



***Gloriosa superba* L. (Glory lily) spotted for the first time in vegetation of Pachmarhi Biosphere Reserve (Hoshangabad district), Central India**

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Abstract

Gloriosa superba Linn. (Glory lily), is a medicinal plant belongs to the family liliaceae. It is one of the important species which is used for several ethno-medicinal purposes by tribes of PBR. The present paper first time deals with the, new record of distributions of *Gloriosa superba* L. species in six localities, namely Tawa nagar (Near Tawa Reservoir), Badkachhar, Chhotianhoni, Dokrikheda, Panarpani and Matkuli of Hoshangabad Districts in PBR. A research study was conducted from December 2010 to November 2011 in various seasons to record & encounter the *Gloriosa superba* L. distributed in various localities of PBR & use by tribal communities & traditional healers. PBR is the most luxuriant forest and rich in medicinal plant resources. The forest area is dominated by a number of tribes such as Koorku, Bharia, Gond and Mawasi who depends solely on their surrounding forests for most of their requirements from food to medicines.

Key-Words: *Gloriosa superba*, Pachmarhi Biosphere Reserve (PBR), Tribals, Traditional Knowledge, Ethno-medicinal, Traditional Medicinal Practitioner (TMP), Traditional healer, Local tribe

Introduction

Glory lily (*Gloriosa superba* L.) is a medicinal plant belonging to the family Liliaceae is a semi-woody herbaceous branched climber reaching approximately 5 meters height, with brilliant wavy-edged yellow and red flowers (Rajak & Rai, 1990). One to four stems arise from a single V-shaped fleshy cylindrical tuber. *Gloriosa superba* is one of the endangered species among the medicinal plants (Badola, 2002) commonly known as Kalihari in Hindi, Kal-lavi in Marathi, Manthori khizangu in Malayalam and Kazhappai kizhangu in Tamil. It is extensively scattered in the tropical and sub-tropical parts of the India. It is adapted to different soil texture and climatic variation. The plant grows in sandy-loam soil in the mixed deciduous forest in sunny positions. *Gloriosa superba* is an inhabitant of tropical Africa and now found growing naturally in many countries of topical Asia including India, Bangladesh, Malaysia and Myanmar. In India, it occurs commonly in tropical forests of Bengal and Karanataka (Sivakumar and Krishnamurthy, 2002). Studies reveal that all parts of the plant especially the tubers & seeds contain alkaloids such as colchicines and Gloriosine (Trease and Evans, 1983).

Tubers and seeds of *Gloriosa superba* are an expensive export commodity. In the Indian systems of medicine, the tubers are used as tonic, antiperiodic, antihelmentic, and also against snake bites (Gupta et al., 2005). Colchicine & Gloriosine are two commonly used phytochemicals for treatment of gout & rheumatism. Different parts of the plant have wide variety of uses especially within traditional medicine practiced in tropical Africa and Asia. The tuber is used traditionally for the treatment of bruises and sprains, colic, chronic ulcers, haemorrhoids, cancer, impotence, nocturnal seminal emission, and leprosy and also for including labour pains and abortions (Kala et al., 2004). *Gloriosa superba* also used in wounds, skin related problems, Fever, Inflammation, piles, blood disorders, Uterine contractions, General body toner, Poisoning (Haroon et al., 2008). *Gloriosa superba* has gained the importance in medicine in recent years & is indicated promising drug for the production of colchicine on commercial scale (Kokate et al., 2004).

Study area

Pachmarhi Biosphere Reserve area is constituted in the Central part of India. It is often recognized as "Genetic Express Highway" linking two biological hot spots of the country viz. Eastern Himalayas and Western Ghats, also as confluence of northern and southern type of vegetation. The total area of Pachmarhi Biosphere Reserve is 4926.28 sq. km., of which 524.37 sq. km. is

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under the core zone and remaining 4462.93 sq. km. comprises the buffer zone. It lies between 22° 10' to 22° 50' N Longitude and 77° 45' to 78° 56' E Latitude. It covers parts of three civil districts, viz., Chhindwara (29.19%), Hoshangabad (59.55%) and Betul (11.26%). It includes three wildlife conservation units viz., Satpura National Park (524.37 sq. km.), Bori Sanctuary (485.72 sq. km.) and Pachmarhi Sanctuary (491.63 sq. km.); (EPCO, 2001). In general the temperature of PBR ranges from 11 to 42°C (Jayson, 1990). It is one of the highly biodiversity-rich areas with high floristic diversity and unique plant life forms because of the varied spectrum of variations of the latitude, altitude, rainfall, topography, soil type and other climatic aspects. The variation in climate occurs from place to place. The PBR is cool in summer and has heavy rainfall in rainy season; whereas low lands in Narmada basin are uncomfortably hot in summer with less rainfall. The mean daily temperature ranges from 26 to 42°C and 9.7°C to 25°C depending upon season. In PBR the flora of Pachmarhi & Bori forest ranges consists of 101 families consisting of 452 genera and 778 species. The species consists of 247 trees & shrubs as well as 531 herbs. Out of 101 families 36 are restricted to Pachmarhi range & 4 to Bori range (Mukherjee A.K., 2001). It is equally known for its cultural diversity, as it is inhabited by number of tribal and non tribal communities. The major tribal groups inhabited in PBR are *Gond*, *Korku*, *Bharia*, and *Mawasi*. Because of numerical strength the *Gond* tribe dominates the central part of India, which was known as Gondwana state, as the *Gond* ruled this part of India in the past (Kala, C.P., 2011).

However, Hoshangabad district of PBR is relatively unexplored and little work has been done in context of ethno-botanical studies & floristic surveys. Keeping in view the importance of *Gloriosa superba*, this study was undertaken to record this medicinal herb in different localities of PBR. In recent years floristic survey in PBR area has been undertaken by earlier workers such as Acharya, 2008; Kala, C.P., 2011; Ballendra Pratap Singh & Ravi Upadhyay, 2010, 2011, 2012 and Rajesh K. Mishra et. al., 2012.

Plant profile

Gloriosa superba L. Sp. Pl. 305. 1753; Wight, Ic. 6: 25. t. 2047. 1853; Hook. F. Fl. Brit. India 6: 358. 1892; Duthie, Fl. Gangetic Pl. 3: 262. 1920.

Classification

Kingdom	Plantae
Division	Magnoliophyta
Class	Liliopsida

Order	liliales
Family	liliaceae
Genus	<i>Gloriosa</i>
Species	<i>superba</i>

Taxonomic Description

Gloriosa superba is erect perennial, tuberous, scandent or climbing herbs with tendrils formed at the tip of the leaves. Stem soft, leaves sessile, spirally arranged or sub-opposite, 6-7 × 1.5-1.8 cm, lanceolate, acuminate, entire, glabrous; the upper ones with cirrhose tips. Flowers axillary, solitary, large, borne on long, spreading pedicels, actinomorphic, hermaphrodite; perianth segments 6, free, lanceolate, keeled within at base, long persistent, yellow in lower half, red in upper half; stamens 6, spreading, hypogynous; anthers extrose, medifix, versatile, opening by longitudinal slits; ovary superior, 3-celled; ovules numerous; style deflected at base, projecting from the flower more or less horizontally. Capsule 2-3 (Smith, 1979; Floridata, 2004). The fruit is oblong containing about 20 globose red colored seeds in each valve (Huxley, 1992; Neuwinger, 1994; Burkhill, 1995). Fl. & Fr.: September-March.

Vernacular Names

English Name: Climbing-lily, Creeping-lily, Flame-lily, Glory-lily, Gloriosa lily, Tiger claw Sanskrit Names: Langli, Kalikari, Ailni, Agnisikha, Garbhaghataini, Agnimukhi

Local Names in India: Kalihari, Kathari, Kulhari, Languli (Hindi); Bishalanguli, Ulatchandal (Bengali); Dudhio, Vacchonag (Gujarati); Indai, Karianag, Khadyanag (Marathi); Karadi, Kanninagadde (Kannada); Adavi-nabhi, Kalappagadda, Ganjeri (Telugu); Mettoni, Kithonni (Malayalam); Kalappai-Kizhangu, Kannoru (Tamil); Ognisikha, Garbhaghato, Panjangulia, Meheriaphulo (Oriya); Kariari, Mulim (Punjabi) (CSIR, 1948-1976).

Common Names in World: Glory lily, Flame lily, Isimiselo, Vlameleie, Riri vavai-moa.

Habitat & distribution

The plant grows in sandy-loam soil in the mixed deciduous forests in sunny positions. It is very tolerant of nutrient-poor soils. It occurs in thickets, forest edges and boundaries of cultivated areas in warm countries up to a height of 2530 m. It is also widely grown as an ornamental plant in cool temperate countries under glass or in conservatories (Neuwinger, 1994; Inchem, 2004).

A native to tropical jungles of Africa is now found growing naturally in many parts of tropical Asia including India, Burma, Malaysia, Sri Lanka (Jayaweera, 1982). In temperate countries, *G. superba* is

propagated as an ornamental in conservatoris, best suited to greenhouses (Neuwinger, 1994). In India, it is mainly found in Nasik, Ratnagiri, Savanthwadi (Maharastra); Uttara Kannada, Hassan, Chikmangalur, Coorg, Mysore (Karnataka); Cannanore, Palakkad, Trivandrum (Kerala); Tamil Nadu and Goa (CES, 2004). Today, it is under cultivation in fairly large areas of India but seen less in Patalkot valley of Central India. Distribution in Patalkot area of PBR: Gaildubba, Rathed, Harra-ka-Char, Chimgapur, Kareyam, Jaitpur, Bijouri, Chhindi and Sidhouli (Acharya, 2008).

Chemical constituents

Studies reveal that all parts of the plant, especially the tubers are extremely toxic due to the presence of a highly active alkaloid, Colchicine. The species also contains another toxic alkaloid, Gloriosine (Gooneratne, 1966; Angunawela & Fernando, 1971). Other compounds such as lumicolchicine, 3-demethyl-N-deformyl-N-deacetylcolchicine, 3-demethylcolchicine, N-formyldeacetylcolchicine have been isolated from the plant (Chulabhorn *et al.*, 1998). Wide varieties of phytochemicals are found in glory lily (Table-1); (Capraro *et al.*, 1984; Srivastava *et al.*, 1977). In the world market glory lily considered as rich source of colchicines and gloriosine. Silosterol, its Glucoside and beta and Gamma Lumicolichicines. Beta silosterol, its Flucoside and 2-H-6-MeO benzoic acid.

Toxic effect

A pale yellow to greenish yellow alkaloid Colchicine is mainly responsible for the toxic effect. The toxins in *G. superba* have an inhibitory action on cellular division resulting in diarrhoea, depressant action on the bone marrow and alopecia. After ingestion of tubers, initial symptoms develop within two to six hours. Intense vomiting, numbness and tingling around the mouth, burning and rawness of the throat, nausea, abdominal pain and bloody diarrhoea leading to dehydration etc. are some of the primary symptoms developed initially in the victim. The other important complications include respiratory depression, shock, hypotension, marked leucopenia, thrombocytopenia, coagulation disorders, oliguria, haematuria, confusion, seizures, coma and ascending polyneuropathy. Alopecia and dermatitis are the late manifestations that develop about one to two weeks after poisoning (Inchem, 2004).

Clinical and toxicological observations were made by various workers time to time (Gooneratne, 1966; Dunuwille *et al.*, 1968; Angunawela & Fernando, 1971; Murray *et al.*, 1983; Kimberly, 1983; Saravanapavanathan, 1985; Craker & Simson, 1986; Wijesundere, 1986; Ellenhorn *et al.*, 1996; Inchem, 2004).

Ethno-medicinal importance

The sap from the leaf tip is used for pimples and skin eruptions. Tribals of Patalkot apply the powder of rhizome with coconut oil in skin eruptions and related diseases for 5 days. This combination is said to be effective in snake and scorpion bites too. Tribals crush roots of the plant in water and apply on head for curing baldness. To avoid painful delivery, Gonds and Bharias of Patalkot, apply rhizome extract over the navel and vagina. It induces labour pain and performs normal delivery. Bhumkas (local healers) generally prescribe 250 to 500 mg of the rhizome as dosage. According to Bhumkas of Patalkot, this dose may lead to abortion if given to a lady with pregnancy of 1 or 2 months. Since the rhizome is having abortive action, this is prescribed for normal delivery. Duke (1985) has also reported the abortifacient action of the plant rhizome. In Gaildubba, juice of the leaves is given to kill the lice.

In traditional medicine system, tuber is used for the treatment of bruises and sprains (Rastogi & Mehrotra, 1993), colic, chronic ulcers, hemorrhoids, cancer, impotence (Nadkarni, 1978), nocturnal seminal emissions and leprosy. Many cultures believe the species to have various magical properties (Watt & Breyer-Brandwijk, 1962; Neuwinger, 1994; Burkitt, 1995). The plump roots of the plant have been used in the treatment of parasitic skin infections, leprosy, and internal worms (Mutshinyalo, 2001; Dhushara, 2004).

In Ayurveda and Yunani systems of medicine, the tuber of plant is well known due to its pungent, bitter, acrid, heating, anthelmintic, laxative, alexiteric and abortifacient nature. It is widely used in the treatment of ulcers, leprosy, piles, inflammations, abdominal pains, intestinal worms, thirst, bruises, infertility and skin problem (Kirtikar & Basu, 1935; THDC, 2002). However, ingestion of all parts of the plants is extremely poisonous and can be fatal (Senanayake & Karalliedde, 1986).

Material and Methods

Collection of Plant material (Specimens)

The collection of planting material has been done with help of traditional healers/TMP/Medicine men (vaidhyya)/local people/tribals. The people in study area were male, female, Hindus, Muslims, self employed traditional medicinal practitioners. These people mainly belong to *Gond*, *Bharia*, *Koorku*, and *Mawasi*. The secondary informants who help in collection of *Gloriosa superba* are government servants, shopkeepers, forest officials. Their reported ages ranged from 24 to 87 and each traditional healer/informants had a mean family member number nine. The majority of 62% were illiterate and those

could read and write constituted 33% while 14% attended grades one to four.

The plant material collected during December 2010 to November 2011 respectively from six localities of PBR, covering an altitudinal range of 250 to 1650 m height. The specimens were collected from terrestrial habitats such as sandy loam soil, rocks, soil covered rocks, wet rocks & thickets forest edges. The plant material (specimens) carefully handled for identification with the help of available authenticated literature, especially Oommachan, M. (1977) & Flora of Madhya Pradesh Vol. – I by Verma et al., (1993). Plant material was preserved by making herbaria following the routine method of plant collection and herbarium technique (Jain and Rao 1977). The voucher specimens were carefully numbered & deposited in the Herbarium of Botany Department, Government Motilal Vigyan Mahavidyalaya, Bhopal (M.P.), India. The area covered under PBR and the major sites of plant collection has been shown in the Figure 1.

Results and Discussion

In the present investigation we reported *Gloriosa superba* L. in six localities of Hoshangabad district in PBR viz., Badkachhar (Longitude 22° 40' 12.13" N; Latitude 79° 25' 09.63" E), Chhotianhoni (Longitude 22° 38' 37.17" N; Latitude 78° 21' 14.50" E), Dokrikheda; near Dam (Longitude 22° 38' 45.40" N; Latitude 78° 21' 28.57" E), Panarpaani (Longitude 22° 30' 11.11" N; Latitude 78° 27' 07.52" E), Matkuli (Longitude 22° 35' 07.03" N; Latitude 78° 27' 58.37" E), Tawa nagar (Near Tawa Reservoir) (Longitude 22° 36' 28.46" N; Latitude 77° 59' 17.56" E) of PBR (Table 2). None of the earlier investigator (M Oommachan, 1990; Vasudeva & Bir, 1993; Pathak, 2001; EPCO, 2001, 2002; Acharya et al., 2008; Kala, C. P., 2011; Ballendra Pratap Singh & Ravi Upadhyay, 2010, 2011, 2012) reported this species in Pachmarhi wild life century in Hoshangabad Districts. of PBR. Although Acharya et al., (2008) reported *Gloriosa superba* in Patalkot area of Chhindwara District, viz., Gaildubba, Ratheda, Harra-ka-char, Chimtipur, Kareyam, Jaitpur, Bijouri, Chhindi and Sidhouli in PBR. According to our present survey the status of this medicinal herb is endangered in PBR, which also supports the IUCN Red List (2001) status & earlier investigation by Acharya (2008).

In the present investigation we reported *Gloriosa superba* L. in six localities of Hoshangabad district in PBR viz., Badkachhar, Chhotianhoni, Dokrikheda, Panarpaani, Matkuli, Tawa nagar (Near Tawa Reservoir); (Table 2). None of the earlier investigator (M Oommachan, 1990; Vasudeva & Bir, 1993; Pathak, 2001; EPCO, 2001, 2002; Acharya et al., 2008; Kala,

C. P., 2011; Ballendra Pratap Singh & Ravi Upadhyay, 2010, 2011, 2012) reported this species in Pachmarhi wild life century in Hoshangabad Districts. of PBR. Although Acharya et al., (2008) reported *Gloriosa superba* in Patalkot area of Chhindwara District, viz., Gaildubba, Ratheda, Harra-ka-char, Chimtipur, Kareyam, Jaitpur, Bijouri, Chhindi and Sidhouli in PBR. Recently, Rajesh K Mishra et al., 2012 documented the use of ethno-medicinally important plants of Pachmarhi region. According to our present survey the status of this medicinal herb is endangered in PBR, which also supports the IUCN Red List (2001) status & earlier investigation by Acharya (2008). To maintain home gardens in tribal/deep forest areas can play important in conservation & to maintain genetic diversity of such high valued endangered medicinal herbs (Kala, C. P., 2010).

In the present paper, first hand information on *Gloriosa superba* spotted from the different localities in Hoshangabad district of Pachmarhi Biosphere Reserve was presented. This information was also cross checked with the available literature of Oommachan, M., 1990; Pathak, 2001; EPCO, 2001, 2002; Acharya et al., 2008; Kala, C. P., 2011; Ballendra Pratap Singh & Ravi upadhyay, 2010, 2011, 2012. The results provided in this study are new, as they have not been reported earlier.

One year of extensive survey in different localities in PBR, results in occurrence of *Gloriosa superba* in six places. Apart from the excessive collection, anthropogenic pressure & destruction of natural habitats are the key factor in depletion of this glorious herb in PBR. There is a greater need of a "community-based' approach in conservation. Awareness among the local community is one of the most important tasks. For this, various activities like poster presentation, campaigns, educational pamphlets and slogans can be applied. A society can be made in the villages that will look after the conservation of important medicinal and economical plants. Universities, Colleges, NGOs and other agencies should come forward and adopt a village of their respective region. Specially, the 'Board of Biodiversity' established by Govt. of India, can play a vital role in conservation of important medicinal plant. A medicinal plant garden/ herbal garden/ home gardens and green house can be made in the village itself. At one side there is need of *ex-situ* and *in-situ* conservation, on the other hand, preservation of traditional Ethno-medicinal-botanic knowledge is highly needed. Local healers of targeted area should be encouraged and given support time to time.

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. If endangered plants like *G. superba* are allowed to become damaged through excessive collection, a whole series of traditional medicines and plants which have been in use for thousands of years will be threatened. It is therefore need of the hour to come forward and rescue this important glorious herb of PBR. Active participation from everyone is highly needed specially people from Hoshangabad district of PBR.

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References

1. Acharya, Deepak., Shrivastava, A. (2008). Indigenous Herbal Medicines: Tribal Formulations & Traditional Herbal Practices. Aavishkar Publishers Distributors, Jaipur- India, ISBN 978-81-7910-252-7, 440.

2. Angunawela, RM and Fernando, HA. (1971). Acute ascending polyneuropathy & dermatitis following poisoning by tubers of *G. superba*. *Ceylon Medical Journal*, 16: 233-235.

3. Badola, H. K. (2002). Endangered medicinal plant species in Himachal Pradesh. A report on the International Workshop on 'Endangered Medicinal plant species in Himachal Pradesh', organized by G. B. Pant Institute of Himalayan Environment and Development at Himachal Unit, Mohal-Kullu during 18-19 March 2002 *Curr. Sci.*, 83: 797-798.

4. Ballendra Pratap Singh & Ravi Upadhyay (2010). Observation of some ferns of Pachmarhi Biosphere Reserve in traditional veterinary uses. *Indian Fern J.*, 27: 94-100.

5. Ballendra Pratap Singh & Ravi Upadhyay (2011). Ecotourism and its effects on wildlife of Pachmarhi Biosphere Reserve. *African J. of Enviro. Sci. & Tech.*, 5 (9): 717-721.

6. Ballendra Pratap Singh & Ravi Upadhyay (2011). Ethnobotanical importance of Pteridophytes used by the tribes of Pachmarhi, Central India. *Journal of Med. Plant Res.*, 6 (1): 14-18.

7. Burkhill, HM. 1995. The useful plants of West Tropical Africa, 2nd ed., Vol. 3. Royal Botanic Gardens, Kew. CES, 2004.

8. Capraro HG, Brossi A. (1984). In the alkaloids. (Ed.): A. Brossi. Academic Press, 23, 1984, 1-70.

9. CES(2004).<http://ces.iisc.ernet.in/hpg/cesmg/pew/glosup.html> (Viewed on 31/03/12).

10. CSIR (Council of Scientific and Industrial Research). 1948-1976. *The Wealth of India*. 11 vols. New Delhi.

11. EPCO (2001). Bhopal: Environmental Planning and Co-ordination Organization. Pachmarhi Biosphere Reserve. *Biosphere Reserve Information Services (BRIS)*, Vol. 1 (No. 1).

12. EPCO (2002). Bhopal: Environmental Planning and Co-ordination Organization. Pachmarhi Biosphere Reserve. *Biosphere Reserve Information Services (BRIS)*, Vol. 2 (No. 1).

13. Floridata (2004). http://www.floridata.com/ref/g/glor_rot.cfm (Viewed on 30/04/2012).

14. Gooneratne, BWM. (1966). Massive generalized alopecia after poisoning by *G. superba*. *Br. Med. Journal*, 1: 1023-1024.

15. Gupta, L. M., Rana, R. C., Raina R., and Meenakshi Gupta (2005). Colchicine contents in *Gloriosa superba* L. *SKUAST-J*, 4: 238-241.

16. Haroon K., Murad. A.K., Iqbal, H. (2008). Enzyme inhibition activities of the extracts from rhizomes of *Gloriosa superba* Linn (Colchicaceae). *Journal of enzyme inhibition and medicinal chemistry*, 22 (6) 722-5.

17. Huxley, An (1992). The Royal Horticultural Society dictionary of gardening, Vol. 2. Londan, Mac Millan Press.

18. Inchem(2004).<http://www.inchem.org/documents/pims/plant/pim245.htm>.

19. Jain, S. K. and Rao, R. R. (1977). A Handbook of Field and Herbarium Methods. New Delhi. Todays and Tomorrows Printers and Publishers.

20. Jayaweera, DMA. (1982). Medicinal plants used in Ceylon, Vol. 3. National Science Council of Sri Lanka, Colombo.

21. Jayson, EA. (1990). An ecological survey at Satpura National Park, Pachmarhi and Bori Sanctuaries, Madhya Pradesh. *Indian Journal of Forestry*, 13(4): 288-294.
22. Kala, C., Farooquee N., Dhar U. (2004). Prioritization of medicinal plants on the basis of available knowledge, existing practices and use value status in Uttarakhand, India. *Biodiversity and Conservation*, 13(2): 453-469.
23. Kala, C.P. (2011). Indigenous uses and sustainable harvesting of trees by local people in the Pachmarhi Biosphere Reserve of India. *Int. J. Med. Arom. Plants*, 1(2): 153-161.
24. Kala, CP (2011). Indigenous uses and sustainable harvesting of trees by local people in the Pachmarhi Biosphere Reserve of India. *Int. J. Med. Arom. Plants*, 1(2): 153-161.
25. Kokate, C. K., Purohit, A. P., Gokhale, S.B. (2004). *Pharmacognosy*, Nirali Prakashan, Pune, pp. 506.
26. Mukherjee, A. K. (1984). Flora of Pachmarhi and Bori Reserve. *Botanical Survey of India*.
27. Neuwinger, HD. (1994). African ethnobotany. Poisons and drugs. Chemistry, Pharmacology, Toxicology. Chapman & Hall, Weinheim.
28. Oommachan, M. Bajaj, A. Masih, S. K. (1990). Ethnobotanical observations at Pachmarhi (Madhya Pradesh). *Journal of Tropical Forestry*, 6(2): 157-161.
29. Pathak, S. (2001). Pteridophytic Flora of Pachmarhi Hills M. P. (Ph. D. Thesis) Vikram University Ujjain, M. P.
30. Rajak, R.C. and M.K. Rai (1990). Herbal Medicines Biodiversity and Conservation Strategies. International Book Distributors, pp. 75-79.
31. Rajesh K. Mishra, Shambhu P. Patel, Anupam Srivastava, Rajiv K. Vashistha, Ajay Singh, Ashok K. Puskar (2012). Ethno-medicinal plants of Pachmarhi region, Madhya Pradesh, India. *Nature and Science*, 10 (4): 22-26.
32. Sivakumar, G. and Krishnamurthy, K. V. (2002). *Gloriosa superba* L.- a very useful medicinal plant. In: Recent Progress In Medicinal plants, Vol. 7 – *Ethnomedicine and Pharmacognosy* Part II. Singh, V. K. Govil, J. N., Hashmi, S., Singh, G. (eds). Series Sci. Tech. Pub., Texas, USA, pp. 465-82
33. Smith, A.C. (1979). Flora Vitiensis nova: A new flora of Fiji. Lawai, Kauai, Hawaii. *National Tropical Botanical Garden*. 1: 141-142.
34. Srivastava UC., Chandra V. (1977). *Gloriosa superba* Linn. (Kalihari) - An important colchicines, 1977.
35. Trease, S. E. and Evans, D. (1983). Colchicum seed and corm. In: *Pharmacognosy*, 12th Balliere Tindall, London, pp. 593-597.
36. Vasudeva, S. M. and Bir, S. (1993). Pteridophytic Flora of Pachmarhi Hills, Central India-II (Keys to different Taxa & Fern Families: Ophioglossaceae-Davalliaceae). *Indian Fern J.*, 10: 40-72.
37. Verma, D. M., Balakrishnan, N. P. and Dixit, R. D. (1993). *Flora of Madhya Pradesh Vol. I*. Botanical Survey of India, Department of Environment and Forests, Government of India, Calcutta, pp 69, 50, 72, 74.

Table 1: Chemical constituents of plant

S. No.	Plant parts	Chemical constituents
1.	Plant	Cornigerine,3-demethyl-N-formyl-N-deacetyl-blumicolchicine, 3-demethyl-g-lumicolchicine, 3-demethyl colchicines.
2.	Fresh tubers root	Colchicine, b-sitosterol, its glucoside, a long chain fatty acid, b and g-lumiccolchicines, 2-OH-6-MeO benzoic acid.
3.	Seed	High level of colchicines.
4.	Young leaf	Cholidonic acid.
5.	Flower	Luterlin and its glucosides, N-formyl-de-Ac-colchicine, lumicolchicine.

Table 2: *Records of *Gloriosa superba* L. in different areas of Hoshangabad district in PBR

S. No.	Villages/Localities*	Longitude & Latitude	Status
1.	Badkachhar	22° 40' 12.13" N; 79° 25' 09.63" E	Endangered
2.	Chhotianhoni	22° 38' 37.17" N; 78° 21' 14.50" E	Endangered
3.	Dokrikheda (Near Dam)	22° 38' 45.40" N; 78° 21' 28.57" E	Endangered
4.	Matkuli	22° 35' 07.03" N; 78° 27' 58.37" E	Endangered
5.	Panarpaaani	22° 30' 11.11" N; 78° 27' 07.52" E	Endangered
6.	Baagra Tawa (Near Tawa Reservoir)	22° 36' 28.46" N; 77° 59' 17.56" E	Endangered

*Note: This information is being reported by us for the first time, none of the earlier investigator reported *Gloriosa* in PBR (M Oommachan, 1990; Vasudeva & Bir, 1993; Pathak, 2001; EPCO, 2001, 2002; Acharya et al., 2008; Kala, C. P., 2011; Ballendra Pratap Singh & Ravi upadhyay, 2010, 2011, 2012)

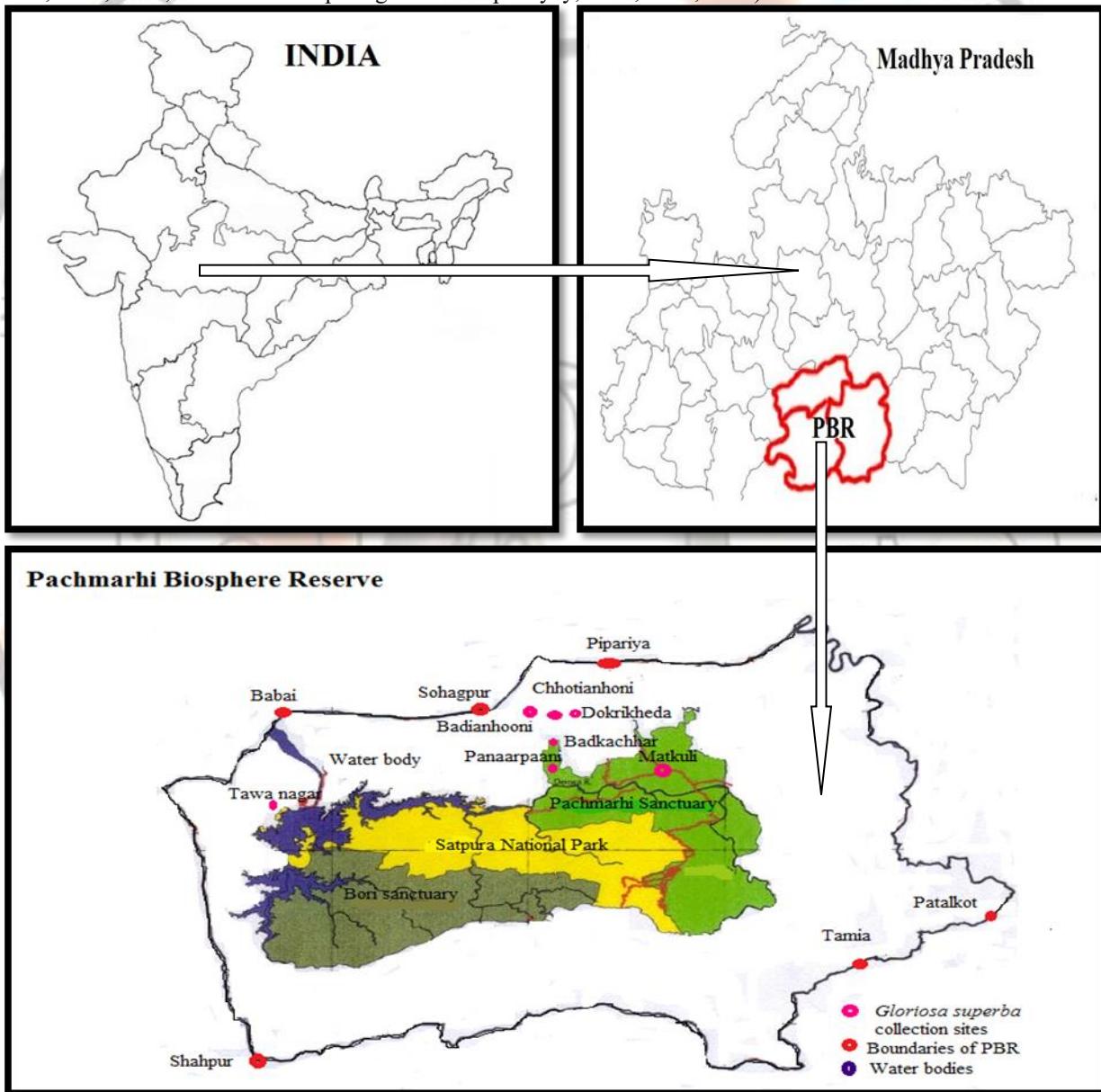


Fig. 1: Pachmarhi Biosphere Reserve Area; Showing geographical location of the study sites & also illustrating the geographical position of different collection sites of *Gloriosa superba*.



Fig. 1: *Gloriosa superba* growing in natural habitat at different places in PBR; (A) Badkachhar (B) Chhotianhoni (C) Matkuli (D) Dokrikheda (Near Dam) (E) Panarpaani (F) Tawa nagar (Near Tawa water Reservoir) (G) *Gloriosa* seeds collected from Tawa nagar (H) *Gloriosa* tubers collected from Dokrikheda.