



IJPPR

INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals

ISSN 2349-7203



Human Journals

Review Article

July 2021 Vol.:21, Issue:4

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Medicinal Importance of an Endangered Ayurvedic Medicinal Herb - *Lilium polyphyllum*



IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals



ISSN 2349-7203

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Submitted: 21 June 2021
Accepted: 27 June 2021
Published: 30 July 2021



www.ijppr.humanjournals.com

Keywords: *Lilium polyphyllum*, Astavarga, Kshirkakoli, Ayurveda, Medicinal values, Endangered plants

ABSTRACT

Lilium polyphyllum D.Don ex Royle also known by the name of whitelily is a member of family Liliaceae. It is a perennial and bulbous herb which can grow up to a height of 1 meter and has narrow leaves. It is described under *Astavarga* plants in Ayurvedic system of medicine. "*Astavarga*" a group of 8 medicinal plants which are used in the preparation of various Ayurvedic tonics and have rejuvenating effects. This herb is also known by the name of *kshirkakoli*. It is harvested for its bulbs which have soothing, astringent properties and are used in the preparation of various traditional and modern medicines as a refrigerant, aphrodisiac, diuretic tonics. Its bulbs also contain various phytochemicals such as linalool, saponins etc. which are also responsible for its medicinal value. This plant is used in the preparation of various Ayurvedic tonics such as Chyavanprash, Astvarga Churan, Jivaniya ghrita. Due to its vast medicinal values, it is being exploited at very high rates that gives it a status of a critically threatened or endangered plant.

INTRODUCTION

Lilium polyphyllum D. Don Royle which is locally known by the name of *Kshirkakolithat* belongs to family Liliaceae. The other name of this herb is White Himalayan Lily, White Lily, many leaved lily (Balakrishna A. *et al.*, 2018). It is a critically threatened herb which is also mentioned in the IUCN's Red list of endangered plant (Vedet *et al.*, 2003). The genus *Lilium* reportedly contains approximately 110 sp. and is classified into 5-10 subgenera which is geographically scattered in northern hemisphere (Europe, Temperate Asia and North America) (Dhyani *et al.* 2013). It is found between North-Western Himalayas of Uttarakhand (a state in India) up to west of Afghanistan (Rana & Samant 2011). In India it is found in Hattpo peak, Narkanda forests, Chail (Solan Dist.), Sungari-Bahli on Rampur Road of Himachal Pradesh; Gulmarg, Liddar valley of Jammu and Kashmir and Gangotri, Rainthal, Amardhar, Kedarnath, Madmaheshwar of Uttarakhand (Balakrishnan *et al.* 2018). *L. polyphyllum* was discovered by Royle in 1839 at Taranda Kanawara (Uttarakhand, India). Curator of Royal botanical garden, Edinburg, Mac Nab raised the plants from the seeds sent from Shimla (Himachal Pradesh, India) and for the first time reported flowering in it, in 1871 (Sourabh *et al.*, 2015). A monograph on genus *Lilium* was also published (Elwes *et al.*, 1880). It is observed that this herb grows better in cooler, moist and porous acidic soil (pH around 6.5-6.8) on northward gentle slope (30-35 degree) underneath the shady sites of *Cedrus deodara* forest where sunlight received for only 2 to 4 hour a day (Sourabh *et al.*, 2015). It is a bulbous herb with fleshy scales which are long, narrow and nearly equal. Stem is hollow approximately 60-120 cm erect and slender (Balakrishnan *et al.*, 2018). Leaves are alternate, spirally arranged, lanceolate to near lanceolate, 5-13cm long and 0.5-1.5 cm wide with parallel venation (Balkrishnan *et al.*, 2018; Dhyani *et al.*, 2009). Flowers are large, fragrant, solitary, and pendulous. The bulb is a underground stem with fleshy conical, translucent scales and roots are attached with basal plate. Scales are modified leaves which stores food (Sourabh *et al.*, 2015).

Lilium species like *L. regale*, *L. cocnolor*, *L. davidii* var. *unicolor* and *L. pumilum* are being used in traditional Chinese medicinal system. It is reported that these species contain various biochemical compounds namely alkaloids, polysaccharides, saponins, and colchicine that have been reported to possess antioxidant activities. Some of these species are commonly used as vegetables as they have high level of proteins, minerals, amino acids, and dietary fiber. From at least 2000 yr. lilies are being grown as vegetables and medicine in China (Li *et al.*, 2019).

Lilium polyphyllum belong to Astavarga plants of Ayurvedic medicinal system. The “Astavarga” plants suffer a lot of confusion in their identification and authentication in accordance with Ayurvedic literature (Shau et al., 2016). According to various Ayurvedic literatures, the Astavarga drugs are used in the formation of various Ayurvedic formulations like *Satavari ghritam*, *Shiva ghritam*, *Ashok ghritam*, *Piplayangh ghritam*, *Balatailam* etc. (Dhyani et al., 2010). *L. polyphyllum* (Kshirkakoli) along with another Astavarga plant *Roscea procera* (Kakoli) comes under “*Brmhaniya varga*” (drug responsible for formation of body mass i.e. Mansadhatu) (Vij et al., 2019). The medicinal value of these plants is due to their chemical constituent which produces a definite physiological action in human body (Shau et al., 2016). The bulb of *L. polyphyllum* is the medicinal part of the herb which is used as galactagogue, aphrodisiac, expectorant, antipyretic, refrigerant and diuretic (Rana & Samant, 2011). The bulbs are also used as vegetables in various regions of Uttarakhand and Gangotri regions (Dhyani et al., 2010).

Medicinal values

Lilium polyphyllum D. Don Royle is known to have various medicinal properties. Sahu et al. (2016) conducted a series of experiments on the powdered part (rhizome) of *Kshirkakoli* to find out its immunomodulation activity. They prepared various extracts of this plant. These extracts were then evaluated and estimated quantitatively and qualitatively for their chemical constituents. Results indicated that the extract of *kshirkakoli* shows the presence of Saponins, Phytosterols, Phenolic compounds, Flavonoids, Alkaloids, Steroids and Carbohydrate compounds. These extracts were then used in the study for acute toxicity of *kshirkakoli* extracts; its effect on delayed type hypersensitivity reaction (DTH), on hematological parameter and on lymphoid organ weights. These tests were conducted on Swiss albino mice (25-30g) of either sex, and results indicated that EAEKS (Ethyl acetate extract of *Kshirkakoli*) significantly increases the total WBC's count, suggesting that extract can possibly stimulate hematopoietic system. The extract was also found to be effective for improving humoral and cell-mediated immunity. Moreover, it was also reported that weight of spleen and thymus was increased suggesting that the EAEKS extract might have stimulated the formation of immune cell.

Further HPTLC analysis of *Kshirkakoli* carried out by Shau et al. (2016) shows the presence of maximum constituents like sugars, steroids and saponins. They used the bulbs of *kshirkakoli* plant to carry out extraction. The rhizomes of *kshirkakoli* were dried and coarsely

powdered, then extracted with ethyl acetate (50°-55°), petroleum ether (55°-60°C), acetone (55°-60°) chloroform (50°-55°C) and ethanol (60°-65°C) successively by soxhlation. After the ethanol extraction, marc was dried and hydroalcoholic extract was obtained by cold maceration. After this the extracts were then dried in oven(45°C). These extracts were then used in performing HPTLC analysis. The presence of sugar, saponins and steroids were reported in the ethyl acetate and chloroform of *kshirkakoli*. Presence of these active biological phytochemicals secondary metabolites are proved to be beneficial in maintaining human health and in protection from other diseases.

The Anti- Diabetic and spectral analysis carried out by Mir *et al.* (2020) on various extracts of *Lilium polyphyllum* showed that it possess a good inhibiting tendency for alpha amylase and alpha glycosidase, these are the two key enzymes which plays an important role in metabolism of glucose (mainly by breaking down oligosaccharides into glucose). The inhibition of these drugs decreases intestinal glucose absorption which naturally reduces the post prandial blood sugar levels. Further, when the ethanol extracts of this plant is subjected to GC-MS analysis, it showed the presence of *5-hydroxymethyl furfural*, *Methyl 2-furoate*, *methyl piperate*, *methyl palmitate*, *piperine* and *palmitic acid*. Their presence in the extracts of this plant justifies its anti-diabetic properties.

The presence of polyphenolic compounds such as *phloridzin*, *caffeic acid*, *3-hydroxy cinnamic*, *chlorogenic acid*, *rutin*, *ferulic acid*, *gallic acid*, *vanillic acid*, *3-hydroxy benzoic acid* in the extract of *Lilium polyphyllum* plant prove its role in DNA damage activity and anti-aging properties (Giri et al., 2017). The biological activity of some of these phenolic compounds is given in table(1). Further FRAP (Ferric reducing antioxidant power) assay shows the presence of maximum antioxidant activity in *Lilium polyphyllum* extract (Giri et al., 2017).

Table No. 1: Various phytochemicals and their biological effects.

ACTIVE CONSTITUENT	BIOLOGICAL EFFECTS	REFERENCES
5-Hydroxymethyl furfural	Inhibit sickling of RBCs, relieve fatigue, antioxidative, anticarcinogenic action, antimicrobial, anti-inflammatory	Balkrishna et al.(2018)
Peiminine	Anti-cancer, anti allergic and anti-inflammatory	Balkrishna et al. (2018)
Gallic acid	Antioxidant, antimutagenic, anti-inflammatory	Mansouri et al. (2013); Verma et al.(2013)
Catechin	Anticancer, anti-inflammatory, antiobesity, antidiabetes and neuroprotective effects	Giri et al.(2017)
Chlorogenic acid	DNA protection and antimutagenic activity	Xu et al.(2012); Burgos-Moron et al. (2012)
Linalool	Anti-oxidant activity, Anti-inflammatory activity, Anticancer activity, Anticonvulsants	Balkrishna et al. (2012); Kamatou & Viljoen(2018)
Alpha-terpineol	Cardiovascular and antihypertensive effects, Antioxidant activity, Anticancer activity, Antiulcer activity, Anticonvulsant and sedative activity, Anti- bronchitis activity, Insecticidal activity	Khaleel et al.(2018)

It is also reported that bulbs of this plant is used in the preparation of more than 30 Ayurvedic tonics (Dhyani et al., 2017). These bulbs are used as refringent, aphrodisiac galactogogue, antipyretic, expectorant and tonic in cough in many traditional and modern medicines. Bulbs are also utilised in the preparation of revitalizing night cream and *Chywanaprasha*(Rana & Samant 2011). Various ethnobotanical studies reveals that it can be used in the treatment of kidney problems, pain and redness of eye, impotency, enhance strength and disease resistance and in cooling down of fever (Dhyani et al., 2010).

Lilium polyphyllum along with other plants namely *Roscoea purpurea* Smith, *Crepidium acuminatum* (D. Wear) Szlach, *Malaxis muscifera* (Lindl)Kuntze, *Polygonatum verticillatum* (L.)Allioni, *Polygonatumcirrhifolium* (Wall.)Royle, *Habenaria intermedia* D. Don, *Habenaria edgeworthii* Hook.f. ex Collett belongs to Astavarga group of plants in Ayurvedic medicinal system (Vij D. *et al.*, 2019). These Astavarga plants are *Jivaniya* (Vitality promoter) which are known to maintain a balance between three body *Dosa* i.e., *Vata*, *Pitta* and *Kapha*. They are *Bramhaniya* i.e., they promote body mass and is described under *Bemhaaniyavarga*. They are *Ayusya* i.e., promote longevity (Balkrishna A *et al.*, 2018).

The knowledge of therapeutic uses of *Lilium polyphyllum* and its mode of usage lies in the traditional medicinal knowledge which is available either in local dialects or is transferred from one generation to next generation orally. But due to the reluctance of next generations in accruing the knowledge of its therapeutic uses many of its potential medicinal uses are lost (Dhyani *et al.*, 2010).

Table No. 2: Therapeutic uses and formulation of *Lilium polyphyllum* in accordance with traditional medicinal knowledge (Dhyani *et al.*, 2010).

PLANT NAME	PART USED	THERAPEUTIC USES	MODE OF USAGE
<i>Lilium polyphyllum</i>	Bulb	Pain	Blending it with <i>Asparagus racemosus</i> to make oil, which can be applied after a bath.
		Menstrual pain	0.5g of powder blended with 1g <i>Smilax ovalifolia</i> in hot water (boiled).
		Impotency	2g of its powder is added to Astavarga plant, that can be consumed after night meal with milk.
		Eye pain and redness	Powdered with leaves of <i>Cinnamomum tamala</i> , <i>Gallium elegans</i> and <i>Glycyrrhiza glabra</i> , then boil it with goat milk and apply on eyes.

In traditional medicine system *Lilium polyphyllum* had been described for its use in treatment in sexual disorders and intermittent fever (Warrier *et al.*, 1997). In Gangatori region of India, it is also reported that the bulbs of *Lilium polyphyllum* is consumed as food which can be

cooked in vegetable oil alongwith potato that could possibly enhance sexual potency and can be used during wintersto keep body warm (Dhyani et al., 2010).

Due to itsincreasing demand in various Ayurvedic tonics and its less accessibility, many of its substitutes are being used. Also its declining population and lack of traditional medicinal knowledge about the therapeutic uses of this plant are the reasons for its substitution. These substitute plants have nearly same biological activity as of this herb. These substitute may include *Aswagandha* (*Withania somnifera*(Linn.) Dunal), *Safeda* (*Chloroohytm arundinaceum* Baker), *Fritillaria roylei* Hook (Balkarishna et al., 2012).



CONCLUSION AND FUTURE PERSPECTIVE

This review article describes the medicinal importance of *Lilium polyphyllum*. It is a plant of “*Astavarga*” group of plants in Ayurvedic medicinal system. Its active constituent are known to provide resistance in our body against various ailments and boost our immunity. However, detailed information about its medicinal properties is restricted as its traditional medicinal knowledge had conveyed orally from one generation to next generation so there is very less number of written text available (Mathur, 2003; Shastri, 2002) It has a great medicinal potential and requires an immediate protection and conservation strategy. A detailed survey is required on its natural habitat to ensure its availability and seious research study is required on its medicinal importance. Further, overexploitation of this plant for commerce and trade, degradation of its habitat due to overgrazing (Rana & Samant 2010) restricts its scope of scientific studies. It is also in the IUCN’s list of endangered plants (Ved et al., 2003), it is therefore mandatory and is our responsibility to conserve this medicinally important plant.

REFERENCES:

1. Balakrishna A, Mishra RK, Sharma N, Sharma VK and Misra L. Phytochemical, Botanical and Biological Paradigm of Astavarga Plants- The Ayurvedic Rejuvenators. *Journal of Natural & Ayurvedic medicine*. 2018; 2(6): 000145.
2. Balakrishna A, Srivastava A, Mishra RK, Patel SP, Vashistha RK, Singh A, Jadon V. and Saxena P. Astavarga plants – threatened medicinal herbs of the North-West Himalaya. *International Journal of Medicinal and Aromatic Plants*. 2012; 2(4): 661-676.
3. Buras-Moron E, Calderon-Montano JM, Orta ML, Pastor N, Perez-Guerrero C, Austin C, Mateos S and Lopez-Lazaro M. The Coffee Constituent Chlorogenic Acid InducesCellular DNA Damage and Formation of Topoisomerase I- and II- DNA Complexes in Cells. *Journal of Agricultural and Food Chemistry*. 2012; 60(30): 7384-7391.
4. Dhyani A, Bahuguna YM, Semwal DP, Nautiyal BP and Nautiyal MC. Anatomical features of *Lilium polyphyllum* D. Don ex Royle (Liliaceae). *Journal of American Science*. 2009; 5(5): 85-90.

5. Dhyani A, Nautiyal BP and Nautiyal M. Importance of Astavarga plants in traditional systems of medicine in Gharwal, Indian Himalaya. *International Journal of Biodiversity Science, Ecosystem Services & Management*. 2010;6, Nos. 1-2: 13-19.
6. Dhyani A, Nautiyal BP and Nautiyal MC. Distribution, status and conservation of *Lilium polyphyllum* (Liliaceae), a critically endangered medicinal plant from India. *Plant Biosystems*. 2017; 152(4): 608-611.
7. Dhyani A, Phartyal SS, Nautiyal BP, Nautiyal MC. Epicotyl morphophysiological dormancy in seeds of *Lilium polyphyllum* (Liliaceae). *Journal Bioscience*. 2013; 38(1): 13-19.
8. Elwes HJ, Fitch WH and Bourne S. A Monograph of the Genus *Lilium*, Taylor and Francis, London. 1880.
9. Giri L, Belwal T, Bahukhandi A, Suyal R, Bhatt ID, Rawal RS and Nandi SK. Oxidative DNA damage protective activity and antioxidant potential of Astavarga species growing in the Indian Himalayan Region. *Industrial Crops and Products*. 2017; 102: 173-179.
10. Li JW, Zhang XC, Wang MR, Bi WL, Faisal M, Jaime A, Teixeira da Silva, Volk GM and Wang QC. Development, progress and future prospects in Cryobiotechnology of *Lilium* spp. *Plant Methods*. 2019; 15:125, doi: 10.1186/s13007-019-0506-9.
11. Kamatou GPP and Vijoan AM. Linalool- A Review of Biologically Active Compound of Commercial Importance. *Natural Product Communications*. 2008;3(7): 1183-1192.
12. Khaleel C, Tabanca N and Buchbauer G. Alpha- terpineol, a natural monoterpene: A review of its biological properties. *Open Chemistry*. 2018;16: 349- 361.
13. Mansouri MT, Naghizadeh B, Ghorbanzadeh B, Farbood Y, Sarkaki A and Bavarsad K. Gallic acid prevents memory deficits and oxidative stress induced by intracerebroventricular injection of streptozotocin in rats. *Pharmacology Biochemistry and Behavior*. 2013; 111: 90-96.
14. Mathur DR. Yogtarangini. Varanasi (India): Chaukhamba Vidhyabhawan. 2003.
15. Mir AM, Ashraf MW, Singh SP, Madwal SP and Mir BA. Investigation of the Antibiotic Activity and GC-MS Analysis of Extracts of *Lilium polyphyllum*. *Tropical Journal of Natural Product Research*. 2020; 4(12): 1190-1195.
16. Rana MS and Samant SS. Threat categorisation and conservation prioritisation of floristic diversity in the Indian Himalayan region: a state of art approach from Manali Wildlife Sanctuary. *Journal for Nature Conservation*. 2010; 18(3): 159-168.
17. Rana MS and Samant SS. Population biology of *Lilium polyphyllum* D. Don ex Royle- a critically endangered medicinal plant in a protected area of Northwestern Himalaya. *Journal for Nature Conservation*. 2011; 19(3): 137-142.
18. Sahu P, Itankar P, Mishra R, Maliye A and Sonekar M. Phytochemical Screening and HPTLC Finger Printing Analysis of *Roscea procera* (Kakoli) and *Lilium polyphyllum* (Kshirkakoli). *International Journal of Pharmacy & Pharmaceutical Research*. 2016; 8(1):53-69.
19. Sahu RA, Itankar PR, Mishra RR and Maliye AN. Pharmacological Evaluation of *Roscea procera* (Kakoli) and *Lilium polyphyllum* (Kshirkakoli) extracts for Immunomodulatory activity. *International Journal of Pharmacognosy and Phytochemical Research*. 2016; 8(11): 1788-1794.
20. Shastri V. Bhavprakashnighantu. New Delhi (India), Motilal Banarashidash. 2002.
21. Sourabh P, Thakur J, Uniyal PL and Pandey AK. Biology of *Lilium polyphyllum*- A threatened medicinal plant. *Medicinal Plants*. 2015; 7(2): 158-166.
22. Ved DK, Kinhal GA, Ravikumar K, Prabhakaran V, Ghate U, Vijayshankar K, Indresha JH. Conservation assessment and management prioritization for the medicinal plants of Jammu & Kashmir, Himachal Pradesh & Uttaranchal. Bangalore, India: Foundation for Revitalization of Local Health Tradition. 2003.
23. Verma S, Singh A and Mishra A. Gallic acid: Molecular rival of cancer. *Environmental Toxicology and Pharmacology*. 2013; 35(3): 473-485.
24. Vij D, Srivastava PK and Mishra RK. Astavarga (Group of eight medicinal plants): The wonder herbs of Ayurveda. *International Ayurvedic Medical Journal*. 2019; 7(9): 1564-1571.
25. Warriar PK, Nambiar VPK and Ramankutty C. Indian Medicinal Plants. A compendium of 500 medicinal plants. Hyderabad (India): Orient Longman, pp. 176. 1997.
26. Xu JG, Hu QP and Liu Y. Antioxidant and DNA- protective Activities of Chlorogenic Acid Isomers. *Journal of Agricultural and Food Chemistry*. 2012;60(46): 11625-11630.

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