0	4.0	5.0	83 (65.65)	90 (71.57)	94 (75.82)	89 (70.63)
T5	5.7	5.0	4.3	5.0	87 (68.87)	91 (72.54)	93 (74.65)	90 (71.56)
T6	4.3	4.0	3.7	4.0	90 (71.57)	94 (75.82)	97 (80.02)	94 (75.82)
T7	4.3	3.7	3.3	3.8	90 (71.57)	94 (75.82)	96 (78.46)	93 (74.65)
Mean	5.3	4.8	4.4	4.8	87 (68.87)	91 (72.54)	94 (75.82)	91 (72.54)
	T	D	TD		T	D	TD	
SEd	0.233	0.356	0.617		1.193	0.783	2.067	
CD(P=0.05)	0.470	0.719	NS		2.412	1.579	NS	

Figures in parentheses indicate arc sine transformed values

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