



Review Article

A REVIEW ON PHYTOCHEMICAL AND PHARMACOLOGICAL PROFILE OF *GLORIOSA SUPERBA* LINN

Sachin Chaudhary¹, Abdel-Nasser El-Shorbagi¹, Bhawna Shridhar², Mandeep Kumar Gupta²,
Harish Chandra Verma^{2*}

¹Department of Medicinal Chemistry, College of Pharmacy, University of Sharjah, Sharjah-27272, United Arab Emirates

²Department of Pharmaceutical Sciences, Moradabad Educational Trust Group of Institutions, Faculty of Pharmacy,
Moradabad-244001, Uttar Pradesh, India

*Corresponding Author Email: harishpharma2007@gmail.com

Article Received on: 30/01/19 Approved for publication: 12/03/19

DOI: 10.7897/2230-8407.1004113

ABSTRACT

The current review article target on taxonomical, phytochemical and medicinal benefits of *Gloriosa superba* Linn. It is one of the endangered species among the medicinal plants hence International Union for Conservation of Nature has placed it in 'Red Data Book'. It is used as an analgesic, anti-inflammatory, anti-thrombotic, anticoagulant, anticancer, antimicrobial, antifungal, lipoxxygenase inhibitor. In recent years, this plant is extensively utilized for the production of colchicine to treat gout. The prevalent clinical symptoms of poisoning due to ingestion of this plant are gastroenteritis, nausea, vomiting, diarrhea, dehydration and acute renal dysfunctioning. This review article illustrate the importance of *G. superba* to retrieve the future prospects.

Key words: *Gloriosa superba* Linn, Phytochemical, Medicinal, Colchicine, Poisoning.

INTRODUCTION

Gloriosa superba Linn., (Glory lily) is a medicinal plant belonging to the family Liliaceae. *Gloriosa superba* derives its name *Gloriosa* from the word "Glorious", which means handsome and *superba* from the word "superb" means splendid or majestic kind. This plant has been employed as a source of medicine right from the ancient time. It is a semi-woody herbaceous-branched climber reaching approximately 5 meters height, with brilliant wavy-edged yellow and red flowers¹. One to four stems arise from a single V-shaped fleshy cylindrical tuber. It is among the semi-poisonous drugs in the Indian medicine, which cure many ailments but may prove fatal on misuse². *Gloriosa superba* is a native of tropical Asia and Africa. It is found growing throughout tropical India, from the North-West Himalayas to Assam and the Deccan peninsula^{3,4}. Phytochemicals are extensive type of bioactive components present in plants species. Generally, phytochemicals have been grouped into six main classes including carbohydrates, lipids, phenolics, alkaloids, and terpenoids. The phytochemical compounds are responsible for producing biological effects⁵⁻¹⁵. The phytochemical investigations of *Gloriosa superba* plant exhibited the presence of carbohydrates, alkaloids, glycosides, flavonoids, steroids, terpenoids and phenolic compounds¹⁶.

TAXONOMIC CLASSIFICATION

The taxonomy of *Gloriosa superba* is in the kingdom (*Plantae*), order (*Liliales*), family (*Liliaceae*), genus (*Gloriosa*), division (*Magnoliophyta*), class (*Liliopsida*), species (*Superba*). The genus *Gloriosa* is comprised of about 10 to 15 known species such as *Gloriosa superba* Linn, *G. luteo*, *G. plantii*, *G. latifolia*, *G. magnifica*, *G. rothschildiana*, *G. abyssinica*, *G. longifolia*, and *G. simplex*. The essential species originated in India are *G. superba* and *G. rothschildiana*¹⁷.

TAXONOMIC DESCRIPTION

Morphologically as enlisted in (Figure 1), *Gloriosa superba* is erect perennial, tuberous, scandent or climbing herbs with tendrils formed at the tip of the leaves. Stem is soft, leaves are sessile, spirally arranged or sub-opposite (6-7 x 1.5-1.8 cm) in dimension, lanceolate, acuminate, entire, glabrous; the upper ones with cirrhose tips. Flowers are axillary, solitary, large, borne on long, spreading pedicels, actinomorphic, hermaphrodite; lanceolate, keeled within at base, long persistent, yellow in lower half, red in upper half; stamens are spreading, hypogenous; anthers are extrose, medifixed, versatile, opening by longitudinal slits; ovary is superior, 3-celled; ovules are numerous; style is deflected at base, projecting from the flower more or less horizontally. The fruit is oblong containing about 20 globose red colored seeds in each valve^{2,18}.



Figure 1: Morphological characters in *Gloriosa superba*. (A-Whole plant; B-Flower; C-Fruiting stage; D-Dried fruits; E-Dried seeds; F-Tuber.

PHYTOCHEMICAL CONSTITUENTS

Every part of the plant contains varieties of phytochemical compounds. Tubers are immensely toxic due to the presence of a highly active alkaloid, colchicine and gloriosine. Other compounds such as cornigerine, lumicolchicine, 3-demethyl-N-formyl-N-deacetyl-lumicolchicine, 3-demethyl-g-lumicolchicine, 3-demethyl colchicines, colchicocide, tannins and superbine have been isolated from plant. The seeds contain novel colchicine glycoside, 3-o-dimethylcolchicine-3-o- α -D-glucopyranoside. The tubers contain β -sitosterol, lumicolchicines, 2-hydroxy-6-methoxy benzoic acid. Moreover, it has been reported that researchers have isolated luterlin from the roots, N-formyl-deacetyl colchicines from the flowers of *Gloriosa superba*¹⁹⁻²¹.

TRADITIONAL USES

In Ayurveda, *Gloriosa superba* is acknowledged as an ethnomedicinal plant. In Indian traditional folk medicines, it is used for the treatment of indigestion, fever, arthritis, cardiomyopathy, skin infections. However, when administered in high dose is very toxic. The tubers are reported to exhibit anthelmintic, laxative, alexiteric and abortifacient potential in Ayurveda and Unani medicines. Traditionally, in rural region of Asian continents the plant is employed for the treatment of ulcer, piles, leprosy, abdominal ache, inflammations, infertility, intestinal worm infections, baldness and snakebites. The medicinal benefits of *G. superba* according to the different communities and sources of literatures are tabulated in table 2 and 3^{22,23}.

Table 2: Medicinal importance of *G. superba* according to the different communities

Communities	Plant Parts	Uses
Santal	(i) Tuberous Root (ii) Plant (iii) Leaf	Abortifacient, intermittent fever, wound infections. Syphilis, tumors, Spleen complaints, Asthma.
Munda and Oraon	Tuber	Antifertility purpose.
Ethnic Communities of North-East India	Root	Gout, stomachache, as a tonic.
Ethnic Communities of Bihar	Root	Cholera, to facilitate childbirth.
Ethnic Communities of Dehradun and Siwalik	Root	Anthelmintic.
Ethnic Communities of Garhwal	Tuberous root	Abortion.
Tribes of Varanasi	Root	Gout, rheumatism.
Tribes of Pithoragarh	Tuber	Gonorrhoea, leprosy, piles.

Table 3: Medicinal importance of *G. superba* according to the sources of literatures

Sources of Literature	Plant Parts	Uses
Charak Samhita	Plant	Useful in itching, skin diseases and ailments caused by kapha and vata.
Sushruta Samhita	Root	To relieve from postnatal complaints.
Rajanighantu	Plant parts	Pungent, thermogenic, eliminates deranged kapha (phlegm) and vata (wind), terminates pregnancy.
Dhanvantari Nighantu	Plant parts	Leprosy, labor pain, wound infections, purgative.
Maudanani Nighant	Plant parts	Bitter, pungent, thermogenic, abortifacient, skin infections.
Bhavaprakasha	Plant parts	Aperient, alkaline, astringent, pungent, bitter, highly potent light abortifacient, excites pitta (bile), cures dropsy, piles, wounds, acute spasmodic pain, removes worms.
Chakradatta	Root-paste	If smeared over the palms and feet of pregnant women, delivery of child becomes easier.
Ayurveda	(i) Roots (ii) Leaf juice	Abortifacient, acrid, anthelmintic, antipyretic, bitter, depurative, digestive, emetic, expectorant, purgative, stomachic, tonic, thermogenic, promoting labor pain, expulsion of placenta. Effective against paralysis, rheumatism, snakebite, insect bites, asthma.
Siddha	Root & Tuber	Various skin diseases.

PHARMACOLOGICAL ACTIVITIES

Antimicrobial activity

Haroon *et al.*, reported antibacterial and antifungal activity of methanolic extract and its subsequent fractions in different solvent systems. The study claimed that n-butanol fraction showed excellent antifungal potential against *Candida albicans* and *Candida glabrata* (up to 90%) and against *Trichophyton longifusus* (78%) followed by chloroform fraction against *Microsporum canis* (80%). The chloroform fraction demonstrated highest antibacterial activity against *Staphylococcus aureus* (69.4%)²⁴.

Enzyme inhibition activity

Haroon *et al.*, reported the enzyme inhibition activity of alcoholic extract of *G. superba* Linn rhizomes. The alcoholic extract and its subsequent fractions in chloroform, ethyl acetate, n-butanol, and water were investigated against lipoxigenase, acetylcholinesterase, butyrylcholinesterase and urease. The chloroform extract represented maximum inhibition potency (90%) on lipoxigenase and 29.10% inhibition potency on butyrylcholinesterase. The ethyl acetate fraction showed highest inhibition potency (83.50%) on acetylcholinesterase. However, urease was not inhibited by any of the tested fractions²⁵.

Treatment of snakebite

Ramar Perumal Samy *et al.*, claimed the use of *G. superba* tubers paste in the treatment of snakebite. The study reported that purified fraction (2.4 mg/kg, body weight) significantly inhibited the toxic effects of snake venom induced changes in serum SOD and LPx levels in mice²⁶.

Analgesic and anti-inflammatory activity

Jomy C. John *et al.*, reported the analgesic and anti-inflammatory activity of hydroalcoholic extract obtained from dried aerial parts of *G. superba* employing Eddy's hot plate method and acetic acid

induced writhing method for determination of analgesic potential; cotton wool granuloma and carrageenan induced paw edema model for anti-inflammatory activity. The study claimed that the treatment of mice at 100, 200, and 400 mg/kg body weight exhibited significant ($P < 0.01$) increase in reaction time. The maximum percentage protection was observed at 90 min for all the three doses. The % inhibition of writhes were 64.09%, 78.56% and 81.45% at dose of 100, 200, and 400 mg/kg body weight. The dose of 200 and 400 mg/kg exhibited significant results in carrageenan induced paw edema model ($P < 0.05$) as compared to control. The rats exhibited 9.59%, 28.72% and 45.8% inhibition of granuloma mass formation after 7 days of treatment with dose of 100, 200, and 400 mg/kg body weight²⁷.

Neuroprotective activity

V. Uma Rani *et al.*, reported neuroprotective activity of hydroalcoholic extract obtained from tubers of *G. superba*. The study revealed that the extract of *Gloriosa superba* Linn decreased the transfer latencies, strengthened its memory improvement action in drug treated rats. Hence showed decrease in muscle strength measured by rota-rod test whereas, in hydroalcoholic extract of *Gloriosa superba* treated group there was improvement in muscle strength. The locomotor activity assessed by actophotometer and open field test was decreased in lead nitrate group compared with hydroalcoholic extract of *Gloriosa superba* Linn treated group. Biochemical analysis of brain revealed that the chronic administration of lead nitrate significantly increased lipid peroxidation and decreased levels of catalase (CAT), reduced glutathione (GSH) and glutathione reductase (GR), an index of oxidative stress process. Administration of hydroalcoholic extract of *Gloriosa superba* Linn attenuated the lipid peroxidation and reversed the decreased brain CAT and GSH levels. Lead exposed rats showed increased levels of various serum parameters like glucose, ALT, ALP, TG and TC²⁸.

Anti-arthritis activity

K.P. Latha *et al.*, reported the anti-arthritis activity of chloroform extract obtained from tubers of *G. superba* using Freund's complete adjuvant induced arthritis model in rats. The study demonstrated that chloroform extract of tubers of *G. superba* has shown a dose dependent and significantly decreased paw edema and ankle diameter in treated groups as compared with arthritic group²⁹.

Anticoagulant activity

Nalise Low Ah Kee *et al.*, reported anticoagulant/anti-thrombotic potential of methanolic extract obtained from leaves of *G. superba*. The study proclaimed that leaf extract of *G. superba* inhibited thrombin-induced with IC50 values of 2.97 mg/ml³⁰.

Anticancer activity

Samson Eugin Simon *et al.*, reported the anticancer activity of phytochemical extract obtained from tubes of *G. superba* against Hep-G2 cancer cell line (Human liver cancer cells) employing MTT assay. The study revealed that concentration of 100µg of plant extract has maximum inhibition value of 54.3% against Hep-G2 cancer cell line³¹.

NOXIOUS EFFECTS/POISONING

The alkaloid, colchicine present in *G. superba* is subjected to cause toxic effects. The most prevalent noxious effects include gastroenteritis, nausea, vomiting, diarrhea, dehydration, acute renal dysfunction, muscle weakness, cardiotoxicity, hypotension, bone marrow hypoplasia with peripheral thrombocytopenia and granulocytopenia^{32,33}.

CONCLUSION

This article has introduced therapeutic uses and medicinal importance of *Gloriosa superba* Linn. Further efforts are required for better understanding of the biological activities reported, and to evaluate the safety and efficacy of some of the widely reported curative applications. The article makes us bound for further study on *Gloriosa superba* in future.

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Cite this article as:

Sachin Chaudhary et al. A review on phytochemical and pharmacological profile of *Gloriosa superba* Linn. Int. Res. J. Pharm. 2019;10(4):1-5 <http://dx.doi.org/10.7897/2230-8407.1004113>

Source of support: Nil, Conflict of interest: None Declared

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