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Germplasm conservation of *Gloriosa superba* L.: A Review

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I. Introduction

Medicinal plants form the backbone of Traditional Systems of medicine in India. Pharmacological studies have acknowledged the value of medicinal plants as potential source of bioactive compounds. Phytochemicals study of medicinal plants serve for drug discovery and design. Medicinal plants are rich source of novel drugs that forms the ingredients in traditional Systems of medicine, modern medicines, nutraceuticals, food supplements, folk medicines, pharmaceutical intermediates, bioactive principles and lead compounds in synthetic drugs (Jagtap *et. al*., 2014).

Glory lily is among some of the modern medicine's most important plants actually facing local extinction (Dhushara, 2004). Takhtajan placed *Gloriosa* in family Colchicaceae of order Liliales. Engler&Prantl placed *Gloriosa* in family Liliaceae of order Liliflorae. Benthem & Hooker placed *Gloriosa* in series Coronarieae order Liliaceae tribus Colchiceae.

It is a strikingly beautiful perennial creeper with hollow stem of about six meter, which emerges per year from the tuberous underground stem in rainy season. It is widely distributed monocot in India. There are several associated species of *Gloriosa* including *G. superba*, *G. simplex, G. grandiflora, G. lutea*, *G. planti*, *G. longifolia, G. rotheschildiana, G. sudanica*, etc. The leaves are etiolated, alternate, sessile, lanceolate, and spear shaped with curved end, which helps them to climb and creep. It has brilliant wavy edged yellow and red flowers that appears from November to March every year . Flowers are large, solitary at ends of branches, greenish at first, then yellow, passing through orange, and scarlet to crimson. The peculiar structures of the large flowers with six perianth lobes bent backwards, six radiating anthers and the style bent almost 90° at the point of attachment to the ovary does not make them suitable for pollination by small insects . Fruits are oblong, ellipsoid capsule. Seeds are numerous and rounded.

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 a source of medicine right from the ancient time. *Gloriosa superba* plant is used to cure arthritis, gout, rheumatism, inflammation, ulcers, bleeding piles, skin diseases, leprosy, impotency, snakebites, etc. Various compounds have been isolated from the plant parts viz colchicine, colchicoside (its semi-synthetic derivative - thiocolchicoside), superbine, gloriosine, lumicolchicine, 3-demethyl-N-deformyl-N-deacetylcolchicine, 3-demethylcolchicine, N-formyldeacetylcolchicine,.

Gloriosa superba is believed as most important herb that is exported, and collection of seeds and roots for the foreign market is causing a shortage of raw material for local drug industries in India. Plants like *G. superba* are becoming damaged through excessive collection, a whole series of traditional medicines and plants which have been in use for thousands of years will be threatened by indiscriminate usage.

Glory lily (*Gloriosa superba* L.) is a medicinally potent plant species used for the production of alkaloid colchicine. With ever increasing demand, there is a pressing need to conserve it This glorious herb found in abundance once upon a time in North east terai region of Uttar Pradesh now-a-days, this herb is becoming rare in this region. It evokes us to write an project and make it an important issue so that, conservationists, botanists, entrepreneurs and NGOs come forward to rescue and save this plant in the region

Conservation of various verities of *Gloriosa* is important so that plants which are having more desired constituent can be identified and mass propagated for the purpose of drug development.

II. Review Of Literature

Aleem in 1992 worked on *Gloriosa superba* poisoning. Suri *et. al*., (2001) worked on a new glycoside, 3 Odemethylcolchicine-3-O-alpha-d-glucopyranoside from *Gloriosa* seeds. Sivakumar & Krishnamurthiny (2002) worked on anticancer properties of *Gloriosa superba* L., Hassan & Roy (2005) worked on the Micropropagation of *Gloriosa superba* L. through high frequency shoot proliferation. Khan *et. al*., (2007) done work on the Enzyme inhibition activities of the extracts from rhizomes of *Gloriosa superba* Linn (Colchicaceae). Khan *et. al*., 2008 worked on Antimicrobial activities of *Gloriosa superba* Linn. (Colchicaceae) extracts. Ade &Rai in 2009 written the Review: current advances in *Gloriosa superba*. L. Pawar (2010) studied on Anthelmintic activity of *Gloriosa superba* Linn. Saradha *et al*.,(2012) worked on the Phytochemical Constituents of *Gloriosa superba* Seed, Tuber and Leaves. Khandel, *et. al*., (2012) spotted *Gloriosa superba* L. (Glory lily) for the first time in vegetation of Pachmarhi Biosphere Reserve (Hoshangabad district), Central

India. Research work on Phytochemical Screening, Antioxidant, Antimicrobial and Flavonoid Analysis of *Gloriosa superba* Linn. Rhizome Extracts by Sanjay Jagtap and Rajendra Satpute (2014). Colchicine Content in Induced Mutants of Glory Lily (*Gloriosa superb*a L.) was estimated by Anandhi *et al*.,(2014). A Review on *Gloriosa superba* L. as a medicinal plant was written by Kavithamani *et. al.,* (2013), Padmapriya *et. al*.,(2015) *Gloriosa superba* L. An endangered medicinal plant By Ritu Mahajan (2015). Mishra *et. al*.,(2017) worked on Evaluation of Anti Arthritic Potential of *Gloriosa superba* (L.) Elite Germplasm Collected from Eastern Himalayas, India. Research work on Ethnopharmacological profile of Gloriosa superba : An endangered medicinal plant was written by Kohali *et. al*., in 2017.

Hubert William Bentley Clewer, Stanley Joseph Green and Frank Tutin (1915) done research work on the constituents of *Gloriosa superb.* Gooneratne, (1966) worked on massive generalized alopecia after poisoning by *G. superba*. Agunawella & Fernando (1971) worked on acute ascending polyneuropathy and dermatitis following poisoning by tubers of *Gloriosa superba*. *Gloriosa superba* L. (family Colchicaceae): Remedy or poison, by Maroyi and van der Maesen (2011). KandeVidanalage C.J. (2016), worked on a rare case of attempted homicide with Gloriosa superba seeds.

III. Disscussions

The north eastern terai region of Uttar Pradesh is tropical part of the world, which harbor about 40-45 % of the total number of species, due to their climatic and edaphic conditions, which are best suited for the growth of plants.India is the third richest country in the world with respect to biodiversity and tropical India particularly rich in this respect.

Gloriosa superba Linn, commonly called Glory Lily, is an important medicinal plant and has been used to cure various aliments in the traditional Ayurvedic system of medicine since ancient times. Due to expanding human population, increasing agriculture, rapid urbanization, unchecked extraction of plants or plants parts for various uses from their natural habitat have led to many species, specially medicinal plants either becoming extinct or rare (Nayar and Sastry, 1987).

In situ conservation focuses on preserving the genetic variation in the location it has been encountered originally i.e. in its natural habitats either in the wild or in traditional farming system. On the other hand *ex situ* involves conservation outside the native habitat and is generally used to safeguard populations in danger of

destruction, replacement or deterioration. Approaches to *ex situ* conservation include methods like seed storage, field genebanks and botanical gardens.

On the other hand *ex situ* involves conservation outside the native habitat and is generally used to safeguard populations in danger of destruction, replacement or deterioration. Approaches to *ex situ* conservation include methods like seed storage, field genebanks and botanical gardens. *In-situ* conservation involves maintenance of genetic variation at its native location although the conservation strategies are still very much in their modulation stage, many still remains unrevealed. *ex-situ* conservation regarded as the process of cultivating and naturalizing endangered species outside of their original habitats, has become a practical alternative especially for those overexploited and endangered medicinal plants with slow growth, small abundance and replant diseases, e.g. *Paris* species in family Trilliaceae and *Panax* species in family Araliaceae. *Ex-situ* cultivation becomes an immediate action to sustain medicinal plant resources.

Biotechnological approaches are imperative for rapid multiplication and conservation of the critical genotype of medicinal plants. These include *In vitro* propagation Genetic transformation. Micropropagation has been proved as an important technique for the multiplication of plants in a large scale. Usually, it is carried out either through callus production from explants followed by shoots and roots, or from auxillary explant followed by rooting. *In vitro* regeneration leads to the development of whole plantelet from a single explant under controlled conditions, Tissue culture provides propagules such as minitubers or minicorms for plant multiplication throughout the year irrespective of the season. Using this method stock of germplasm can be maintained for many years. Employing *in vitro* methods more pathogen free plants can be raised and maintained economically. *Gloriosa superba* L, *Rauwolfia serpentina* L. Benth. Ex. Kurz. and *Buchanania lanzan* Spreng are few among the many plants for which *in vitro* propagation has been employed thoroughly. Hairy roots, transformed with *Agrobacterium rhizogenes*, have been found to be suitable for the production of secondary metabolites because of their stable and high productivity in hormone-free culture conditions. Genetic transformation facilitates the growth of medicinal plants with multiple durable resistances to pests and diseases. Likewise, transgenes or marker-assisted selection may assist in the development of insect, pest, and drought, salinity resistant plants, which will be needed to fulfill the world's need and save land for the conservation of plant biodiversity in natural habitats. There are more than 120 species belonging to 35 families in which transformation has been carried out successfully by using *Agrobacterium* and other transformations techniques.

Gloriosa superb is valued as a source of colchicine used in treating gout. Colchicine is present in tubers as well as seeds of this species. Till recently, the plant was harvested for its tubers leading to destructive harvesting of the plant. The discovery of colchicine in its seed has shifted the emphasis from tuber to seed as

source of colchicine. But the species is beset with the problem of low seed set in nature, which makes seed harvest uneconomical. Earlier, factors responsible for low seed set under natural conditions were studies by subjecting its flowers to different pollination methods like open pollination, bagging, controlled self and cross pollination and honeybee pollination. Effect of these pollination methods was analyzed on the basis of seed set, number of seeds per fruit and colchicine content in the seed. Under natural conditions about 4 g of dry seed is obtained per plant. dry seed yield up to 9.2 g was obtained by resorting to controlled hand pollination between different flowers on the same plant. According to Raina and Gupta (1999), seed setting in this species depends on pollen availability/viability, stigma receptivity and pollinator behaviour. The species is also characterized by sequential opening of flowers whereby no two flowers on the same branch are at the same stage of pollen dehiscence and stigma receptivity. The staggered flowering ensures that the different flowers do not compete with each other for pollen and pollinator and every flower has equal chances of receiving adequate amount of pollen (Gupta and Raina 2001). The higher seed yield recorded in controlled selfing (idiogamy) is due to assured pollination that is not the case with naturally pollinated flowers.

The purpose of this review is to identify the medicinal Properties of *Gloriosa superba* from the flora of North Eastern terai region of U.P. The utility of the work is to develop a viable medicinal crop for human beings and several important bio functional compound which are present in this plant should be developed at industrial/ commercial level so they could be utilized as medicine and biofunctional compounds, which can also serves as industrial raw material for medicines and also provide a new approach in the management of collection, identification and chemical evaluation of the plant for improving the economic strata of the region as well as country.

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