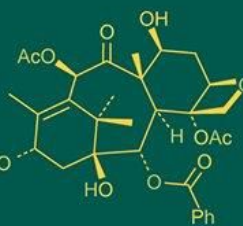
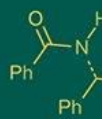
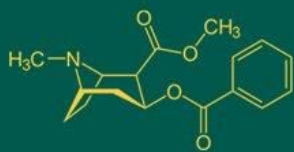


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Namrata Tanaji Sagare

M.Sc. Scholar, Department of
PHM of Medicinal, Aromatic,
Plantation, Spices and Forest
Crops, PGI-PHTM, Killa-
Roha, Dr. Balasaheb Sawant
Konkan Krishi Vidyapeeth,
Dapoli, Ratnagiri,
Maharashtra, India

Dr. Jitendrakumar Kadam

Principal Scientist, ICAR-
National Institute of Abiotic
Stress Management, Malegaon,
Baramati, Pune, Maharashtra,
India

Dr. GD Shirke

Professor and Head,
Department of PHM of
Medicinal, Aromatic,
Plantation, Spices and Forest
Crops, PGI-PHTM, Killa-
Roha, Dr. Balasaheb Sawant
Konkan Krishi Vidyapeeth,
Dapoli, Ratnagiri,
Maharashtra, India

Divyarani Babaso Gholap

M.Sc. Scholar, Department of
PHM of Medicinal, Aromatic,
Plantation, Spices and Forest
Crops, PGI-PHTM, Killa-
Roha, Dr. Balasaheb Sawant
Konkan Krishi Vidyapeeth,
Dapoli, Ratnagiri,
Maharashtra, India

Corresponding Author:**Namrata Tanaji Sagare**

M.Sc. Scholar, Department of
PHM of Medicinal, Aromatic,
Plantation, Spices and Forest
Crops, PGI-PHTM, Killa-
Roha, Dr. Balasaheb Sawant
Konkan Krishi Vidyapeeth,
Dapoli, Ratnagiri,
Maharashtra, India

Qualitative analysis of glory lily (*Gloriosa superba* L.) at different geographical locations from Sahyadri hills of Konkan region

**Namrata Tanaji Sagare, Jitendrakumar Kadam, GD Shirke and
Divyarani Babaso Gholap**

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Abstract

Gloriosa superba L., which is part of the Colchicaceae family, with several therapeutic uses. It is a perennial herb that grows from a fleshy rhizome or seed. The present research was carried out to screen *Gloriosa superba* L. for post harvest qualities and studying qualitative and quantitative phytochemicals present in *Gloriosa superba* L. which includes different geographical locations in Konkan region viz., Ratnagiri, Raigad, Sindhudurg, Palghar and Thane and different plant parts such as leaves, flower and tuber. In the present investigations the tubers of *Gloriosa superba* L. at Ratnagiri location recorded overall maximum content of the various phytochemicals which was at par with Raigad and followed by Sindhudurg location. According to the study, the saponin was present slightly and tannins moderately in tubers only at all geographical locations. Starch was maximum at Palghar and Thane. Steroids was maximum at Sindhudurg, glycoside were present in flower and tuber with maximum in Ratnagiri and flavonoids were in all plant parts but high in flower with respective of all geographical locations except Palghar.

Keywords: *Gloriosa superba* L., phytochemicals, geographical locations, tubers

Introduction

Gloriosa superba L. is an important medicinal plant that is used to treat gout, arthritis and other diseases related to cancer. The tubers were indiscriminately collected in the wild and used for medical purposes prior to 1980. The most of the species was endangered due to the continual over exploitation of wild tubers. Up to 75% of the raw materials needed by pharmacies and pharmaceutical factories were sourced exclusively from the wild since ancient time. It has been reported that *Gloriosa superba* L. is a widely distributed tropical plant that occurs natively in Africa, India and South Eastern Asia. It is found naturally throughout most of tropical Asia, including Burma, Malaysia, Sri Lanka and India, up to a height of 2530 meters. It can be found in thickets, the edges of forests and the boundaries of cultivated regions in warm nations. *Gloriosa superba* L. is planted as an ornamental in greenhouses and conservatories in temperate regions. This important plant is also being propagated by a number of nurseries and botanical research institutes. Gardeners who like beautiful flowers have also included Kalihari as a potted plant in their landscapes. It is an eye-catching addition to any home garden because to its unique climbing behaviours, but handling it needs to be done with utmost caution due to its severe toxicity. Alluding to the wonderful red and yellow blossoms, the generic name *Gloriosa* means "full of glory" and superb means "superb".

Gloriosa superba L. lilies are highly prized for their unique, excessive and brightly colored blossoms. It is one of the medicinal plant that is grown for commercial purposes and yields significant returns. It yields higher returns than cash crops when grown as a medicinal crop. Because of the presence of toxic alkaloids, such as colchicine, all parts of the plant are highly deadly; use can be lethal and touch may cause skin irritation.

Gloriosa superba L. is a perennial herbaceous climbing plant with tuberous roots and a weak stem. It is spread throughout India, from the country's warmest southern regions to the country's milder mid-hill regions in Himachal Pradesh, Uttar Pradesh, Jammu and Kashmir

(Chopra *et al.* 1956) ^[4]. In addition to being the state flower of Tamil Nadu and also the national flower of Zimbabwe (Jana and Shekhawat, 2011) ^[10]. Vine stems have simple, linear, lanceolate leaves without stalks and cirrhose tips that are spirally twisted in the upper section to look like tendrils (Farooqi *et al.* 1993) ^[8]. The huge single flowers have the potential to produce a corymbose inflorescence. They have six reflexed or recurved petals that are crisped, twisted and they bloom yellow before becoming deep scarlet and yellow-red. This species blossoms are utilized as cut flowers because they are decorative. The peculiar structure of the flower, consisting of six lobes on the perianth that are twisted backward, six anthers that radiate and a style that is nearly 90° curved at the ovary attachment point, prevents small insects from pollinating it. The fruits are oblong and contain almost twenty globose red-colored seeds in each valve. The seeds are ovoid and surrounded by fleshy, two red sarcotesta. The five phases of flower development are pre-anthesis, anthesis, opening of the bud and post-pollination stage (Farooqi and Sreeramu, 2004) ^[26]. Three days are necessary for the stigma to remain receptive: the day before anthesis, the day of anthesis and the day after anthesis. The color changes from green to red in the stigma color indicates an absence of stigma receptivity. According to the International Union for Conservation of Nature and Natural Resources (IUCN), the species is given in the Red Data Book, a global database of endangered plant species. Tamil Nadu produces more than 600–700 tonnes of glory lily seeds annually and has the greatest glory lily growing area (up to 6000 acres) in all of India.

India is one of the nations that have extensively planted *Gloriosa superba* L. turning it into a major non timber commodity that exported to industrialized nations for use as a raw material in modern pharmaceutical industry. Seeds and bulbs fetch high prices in exports. Seeds and tubers can be traded in fresh, dried, powdered or oiled forms. Cut flowers or potted plants are obtained from plants. India yields 1.5–3 quintals of seeds and 1.0–1.25 quintals of dry rhizomes per hectare annually.

Materials and Methods

Collection of plant sample

The fresh *Gloriosa superba* L. plant part viz., Leaves, Tuber, Flower were collected from the different geographical locations in konkan region such as Ratnagiri, Raigad, Sindhudurg, Palghar and Thane. The three samples from different geographical locations were collected from each district. The experiment was conducted at Post Graduate Institute of Post Harvest Technology and Management Killa-Roha, under Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli. Dist-Ratnagiri (M.S) during winter and summer season (October to June) 2023-2024. Season of *Gloriosa superba* L. plant material collected from September to November and lab experiment were conducted from December 2023 to June 2024.

Extraction of plant materials

Fresh leaves, flowers and tubers were washed thoroughly under running tap water followed by sterile distilled water and dried under shade. They were ground into coarse powder by using mechanical pulverizer. All the samples, about 100 g of the powder were repeatedly extracted with methanol in a 500 mL round bottom flask with 250 mL solvent. The reflux time for each solvent was 25 cycles for

complete extraction using soxhlet apparatus. The filtrate was collected and concentrated by using rotary evaporator under controlled condition of temperature and pressure. The extracts were concentrated to dryness to yield crude residue. These residues were stored at -20 °C, used for preliminary phytochemical screening of secondary metabolites (Senthilkumar, 2013) ^[23].

Qualitative analysis of different plant parts of *Gloriosa superba* L.

Saponin

In a test tube containing about 5 mL of the extract, few drops of sodium bicarbonate was added. The mixture was shaken vigorously and kept for 3 minutes. A honeycomb like froth was formed and it showed the presence of saponins (Senthilkumar, 2013) ^[23].

Starch

The aqueous ethanol extract (0.5 g in 5 mL of water) was added to boiling fehling's solution (A+B). Brick red precipitate form at the bottom of the test tube indicates the presence of reducing sugars (Senthilkumar, 2013) ^[23].

Steroids

To 2.0 mL of extract, 1.0 mL of concentrated sulphuric acid was added carefully along the sides of the test tube. A red colour produced in the chloroform layer shows the presence of steroids (Senthilkumar, 2013) ^[23].

Tannin

In a test tube containing about 5 mL of the extract, a few drops of 1% solution of lead acetate was added. A yellow or red precipitate indicates the presence of tannins (Senthilkumar, 2013) ^[23].

Glycosides

To 5 mL of extract add 5 mL of 5% FeCl₃ and 5 mL diluted HCl. Heat for 5 min in boiling water bath. Cool and add benzene or any organic solvent and shake well. Separate the organic layer and add equal volume of diluted Ammonia. Ammonical layer shows pinkish red color indicates the presence of glycosides (Senthilkumar, 2013) ^[23].

Flavonoids

In a test tube containing 0.5 mL of extract, 5 to 10 drops of diluted HCl and small piece of ZnCl or magnesium were added and the solution was boiled for few minutes. The appearance of reddish pink or dirty brown color indicates the presence of flavonoids (Senthilkumar, 2013) ^[23].

Results

Qualitative parameters

Methanolic extracts of *Gloriosa superba* L. leaves, flowers and tubers from different geographical locations, including Ratnagiri, Raigad, Sindhudurg, Palghar and Thane, were screened and presented combinely in table 1. While leaves and flowers were lacking in saponin content, tuber extracts had a small amount of saponin. Ratnagiri, Raigad, Palghar and Thane extracts of leaves had a significant amount of starch, whereas Sindhudurg leaves extracts had a small amount. For flowers extracts, it was found in small amounts all over while for tuber extracts, the starch amount was moderate in Ratnagiri, small in Raigad and maximum in Sindhudurg, Palghar and Thane.

Steroids were found in small amounts in leaves and flower extracts from all geographical region. In tuber extracts it was present moderately in Ratnagiri, Raigad and Palghar, most significant amount in Sindhudurg and slight in Thane locations. An absence of tannin in extracts of leaves and flowers from all regions. It was found in moderate amounts in tuber extracts throughout all geographical locations. All leaves extracts from all geographical regions exhibit glycosides. Ratnagiri had the highest amount of it in flower

extracts, whereas Raigad, Sindhudurg, Palghar and Thane had the lowest amounts. Regardless of geographical region, it was particularly common in tuber extract. Flavonoids are found in small amounts in leaves extracts from across the all geographical locations. It was detected in flower extracts in the highest concentration among all geographical regions, with the exception of Palghar, where it was identified in a modest level. It was found in minor quantities in tuber extract across all geographical locations.

Table 1: Effect of different geographical location on different plant parts on the screening of different phytochemicals of the *Gloriosa superba* L.

Geographical locations	Saponin			Starch			Steroids			Tannin			Glycosides			Flavonoids		
	Leaves	Flower	Tuber	Leaves	Flower	Tuber	Leaves	Flower	Tuber	Leaves	Flower	Tuber	Leaves	Flower	Tuber	Leaves	Flower	Tuber
T1: Ratnagiri	-	-	+	++	+	++	+	+	++	-	-	++	-	+++	+++	+	+++	+
T2: Raigad	-	-	+	++	+	+	+	+	++	-	-	++	-	+	+++	+	+++	+
T3: Sindhudurg	-	-	+	+	+	+++	+	+	+++	-	-	++	-	+	+++	+	+++	+
T4: Palghar	-	-	+	++	+	+++	+	+	++	-	-	++	-	+	+++	+	++	+
T5: Thane	-	-	+	++	+	+++	+	+	+	-	-	++	-	+	+++	+	+++	+

Discussion

Qualitative parameters

Saponin

The data showed that the tuber of *Gloriosa superba* L. had a small amount of saponin in various locations, while the leaves and flowers lacked saponin. Saponin composition and content are greatly influenced by environmental factors that affect plant development and the extraction procedure. Tubers need saponins to defend them from diseases and herbivores, but leaves and flowers may also have defenses Rai *et al.* (2021) [19].

Starch

The data observed that the highest starch present in the tuber of *Gloriosa superba* L. compared to leaves and flowers which can be attributed to plant adaptations to survive in poor soil conditions and mechanism to store energy. The different physiological and biosynthetic reactions occurring inside the plant can be safely attributed to the presence or absence of specific phytochemicals in different parts of the plant. The environment always modifies things, so it is important to consider its influence. One of the primary means that green plants store food is through the process of photosynthesis, which in starch (Shrestha *et al.* 2015) [24]. According to Khandelwal *et al.* (2011) [12], tubers like white potatoes are where it is most commonly stored. Additionally, the high partitioning efficiency and improved sink absorption efficiency in the tubers may be responsible for the increase in tubers.

Steroids

The data observed that the moderate amount of steroids content present in tuber of *Gloriosa superba* L. at different locations as compared to leaves and flowers. The huge variation in the phytochemical contents of wild cultivated plant *Hypericum perforatum* and their products is caused by environmental elements that have significant impact on secondary metabolism including light, temperature, CO₂ availability, soil conditions etc. Kirakosyan *et al.* (2003) [13].

Tannin

The data observed that the moderate amount of tannin content present in tuber of *Gloriosa superba* L. in different locations while it was absent in leaves and flowers. Plants physiological responses to various stresses may encourage

the synthesis of secondary metabolites, which would help the defense systems recover. Tannins prevent the nutrients that are stored from degrading in *Hypericum perforatum* Odabas *et al.* (2009) [17].

Glycosides

The data observed that the highest amount of glycoside content present in tuber of *Gloriosa superba* L. at different locations as compared to flowers and it was absent in leaves. As defense mechanisms against several microorganisms, insects and herbivores. Glycosides are nonvolatile, odorless and function as barriers. The environmental factors have been found to be responsible for the variations and identification of secondary metabolites in medicinal plants (Waterman and Mole, 2019) [27].

Flavonoids

The data observed that the highest amount of flavonoid content present in flowers of *Gloriosa superba* L. in different location as compared to leaves and tuber. Due to variations in the amount of secondary metabolites in medicinal plants in response to environmental changes, as well as the pollinator attracting properties of flavonoids in flowers (Fonseca *et al.* 2006) [9].

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