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Short Communication

Evaluation of oryzalin-induced putative polyploids of *Jasminum sambac* cv. Ramanathapuram Gundumalli

Vishnupandi S.[1], Ganga M.[2*], Rajamani K.[3], Manonmani S.[4] and Manikanda Boopathi N.[5]

[1,2,3]Department of Floriculture and Landscape Architecture, [4]Department of Rice, [5]Department of Plant Biotechnology
Tamil Nadu Agricultural University, Coimbatore - 641 003, Tamil Nadu, India
[*]Corresponding author Email: gangasivakumar@yahoo.com

ABSTRACT

The aim of the research was to create genetic variations in *Jasminum sambac* using oryzalin as a polyploidizing agent. Rooted stem cuttings of *J. sambac* were treated with oryzalin (0.005, 0.01 and 0.05%) and their vegetative and flowering parameters were recorded on 150 days after treatment. The study revealed that the higher concentration of oryzalin (0.05%) caused reduction in plant height, internodal length, number of flowering cymes per plant and number of flower buds per cyme. However, the same treatment significantly enhanced certain vegetative parameters *viz.*, number of secondary branches, stem girth, number of leaves and leaf area, and flowering parameters namely flower bud length, corolla tube length, flower bud girth, diameter of open flower and hundred flower bud weight. High GCV was recorded in major yield attributing traits, i.e. number of flowering cymes per plant and hundred flower bud weight. High heritability and genetic advance registered for the traits *viz.*, plant height, number of secondary branches, internodal length, number of flowering cymes, flower bud girth and hundred flower bud weight per plant indicates least influence by environment and selection such characters may be useful.

Keywords: *Jasminum*, oryzalin, selection, variations

INTRODUCTION

One of the plants that have been domesticated in India for ages is jasmine. These highly prized jasmine flowers are used in making garlands, in ceremonial offerings, for adornment of women's hair, and manufacturing of '*attar*' and 'concrete' for cosmetics business due to their distinctive rich fragrance. Being a triploid species (2n=3x=39), *J. sambac* cv. Ramanathapuram Gundumalli is sterile and does not set seeds (Srivastava & Devaiah, 1988). Hence, conventional hybridization attempts in this cultivar have not succeeded till date and it is normally propagated by asexual means, owing to which limited variability exists in this species.

Polyploidy breeding is an efficient method as compared to conventional breeding due to easy handling within a short span of time and most likely being used in asexual propagated crops like jasmine, to produce novel varieties and desirable genetic variations. Artificial polyploidization results in whole genome alteration that produces greater phenotypic variations. The development of polyploids can be a useful and valuable tool to improve desirable traits in breeding programme (Notsuka et al., 2000). Oryzalin, a dinitroaniline compound class is known to induce polyploidization in plants at trace concentrations. Oryzalin works by binding and disrupting microtubules, which are essential for cell division in plants. This disruption of microtubules can lead to the formation of abnormal cell division patterns and, in some cases, formation of polyploid cells (Doležel et al., 1994). All crop improvement programmes depend on genetic variability. Higher the amount of variability in a population, greater its scope for improvement by selection (Vavilov, 1951). The aim of the present study was to induce variations in *J. sambac* cv. Ramanathapuram Gundumalli using oryzalin and estimate the extent of genetic variability, heritability and genetic advance created through polyploidization.

Uniform sized rooted cuttings of jasmine were grown under 50% shade net. Oryzalin solutions of different concentrations (0.005, 0.01 and 0.05%) were prepared with distilled water and kept in darkness. The plants were subjected to complete submergence in the oryzalin solutions for 6 hours under laboratory condition and then taken out, washed with running tap water thoroughly, then planted back in poly bags with

growing media. The experiment was laid out in non-replicated design. The morphological and flowering parameters were recorded after 150 days of treatment. Phenotypic and genotypic coefficients of variation, heritability and genetic advance as per cent of mean were estimated for all the plant traits. The PCV and GCV were classified as low (<10%), moderate (10-20%) and high (>20%) as per Sivasubramanian & Madhavamenon (1973). In broad sense, the heritability per cent can be categorized as low (0-30%), moderate (31-60%) and high (>60%) as proposed by Robinson et al. (1949). The genetic advance as per cent of mean was categorized as low (<10%), moderate (10-20%) and high (>20%) as suggested by Johnson et al. (1955).

The range for plant height and internodal length in oryzalin treated population was recorded lower than the control (Table 1), which indicates the possibility of some individual plants with reduced plant height, offering scope for selection of compact, dwarf mutants. Increased concentration of oryzalin enhanced vegetative parameters *viz.*, number of secondary branches, stem girth, number of leaves and leaf area, and flowering parameters such as flower bud length, corolla tube length, flower bud girth, diameter of open flower and hundred flower bud weight. Oryzalin treatments exhibited decreased plant height, increased number of branches and flower weight in *Impatiens balsamina* (Defiani et al., 2013), increased flower diameter and decreased flowers per inflorescence in *Rosa rugosa* (Allum et al., 2007); reduction in plant height, increase in leaf number and stem diameter in *Solanum lycopersicon* (Silalahi et al., 2020); improved flower length in *Limonium sinuatum* (Mori et al., 2021) and increased leaf area in *Rhododendron fortunei* (Lan et al., 2020).

The values of PCV were recorded higher than their corresponding GCV for all traits in all treatments studied (Table 1), indicating the role of environmental factors for the expression of plant characters. However, GCV recorded high (>20%) at 0.01% oryzalin treatment for hundred flower bud weight and at 0.05% oryzalin treatment for number of flowering cymes per plant, which indicates induction of genetic variations in the treated population.

High heritability and high genetic advance as per cent of mean were registered in the traits *viz.*, internodal length and number of flowering cymes per plant at 0.005% oryzalin (Table 2.). The flowering parameters namely, number of flowering cymes per plant, flower bud girth and hundred flower bud weight exhibited high heritability and genetic advance at 0.01% oryzalin treatment. The traits plant height, number of secondary branches, number of flowering cymes per plant and flower bud girth at 0.05% oryzalin treatment exhibited the same. High heritability accompanied with high genetic advance indicates that the characters are highly

Table 1 : Performance for various quantitative traits of oryzalin treated *J. sambac* cv. Ramanathapuram Gundumalli

Trait	Oryzalin treatments							
	Control		0.005%		0.01%		0.05%	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range
Plant height (cm)	54.53	44.2-62.4	49.15	41.2-60.8	47.87	29.8-61.6	39.33	26.2-49.7
No. of secondary branches	8.20	7-10	8.27	6-11	8.33	6-12	8.53	6-13
Stem girth (mm)	5.88	3.2-4.9	5.97	5.1-6.8	6.00	5.2-6.9	6.03	5.3-7.4
Internodal length (cm)	4.02	3.2-4.9	3.53	2.4-4.4	3.51	2.7-4.2	3.46	2.4-4.7
No. of leaves	45.40	36-52	45.60	38-54	46.67	42-51	48.20	36-58
Leaf area (cm)	17.20	13.54-20.66	17.43	13.62-24.42	17.51	13.56-22.32	17.63	13.84-23.36
Leaf thickness (mm)	0.36	0.34-0.38	0.39	0.24-0.42	0.41	0.37-0.43	0.44	0.42-0.46
No. of flowering cymes/plant	6.40	6-7	4.87	3-6	4.53	2-6	4.60	1-6
No. of flower buds/ cymes	5.47	4-7	5.40	3-7	5.33	3-6	5.27	3-6
Flower bud length (cm)	2.18	1.8-2.7	2.21	1.7-2.6	2.23	1.7-2.7	2.54	1.6-2.8
Corolla tube length (cm)	1.22	1-1.5	1.25	0.9-1.4	1.26	0.9-1.6	1.30	0.8-1.6
Flower bud girth (cm)	2.21	1.9-2.6	2.22	1.7-2.5	2.25	1.6-2.9	2.35	1.8-2.9
Diameter of open flower (cm)	3.11	2.8-3.4	3.12	2.7-3.4	3.13	2.7-3.5	3.23	2.8-3.6
Hundred flower bud weight (g)	15.59	11.16-19.71	16.86	11.72-21.96	18.14	10.80-26.82	21.99	16.92-27.32

Table 2 : Genetic variability for quantitative traits of oryzalin treated *J. sambac* cv. Ramanathapuram Gundumalli

Trait	Oryzalin treatment											
	0.005%				0.01%				0.05%			
	PCV	GCV	h^2	GAM	PCV	GCV	h^2	GAM	PCV	GCV	h^2	GAM
Plant height	11.76	5.04	18.41	4.46	15.46	10.96	50.25	16.00	22.64	18.34	65.64	30.61
No. of secondary branches	17.98	13.15	53.45	19.80	17.37	12.39	50.91	18.22	20.23	16.37	65.50	27.30
Stem girth	8.39	0.59	0.49	0.08	10.01	5.55	30.71	6.33	10.88	7.04	41.91	9.39
Internodal length	20.32	15.86	60.91	25.50	13.30	3.69	7.69	2.11	17.15	11.23	42.88	15.15
No. of leaves	12.89	8.21	40.53	10.79	10.97	5.02	20.93	4.73	10.90	5.51	25.57	5.74
Leaf area	19.74	13.24	45.00	18.30	15.46	5.17	11.18	3.56	14.72	2.67	3.30	1.00
Leaf thickness	5.25	4.19	63.66	6.89	4.97	3.99	64.48	6.60	3.69	2.46	44.33	3.37
No. of flowering cymes/plant	21.78	19.13	77.12	34.61	20.19	16.81	69.32	28.84	24.37	21.74	79.55	39.94
No. of flower buds/cymes	19.55	9.73	24.79	9.98	19.62	9.51	23.48	9.49	20.88	11.57	30.71	13.21
Flower bud length	12.76	3.82	8.95	2.35	13.31	5.53	17.25	4.73	14.79	10.30	48.82	14.78
Corolla tube length	13.51	3.91	8.39	2.34	16.10	9.77	36.81	12.21	17.69	12.61	50.81	18.51
Flower bud girth	10.93	9.13	69.74	15.70	16.04	14.90	86.28	28.50	12.53	11.17	79.52	20.53
Diameter of open flower	8.75	6.38	53.13	9.58	6.10	1.21	3.93	0.49	6.78	3.51	26.89	3.75
Hundred flower bud weight	21.70	13.67	39.66	17.73	28.06	23.28	68.81	39.78	16.03	9.48	34.99	11.56

heritable and least influenced by environment and selection for improvement of such traits may be useful and effective.

The traits including number of secondary branches, leaf area and hundred flower bud weight at 0.005% oryzalin; plant height, number of secondary branches and corolla tube length at 0.01% oryzalin and the traits internodal length, number of flower buds per cyme, flower bud length, corolla tube length and hundred flower bud weight at 0.05% oryzalin recorded moderate heritability and genetic advance as per cent of mean. These traits were highly influenced by environmental effects and selection would be ineffective. Similar results were also observed in *Dendranthema grandiflora* (Padmadevi, 2009) and *J. sambac* cv. Mysuru Mallige (Venkatesha et al., 2022).

From the present study, it could be inferred that a higher degree of genetic improvement in *J. sambac* cv. Ramanathapuram Gundumalli can be achieved through selection of traits namely, plant height, number of secondary branches, internodal length, number of flowering cymes per plant, flower bud girth and hundred flower bud weight from the oryzalin treated population. Hence, treatment with oryzalin is a potential tool for creating variability in vegetative and flowering traits of *Jasminum. sambac*.

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