



An Analytical Study of *Gloriosa Superba* Linn

Seema Sharma
Research Scholar
Radha Govind University
Ramgarh, Jharkhand

Abstract

Gloriosa superba is a striking climber with unusual and beautiful, red and yellow, flame-like flowers in summer; it is suitable for shade or sun, and is easy to grow. *Gloriosa superba* is the only species in this genus in the autumn-crocus family (Colchicaceae). With various common names including gloriosa lily, glory lily, fire lily, flame lily, climbing lily, creeping lily, and cat's claw or tiger's claw, this highly variable, deciduous, summer-growing tuberous plant from tropical and southern Africa and temperate and tropical Asia (from China to India) is grown as a perennial in mild climates (zones 8-12) and as a summer "bulb" in colder areas for its dramatic flowers. In lower doses it has been used as a traditional medicine.

Introduction

Gloriosa is considered to be a single highly variable species. In Zimbabwe morphologically uniform populations occur which have variable polyploidy levels, but the cytological differentiation does not reflect any precise geographical trend. It is well adapted to different soil textures and climatic variation. It is highly tolerant of nutrient poor soils. It occurs in thickest forest edges and boundaries are of cultivated areas in warm countries up to height of 2530 mt¹.

This plant is exported by India and Sri Lanka to pharmaceutical industries, and more recently also by a few African companies based in Nigeria, Cameroon and Zimbabwe. *G. superba* is also known as the national flower of Zimbabwe. It is an inhabitant of tropical Africa & now found growing naturally in many countries of tropical Asia including Bangladesh, India, Sri Lanka, Malaysia & Myanmar. In India, it occurs commonly in tropical forests of Bengal & Karnataka², Telangana & A.P. There are several associated species of *Gloriosa*

¹ Neuriger, 1994

² Siva Kumar & Krishna Murthy, 2002

including *G. superba*, *G. simplex*, *G. grandiflora*, *G. lutea*, *G. planti*, *G. longifolia*, *G. rotheschidiana*, *G. virenses* and *G. sudanica* etc.

Gloriosa superba is an imperative medicinal plant. This has diverse medicinal applications eventually due to over exploitation. The medicinal values of these plants lie in some chemical substances that produce a definite physiological action on human body. The alkaloid – rich plant has long been used as a traditional medicine in many cultures. Alkaloids are naturally occurring chemical compounds containing basic nitrogen atoms. Many alkaloids are toxic and often have a pharmacological effect, which makes them to be used as medications and recreational drugs. *Gloriosa* is a well – known ethno medicinal use in Ayurveda for its colchicine content which is used to treat arthritis. The plant chemicals are classified as primary or secondary metabolites. Plants generally produce many secondary metabolites which are biosynthetically derived from primary metabolites and constitute an important source of microbicides, pesticides and many pharmaceutical drugs. From a long period of time medicinal plants or their secondary metabolites have been directly or indirectly playing disease curing³. Secondary metabolites are frequently accumulated by plants in smaller quantities than the primary metabolites⁴.

Review of related literature

Ghodke, Jyoti & Pandhure, Narayan. (2022) conducted a study on qualitative and quantitative analysis of *Gloriosa Superba* L. The qualitative phytochemical studies were carried out in the solvents viz. Methanol, Chloroform and n-Butanol. The Methanol, Chloroform and n-Butanol tuber and leaves extract of *Gloriosa superba* L. shows the presence of alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols but in tuber of *Gloriosa superba* L. high intensity of phytochemical than that of leaves. also, the quantitative studies were carried out in the same solvent mentioned above, Alkaloid content in tuber of *Gloriosa superba* L. that was 2.921, 2.546 and 3.045 µg/ml respectively, and total flavonoids in tuber, 0.845, 0.641 and 0.978 µg/ml respectively and also followed by total content of phenols that was 1.284, 0.652 and 1.361µg/ml. **Jyoti Ghodke, Narayan Pandhure (2020)** had conducted a study on Qualitative and quantitative analysis of *Gloriosa Superba* L. The objective of the study was to qualitatively and quantitatively analysis *Gloriosa Superba* L. Conclusion of the study showed that *Gloriosa superba* L. is the rich source of phytochemicals, alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols. Its extraction in n-butanol solvent shows highest intensity and content of phytochemicals followed by methanolic extract of tuber of *Gloriosa superba* L and it shows antimicrobial activities. **Kumar, Kaliyaperumal. (2015)** Reviewed *Gloriosa superba* (L.) and its phytochemical properties and pharmacology. This study concluded that medicinal plants are natural sources of bioactive compounds to treat life threatening diseases.

³ Wink et al. 2005

⁴ Karuppusany, 2009; Sathish kumar & Paulsamy, 2009

G. superba is an important medicinal plant, used as an antidote for snake poison, is in demand commercially. The tuber is poisonous, when consumed in high quantities. This plant also considered as colchicine sources for the chemical constituents of medicine industry. Additionally, it would be useful of producing high amount of colchicines for pest control based on natural products. Several studies were reported that *G. superba* to be rich in various biologically active compounds which could serve as potential source of the crude drugs that can be used as a complementary source of traditional medicines. **Padmapriya, S.S., Rajamani, K., & Sathiyamurthy, V.A. (2015).** Reviewed *Gloriosa superba* L. The present review focuses on the botany, medicinal uses, cytogenetics, floral biology, breeding methods, cultivation, post harvest technology and phytochemistry of glory lily. *Gloriosa superba* is an herbaceous or semi-woody climber with v- shaped tubers. The plant is highly valued for its medicinal properties, more importantly for the treatment of cancer related diseases, arthritis, gout, rheumatism and impotency, containing the alkaloids, colchicines and colchicosides.

Taxonomy and Botany of the Plant

- i. Kingdom : Plantae
- ii. Division :Angiospermae
- iii. Clade : Monocots
- iv. Order : Liliales
- v. Family : Colchicaceae
- vi. Genus : *Gloriosa*
- vii. Species : *superb*

Botanical Description

Glory lily is a perennial herb, the stems grow up to four meters. It has an underground fleshy rhizome and the stem climbs using tendrils. Leaves are 13-20 centimeters in length, lance-shaped, sessile, and have tendrils on tips. Flowers are axial, solitary, and actinomorphic and have six bright red to orange tepals of approximately six centimeters in length each. The ovary is superior with numerous ovules and there are six extrorse anthers up to four centimeters long. It has a six-twelve centimeters long capsule fruit having red seeds. Glory lily is cross-pollinated by butterflies but it is not self-incompatible⁵.

⁵The status of *Gloriosa superba*, An exported medicinal plant of India, <http://envis.frlht.org/kvkrishnamurthy.php> (accessed March 20, 2020).

Soil

Glory lily grows best in a red loamy soil. Proper drainage is required but waterlogged soil should be avoided. Soil with a pH around 6.0-7.0 is suitable for this plant⁶.

Climate

Moderate daytime temperatures and cool night temperatures are suitable for this plant. Glory lily is propagated through tubers, planting is distributed from June-July, and fruits are harvested between 160-180 days after the sprouting of tubers⁷.

Fertilizers

Before planting about 10 tons of “Farm yard Manure” (FYM) is added per hectare (ha). Nitrogen, phosphorus, and potassium (NPK) are applied at a ratio of 120:50:75 respectively. Nitrogen is applied in split doses, all phosphorus, all potassium, and half of the nitrogen is applied with FYM, and the remaining half of the nitrogen is applied one and two months after planting. The crop requires irrigation immediately after planting and subsequently at 5 days intervals of time⁸.

Phytochemical Properties and Pharmacology of *Gloriosa superba* (L.)

Phytochemical Properties

G. superba tubers contain colchicines, benzoic and salicylic acid, sterols and resinous substances like as colchicines, 3-demethyl colchicine, 1,2-didemethyl colchicine, 2,3-didemethyl colchicine, N-formyl, N deacetyl colchicines, colchicocide, gloriosine, tannins and superbine⁹. Colchicine is the major compound isolated from the seed and rhizome of this plant¹⁰ and other important compound is gloriosine¹¹. In addition, *G. superba* tubers hold 0.25% colchicine apart from containing sitosterol, glucoside, β -and gamma lumicolchicines, β -sitosterol, flucoside and 2-H-6-MeO benzoic acid and flowers contain luteolin and N-formyldeMe-Colchicine²⁰²¹ reported that new colchicine glycoside, 3-O-demethyl colchicine 3-O- α -D-glucopyranoside found in *G. superba* seeds.

⁶-above

⁷Horticulture: Medicinal crops: *Gloriosa*, http://agritech.tnau.ac.in/horticulture/horti_medical%20crops_gloriosa.html. (accessed March 23, 2020).

⁸-above

⁹ Sarin, Y.K., Jamwal, P.S., Gupta, B.K. and Atal, C.K. Colchicine, 43:87-90

¹⁰ Veeraiah, S., and Jaganmohan Reddy, 3(2): 320-326

¹¹ Gooneratne, B.W., 231 (5494): 1023 – 4.

Polyphenols

Phytochemical analysis of *G. superba* tubers and seed contain total phenolic concentration is 0.975 mg/g and 0.561 mg/g respectively. Total carotenoids concentration was presented in 22.74 mg/100g for tubers and 25.62 mg/ 100g for seeds. In addition, total ascorbic acid concentration 21.06 mg / 100g and 23.34 mg/ 100g for tubers and seeds respectively, reported by¹². Saradha devi, M. and Annapoorani, S. Observed that *G. superba* seed have the presence of carbohydrates, alkaloids, glycosides, flavanoids, steroids, phenolics and terpenoids. Additionally, *G. superba* leaves exhibited the presence of carbohydrates, alkaloids, flavanoids, steroids and terpenoids¹³. *G. superba* tuber exhibited the presence of carbohydrates, alkaloids and flavonoids, vitamin C, vitamin E, phenols, glycosides, saponins and minerals¹⁴, observed that *G. superba* leaves and tubers exhibited various classes of compounds such as alkaloids, flavonoids, glycosides, saponins, steroids, phenols and tannins. Additionally, those suggested that *G. superba* plant are rich in several biologically active compounds which could serve as potential source of the crude drugs that can be used as a complementary source of traditional medicines.

Pharmacological Activities

The different parts of *G. Superba* exhibited diverse pharmacological activities and it was summarized in Table 1.

1. Antimicrobial activity The phytochemicals from tubers of *G. superba* have with antimicrobial activity of showed a higher activity against the gram negative bacteria, *Escherichia coli*,¹⁵. Khan, H., Khan, M.A. and Mahmood, T. reported anti-microbial potential of *G. superba* extracts in which excellent antifungal activity was confirmed against *Candida albicans*, *C. glabrata*, *Trichophyton longifusus*, *Microsporum canis* and *Staphylococcus aureus*¹⁶. Antimicrobial activity of acetone, ethanol, methanol and hexane extracts of root and stem from *G. superba* was evaluated and reported that it showed that all the extracts posses antimicrobial activity against *E. coli*, *S. aureus*, *A. niger* and *A. flavus*. However, the acetone extract of the plant showed the highest antifungal activity against *E.coli*¹⁷. A significant antimicrobial activity was observed against gram negative bacteria than gram positive bacteria and *C. albicans* a fungal strain was reported in alcoholic extract of *G. superba* tubers¹⁸.

¹² Megala S. and Elango R., 3(2):1-6.

¹³ Saradha devi, M. and Annapoorani, S., 3(3):111-117

¹⁴ Senthilkumar, M. 3 (1): 1-5

¹⁵ Hemaiswarya S, Raja R, Anbazhagan C, Thiagarajan V. 41(1): 293-299

¹⁶ Khan, H., Khan, M.A. and Mahmood, T. , 6: 855- 859

¹⁷ Kamna, B., and Anirudha, R. 3(4): 353 – 359.

¹⁸ Suryavanshi, S., Rai, G. and Malviya, S. N. 2(1):45-52.

Pharmacological Uses of *Gloriosa Superba*

Gloriosa superba has many bioactive phytochemicals which makes this plant species a wonderful medicine. Literature data revealed that this species used to cure disorders like arthritis, aches, diabetes, cholera, impotence, typhus, etc.

Anti arthritic: Due to action of colchicine on several biochemical reactions on inflammatory mediators, *G. superba* shows anti arthritic activity. Studies suggested that the effect of plant whole extract is more effective on the inflammation causing cells than pure colchicine and which may due to synergistic action of colchicine and other bioactive chemicals present in plant extract.

Analgesic: Analgesic effect of *G. superba* has been shown by hydroalcoholic extract of the plant on acetic acid-induced writhing in mice, the number of writhing reduces with an increase in dose. Studies support the hypothesis of participation in the inhibition of prostaglandin formation.

Uterotonic activity: The root extract of Glory lily treatments shows uterotonic activity both in vivo and in vitro assay of female rats but the height of contractions produced by the extract was a little lesser than that produced by oxytocin hormone. Hence, this plant can be used as a drug to induce labor during child delivery.

Larvicidal effect: Glory lily shows a larvicidal effect on the mosquito *Aedes aegypti*, which is a causative agent of Chikungunya disease and hence this plant can be used as a biocide in the control of the mosquito.

Antimicrobial activity: The crude extract of Glory lily shows excellent antifungal activity against *Trychophyton longifusus* which causes dermatophytosis on hair, skin, and nails; this plant also shows antifungal activity against two species of *Candida* i.e. *C. albicans* and *C. glabrata* which causes candidiasis. This plant shows good antibacterial activity *Staphylococcus aureus*.

Anti-inflammatory activity: The methanol extracts of root tubers of Glory lily has shows good anti-inflammatory activity in percent inhibition of cyclooxygenase assay and lipoxygenase assay.

Conclusion

As our lifestyle is now getting techno-savvy, we are moving away from nature while we cannot escape from nature because we are part of nature. As herbs are natural products they are free from side effects, they are comparatively safe, eco-friendly and locally available. Traditionally there are lots of herbs used for the ailments related to different seasons. There is a need to promote them to save the human lives.

These herbal products are today are the symbol of safety in contrast to the synthetic drugs, that are regarded as unsafe to human being and environment. Although herbs had been prized for their medicinal, flavouring and aromatic qualities for centuries, the synthetic products of the modern age surpassed their importance, for a

while. However, the blind dependence on synthetics is over and people are returning to the naturals with hope of safety and security. It's time to promote them globally.

Gloriosa superba L. is the rich source of phytochemicals, alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols. Its extraction in n-butanol solvent shows highest intensity and content of phytochemicals followed by methanolic extract of tuber of *Gloriosa superba* L and it shows antimicrobial activities.

So, *Gloriosa superba* L. of plant presence different phytochemical compounds useful for Further purification, identification and characterization of the active compounds of would be our priority in future studies.

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