

Short communication

## Genetic variability of *kazhappai kizhangu* (*Gloriosa superba* L.) in Tamil Nadu assessed using morphological and biochemical traits

Chitra Rajagopal\* and Rajamani Kandhasamy

Department of Spices and Plantation Crops, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore 641 003, Tamil Nadu, India.

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### Abstract

*Gloriosa superba* is a climbing medicinal herb with seeds and tubers containing valuable alkaloids viz., colchicine and colchicoside. Morphological and biochemical traits were employed for characterizing 18 germplasm accessions of *G. superba* representing different geographical regions of Tamil Nadu and Andhra Pradesh. Results indicate high variability in morphological and biochemical parameters. Colchicine concentrations ranged from 0.04 % in 'Kallimanthayam wild' to 1.32 % in 'Andhra wild'.

**Key words:** Colchicine, Glory lily, Qualitative characters, Phenotype variants.

*Gloriosa superba* L. is a medicinal plant belonging to the family Liliaceae. Seeds and tubers contain alkaloids such as colchicine and colchicoside, which are used to treat gout and rheumatism (Trease and Evans, 1983). In the Indian systems of medicine, the tubers are used as tonic, antiperiodic, antihelmenthic, and also against snake bites (Gupta et al., 2005). The plant is known as 'Kalihari' in Hindi, 'Manthori khizangu' in Malayalam, and 'Kazhappai kizhangu' in Tamil. The species has been domesticated more recently following its over-exploitation in the natural habitats (Sivakumar and Krishnamurthy, 2002). Mortality on account of leaf blight disease is yet another major threat that this species experiences (Maiti et al., 2007). A study was conducted to assess the variability in *G. superba* through morphological and biochemical characters and to identify the leaf blight tolerant accessions.

Eighteen accessions from different regions of Tamil Nadu and Andhra Pradesh were grown at the Medicinal Plants Unit, Botanical Garden, Tamil Nadu Agricultural University, Coimbatore during 2007 and 2008 in a

randomized block design with three replications. The experimental area was tilled and planting furrows (30 cm deep) made at a distance of 1.5 m, 20 days before planting. Potting mixture (red earth, sand, vermicompost and coir-compost in 1:1:1:1 ratio) was applied in the furrows to ensure nutrient supply to the young plants. Each plot consisted of three 5 m long rows with inter and intra row spacing of 150 cm and 30 cm respectively. The plots were irrigated at weekly intervals. Recommended agronomic and plant protection practices were adopted. Morphological characters mentioned in the descriptor for *Gloriosa superba* (Saravanan and Buvaaneswaran, 2003) such as habit, stem branching, tuber shape, leaf arrangement, lamina margin, lamina colour, flower shape, and biotic stress susceptibility were recorded. Total colchicine in the seeds estimated by HPLC technique was used as the biochemical marker (Balakumbahan, 2008).

After harvest, fresh seeds were dried in open sun for 4 days (farmers' practice) and used for extraction of colchicine. Five hundred milligrams of dried and

\*Author for correspondence: Phone +914226611284; Email <chitra.varadharaj@gmail.com>.

powdered seed material was macerated with 25 ml of methanol at room temperature for 24 h and sonicated for 45 min. in an ultrasonic bath. The extract was filtered and adjusted to a final volume of 25 ml with methanol. An aliquot of the extract was filtered through 0.22 µm filter (Nylon Acrodisc 4427) before HPLC analysis (Daniel et al., 2003). Quantitative determination was carried out by RP-HPLC using a C18 column and a C18 precolumn packed with Kromasil. The mobile phase consisted of water and acetonitrile (70:30). A Hewlett-Packard series 1050 liquid chromatograph equipped with a quaternary pump system, a diode array detector operating at 350 nm, and data processing module was used for the analyses. Leaf blight incidence was worked out by adopting standard methods (Banerjee and Kalloo, 1987).

All the accessions were climbers as already reported by Le Roux and Robbertse (1994). All other characters, however, showed great variations among the accessions. For instance, leaf shapes included ovate, lanceolate, and linear. Based on the tuber shape, out of the 18 accessions studied, 10 had L-shape and eight had V-shape. Leaf arrangement was mostly opposite, but alternate arrangement was also seen. The lamina colour in *Gloriosa* was predominantly pale green or dark green. However, a few accessions showed dark green with pale green streaks. Regarding leaf blight susceptibility, most of the accessions showed no visible signs of susceptibility (11 accessions) and others exhibited either low or high susceptibility.

There was significant variations in the colchicine content of all accessions (Table 1). 'Andhra wild' consistently recorded the highest colchicine content in seed (1.32%) and 'Kallimanthayam wild', the lowest. The relatively high colchicine content of the accession 'Andhra wild' encourages its cultivation in Tamil Nadu.

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Table 1. Colchicine concentration of 18 *Gloriosa* accessions maintained at Coimbatore estimated by RP-HPLC during first and second season

Accession	Colchicine concentration (%)	
	2008 season	2009 season
'Nallampalayam cultivated'	0.42	0.39
'Kallimanthayam cultivated'	0.68	0.70
'Sathyamangalam wild'	0.80	0.84
'Aruppukotai wild'	0.75	0.78
'Aruppukotai cultivated'	0.71	0.75
'Kankayam cultivated'	0.49	0.44
'Kallimanthayam wild'	0.02	0.06
'Ottanchadram cultivated'	0.87	0.92
'Moolanur cultivated'	0.77	0.81
'Jeyankondam cultivated'	0.69	0.66
'Udangudi cultivated'	0.60	0.57
'Viralimalai cultivated'	0.56	0.61
'Pudukottai cultivated'	0.51	0.49
'Andhra cultivated-I'	0.87	0.83
'Andhra wild'	1.33	1.30
'Z-Melur cultivated'	0.74	0.71
'Poondurai wild'	0.77	0.73
'Andhra cultivated -II'	0.47	0.43
Mean	0.67	0.67
CD (0.05%)	0.012	0.005

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