IJMPR 2025, 9(8), 09-16

International Journal of Modern Pharmaceutical Research
www.ijmpronline.com

ISSN: 2319-5878
IJMPR
Review Article
SJIF Impact Factor: 6.669

PARIS POLYPHYLLA: A POTENTIAL ANTI-CANCER SOURCE

***Likha Dyli, Pardhe Ayodhya, Jamdade Sonali and Dr. R.J. Mandade**

Department of Pharmacology, JSPM Sudhakarrao Naik Institute of Pharmacy Pusad, Dist. Yavatmal, Maharashtra 445204, India.

Article Received on: 25/05/2025
Article Revised on: 15/06/2025
Article Accepted on: 05/07/2025

***Corresponding Author**
Likha Dyli
Department of Pharmacology, JSPM Sudhakarrao Naik Institute of Pharmacy Pusad, Dist. Yavatmal, Maharashtra 445204, India.

ABSTRACT
The review consists of an overview of the endangered medicinal plant "Paris polyphylla" has been used as a medication to treat several ailments, such as irregular uterine bleeding and homeostasis. Meanwhile, it has undergone a huge amount of exploitation and illegal trading in the Northeastern part of India. The discussion also consists of the Pharmacological effect of Paris polyphylla extract in various types of anti-cancer treatment including lungs, colorectal, breast, and prostate overview on the extraction of various parts of the plant Paris polyphylla and used as anti-inflammatory, spermicidal, anti-uterine bleeding. The various phytoconstituents have been reviewed in the article.

KEYWORDS: *Paris polyphylla*, anti-cancer activity, steroidal saponins, phytoconstituents, traditional medicine, apoptosis, rhizome extract, antimicrobial, hepatotoxicity, endangered medicinal plant.

INTRODUCTION

History

Paris polyphylla is an endangered medicinal species described in 1813[21] by Smith hence the name *Paris polyphylla* Smith. used for centuries in various regions of northeastern India, China, and Eastern Europe.

Other than various medicinal properties it also contains anti-breast cancer, anti-lung cancer, anti-colorectal cancer, and anthelmintic activity.[5] Historically, the genus *Paris* was classified under the family Liliaceae; however, with the advent of the APG III system, it was reclassified into the family Melanthiaceae, encompassing approximately 24 species globally. This reclassification highlights the dynamic nature of plant taxonomy, as advancements in phylogenetic analysis continually refine our understanding of evolutionary relationships among plant families.[2]

Since the 1980s, the market price of *Paris polyphylla* rhizomes in China has increased approximately 400-fold, rising from 2.7 Chinese Yuan (CNY) per kilogram to as much as 1100 CNY per kilogram by 2017. This sharp price rise has been accompanied by a significant increase in the volume of trade both within and between countries such as India, Nepal, and China.

"Yunnan Baiyao" is an example of one Paris polyphylla rhizome being used as a main ingredient for the treatment of various diseases including bleeding, wound healing, snake bites, tumors, and a variety of disease conditions.[5]

In Arunachal Pradesh primarily sold by the villagers to agents who subsequently sell it to other traders.[21] In the district of Arunachal Pradesh such lower Dibang Valley and Lower Subansiri (now divided into keyi panyor and lower subansiri) were found to be indulged in the illegal trading of rhizomes. A high number of exploitations was found there in Arunachal Pradesh as the locals were unaware of the medicinal uses of the plant Paris polyphylla, therefore the government of Arunachal in 2016 announced the legalization of the Paris polyphylla.[16]

Paris polyphylla has various names where English itself it has two names, love apple, and Paris roots locally it is known as "Tamma" in Arunachal Pradesh[21] in Nepali "Satuwa", in Hindi called "Satwa" and in Sanskrit "Haimapati"[2]

Botanical Sources

The Paris Polyphylla belongs to the kingdom of "Plantae", phylum "Tracheophyta", class "Liliopsida" Order "Liliales" Family "Melanthiaceae".[6]

Fig. no. 1: bundle of paris polyphylla.

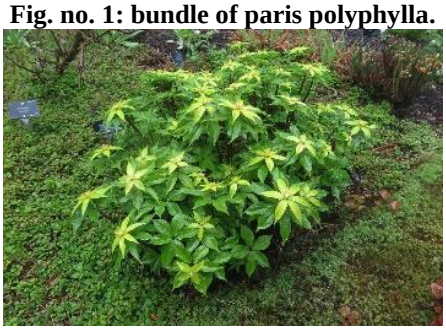

Fig. no. 2: Paris polyphylla.

Table no. 1: botanical source of paris polyphylla.

Kingdom	Plantae
Phylum	Tracheophyta
class	Liliopsida
order	Liliales
family	Melathiaceae
Genus	Paris
species	Polyphylla
Scientific name	Paris polyphylla Smith

Common Names(s)

- English: Love apple, Paris root
- Arunachal Pradesh local: Tamma
- Chinese: Chonglou, Dian Chonglou, Hua Chonglu, QI ye Yizhihua
- Hindi: Satwa
- Nepali: Satuwa
- Sanskirt: Haimapati
- Tamil: Kalchung
- Pharmacopeial name: Rhizoma Paridis

The herb structure can be described as an elongated extended-like structure, with thread-like, yellowish-green petals throughout summer and autumn. "Pars" refers to the symmetry of the plant hence the name. The Paris polyphylla is a rhizomatous, herbaceous plant with a green and unbranched ariel part. The "Polyphylla" describes numerous leaves where poly stands for many and phyla stands for leaves.[3][6] The morphology of plant P. polyphylla can be described as the height of plant 21-30 cm tall, the stem of the plant simple and cylindrical in colour purple or green. Leaves extend up to 7-9inches in length where at the top of the stem; petioles grow 0.5-0.7 cm; leaf shape can be of the shape varies from oblong to lanceolate, Flowers are bisexual therefore they contain both male and female parts and are non-dependent on another plant for reproduction and can reproduce on their own. Sepals can show yellow-green, narrowly ovate-lanceolate to lanceolate, with dimensions measures 2.0-2.7X 0.6-0.8 cm; Petals also yellow-green, with 1mm wide.

Fig no. 3: flowering paris polyphylla.

Fig No. 4: Rhizomes of Paris Polyphylla.

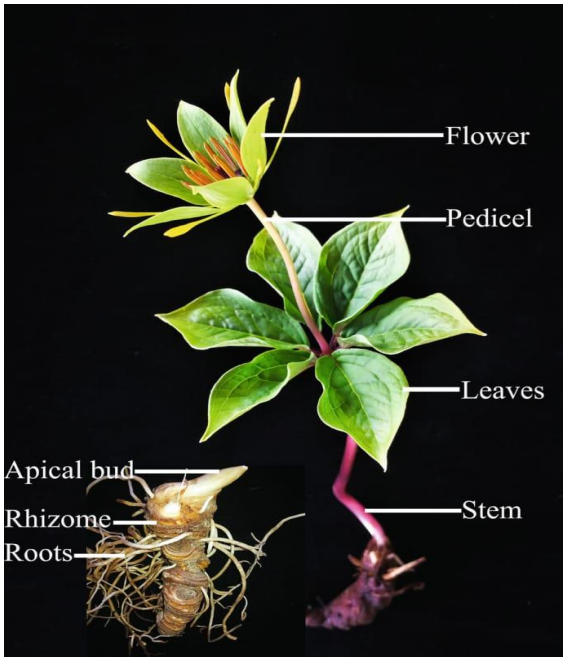

Fig. no. 5: Paris polyphylla and its parts.

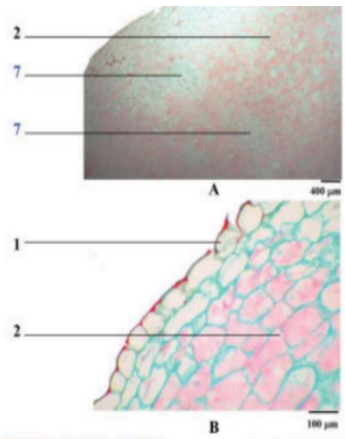

Fig no. 6 Microscopical view of rhizome of paris polyphylla.

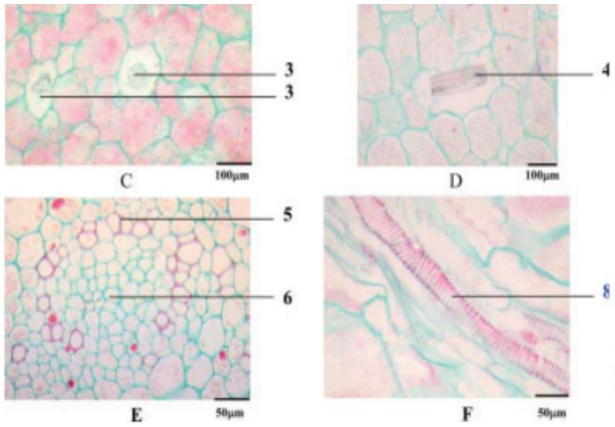

fig. no. 7 microscopical view of rhizome of Paris polyphylla

P. polyphylla Smith's Traverse section of the Rhizome part
A: p. polyphylla traverse section of rhizome outline
B: details of epidermis and cortex.
C: Raphidian cell details, in which raphides are arranged vertically.
D: raphidian cells where raphides radial arrangement can be seen
E: Details showing vascular bundle.
F: vascular bundle detail where radial extends 1 epidermis; 2 cortex; 3 raphides vertical arranged; 4 raphides radial arranged; 5 xylems: 6 Phloem: & vascular bundles; 8 vessels.

The traverse section of P polyphylla is almost circular in outline. The single-layer suberized epidermis cells are rectangular and usually split and get exfoliated as the plant undergoes the growing phase. the vertical raphides in the cells only showed a transverse section of raphide. Irregularly scattered in the vascular cylinder are 17-20 amphivasal bundles, each circular or oval in outline during crossover-section 96-126 µ I diameter. Although there are more than 20 species, significant differences can be found among them.[8]

Adulteration

As the population has been increasing rapidly the demand has therefore been only increasing day by day leading to increased demand. To fulfil the needs of the vast population the drugs are also prone to adulteration by the manufacturing companies, however, for the adulteration the plants have to have the same effect as the Paris Polyphylla for the commercial stock. "*Valerianna Jatamansi*" is the plant mainly used for the adulteration of the Paris Polyphylla Medicinal use. it is cheaper in the market than "Paris Polyphylla", although "Valerianna Jatamansi" has been considered a medicinal plant however the chemical constituent similarity has not been found and their therapeutic effect is unsure. Therefore, the adulterated "Paris polyphylla" intake can cause unsure serious side effects.[7]

Allied Species

classification of Paris, a genus of perennial herbaceous plants, has been a topic of debate among botanists for many years, and no consensus has been reached yet. Several authors have attempted to classify the genus into sub-genus and section, based on the floral and leaf parts within whorls. Hara and Mitchell, for instance, recognized Paris as a single genus, but Hara further divided the 14 known species based on fruit and seed characters into three sections: Paris, Kinugasa, and Euthrya. However, in 1983, Takhtajan proposed a different classification, dividing Paris into three major genera: Paris, Kinugasa, and Daiswa. Despite the ongoing discussion, the distinctiveness and diversity of Paris species remain a fascinating subject of research for botanists, as they continue to explore the morphology, ecology, and evolution of this genus. According to a recent classification by Ji et al., the *Paris* genus is split into two main groups: the subgenus *Paris*, which includes 11 species, and the subgenus *Daiswa*, which includes 13 species. The subgenus *Paris* is further divided into three sections—*Kinugasa*, *Paris*, and *Axiparis*—while *Daiswa* is divided into five: *Dunnianae*, *Euthyra*, *Marmoratae*, *Fargesiane*, and *Thibeticae*. *Paris polyphylla* falls under the subgenus *Daiswa*, specifically within the *Euthyra* section. This species is known to have 11 distinct varieties, including: *Paris polyphylla* var. *smith*, var. *polyphylla*, var. *yunnanensis*, var. *chinensis*, var. *nana*, var. *alba*, var. *stenophylla*, var. *minor*, var. *latifolia*, var. *pseudothibetica*, and var. *kwangtunensis*.[3]

Different Part

Paris polyphylla is highly valued for its medicinal properties, with the rhizome being the most important part used in traditional remedies. However, other parts of the plant also contain bioactive compounds with therapeutic potential. The rhizome, in particular, is known for its strong anti-cancer effects, especially in human lung adenocarcinoma cells, where it promotes apoptosis (programmed cell death) and inhibits tumor growth. Its antioxidant potential has been demonstrated through free radical scavenging, notably in the ABTS

assay. Studies using methanol extracts of the rhizome have shown cytotoxic effects against various cancer cell lines including HeLa, HepG2, and PC3. These extracts have also shown significant antioxidant and antimicrobial properties. Antimicrobial activity has been observed against *Aspergillus niger*, *Staphylococcus aureus*, *Escherichia coli*, and *Trichoderma reesei*, with notable antifungal action particularly against *A. niger*, and some impact on *T. reesei*. Furthermore, extracts using dichloromethane and methanol have been shown to induce apoptosis in chondrosarcoma cells with minimal toxicity to healthy canine chondrocyte cells. Ethanol extracts of the roots have demonstrated the ability to trigger apoptosis in human esophageal cancer cells, while also enhancing the expression of cancer-suppressing genes at both the mRNA and protein levels. Extracts from the rhizome prepared with chloroform, ethyl acetate, and butanol have shown mild to moderate inhibition of tyrosinase, an enzyme linked to pigmentation disorders. The leaves of *Paris polyphylla* have also been found to possess antiviral, antifungal, and antibacterial properties. Methanol extracts from the leaves have shown activity against the chikungunya virus, *Candida albicans*, and various bacteria including *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Listeria innocua*, *Escherichia coli*, *Salmonella enterica*, and *Shigella sonnei*. Additionally, ethanol extracts from the leaves have exhibited anti-cancer activity against human lung cancer cells. The stem extract, particularly with ethanol, has shown promise in treating digestive system cancers by inducing apoptosis. Ethanol extracts of the whole plant have demonstrated activity against a wide range of cancers, including prostate, bladder, colon, lung, liver, leukemia, and breast cancers, as well as showing antimicrobial properties. Notably, steroidal saponins extracted from the rhizome have been identified as key compounds responsible for inducing apoptosis in human lung cancer cells, highlighting the plant's significant potential in cancer therapy.[2]

Geographic distribution, collection and cultivation

Paris polyphylla is a well-known medicinal plant found mainly across East Asia, the Himalayan region, and parts of Europe. It grows in countries like Bhutan, China, India, Laos, Myanmar, Nepal, Thailand, and Vietnam. In India, it is primarily seen in the eastern Himalayan areas. Because it grows in such diverse regions, the plant is known by different local or ethnic names depending on the area.[3]

Collection and cultivation; In the 1990s, China initiated the domestication of Paris sp. despite facing many bottlenecks. Today, the species is cultivated on a large scale and is even a part of the agroforestry system in central Yunan, where Yi healers cultivate it. The government and industry in China provide strong support for the cultivation of Paris sp., with nearly 3,500 hectares of land under cultivation. In contrast, Nepal and India have started small-scale cultivation of this species.[7] From March 2015 to December 2016, a species was recorded in the Dibang Valley of Arunachal Pradesh (280 42'N & 950 42′E), located in the foothills of the eastern Himalayas. The species was found in various forest patches with an altitudinal range of 2,000 to 3,500 meters. It prefers to grow in moist forests with thick canopy cover, humus-rich soil, rhododendrons and bamboo forests with low light intensity, and sloppy areas near the small streams. New leaves sprout from the beginning of March until May, followed by a flowering period from the end of May to June. Seed setting occurs during July and August, and the leaves fall between August and September. The plant undergoes weathering from September to October, and in November, the upper plant parts die, remaining dormant for four months from November to February. Rhizome collection of this species starts with germinating new leaves and continues until the leaves fall from March to October.[21]

Phytoconstituent

Steroidal compounds and their structure identified are.

Table No. 2: Various Distribution Of Paris Polyphylla In India.[12]

State	District	region	Local name
Arunachal Pradesh	Kameng, subansiri, Kurung kumey, Siang, Lohit, Tirapand Chnaglang	-	Do- Tala, Tamma
	Senapati	Hengbung, Maram, Purul and Ma-KIU regions	Singpan
Manipur	Tamenglong	Puilong village	
Uttarakhand	---	---	Satwa
Himachal Pradesh	---	---	---
Jammuand Kashmir	---	---	---
Mizoram	---	---	---
Sikkim	---	---	---
Nagaland	Tuensang	Phansha Village	---
	Phek	Chida region	--
	Kohima	Arudara region	--
	Mokokchung	Longkum village	---
Meghalaya	West Khasi Hill	Nongstoin region	Sohbsein

Table no. 3: steroidal compounds of Paris Polyphylla.

Diosgenin
Pennogenin
Diosgenin-3-O-a-L-rhamnopyranosyl(1→2)-b-D-glucopyranoside
Pennogenin-3-O-a-L-rhamnopyranosyl(1→2)-b-D-glucopyranoside,
Diosgenin-3-o-a-L-rhamnopyranoyl(1→2)[a-Larabinofuranosyl(1 4)]-b-D-glucopyranoside,
Pennogenin-3-O-a-L-rhamnopyranosyl(1→2)-[a-Larabinofuranosyl(1 4)]-b-D-glucopyranoside,
Diosgenin-3-O-a-L-rhamnopyranosyl(1→2)[b-Dglucopyranoside(1-3)]-b-D-glucopyranoside
Diosgenin-3-O-a-L-rhamnopyranosyl(1→4)-a-Lhamnopyranosyl(1-2)-b-D-gucopyranoside
Pennogenin-3-O-a-L-rhamnopyranosyl(1→4)-a-L-rhamnopyranosyl(1-4)[a-L-rhamnopyranosyl(1→2)]-b-D-glucopyranoside

6 compounds were isolated by Devkota in 2005 from the Paris Polyphylla collected from the Parbat district Nepal. The compounds are listed below.

Table no. 4: compounds isolated by devkota in 2005.

Compounds	
Przewalskinone B	1,5-Dihydroxy-7-mthoxy-3-methylanthraquinone
Polyphyllin C	(Diosgenin-3-O[alpha-Lrhamnospyanosyl(1-3)-beta-D-glucopyranoside)
Polyphyllin D	(Diosgenin-3-O[alpha-L-rhamnopyanosyl(1Rha-2Glu)-alpha-L-arabinofurarnosyl(1Ara-4Glu)]-Beta-D-Glucopyranoside)
Saponin-1	(Diosgenin-3-O[alpha-L-rhamnospyranosyl(1Rha-2Glu)-alpha-L-rhamnopyranosyl(1Ara-4Glu)]-Beta-D-Glucipyranoside)
stigmasterol	
Stigmasterol-3-O-beta-D-glucoside	

PHARMACOLOGICAL ACTIVITY

The almost whole plant is useful for medicinal purposes as it contains an enormous number of compounds. the following certain no. of uses are as follows

1. **Anti-cancer activity**; Extensive research has been conducted in China on Paris Polyphylla var. Yunnanensis. Studies on its phytochemistry and pharmacology have identified steroid saponins as the main active compounds with anti-tumor properties. Ethanol and methanol extractions of P. polyphylla have shown anti-cancer activity on various types of cancer cell lines.[16][3], (Polyphyllin D is a component of P. polyphylla that induces apoptosis and autophagy via the JNK1-Bcl-2 pathway, making it useful as an anti-breast cancer treatment.[22]

2. **Lung cancer**; lung cancer is one of the most common causes of cancer death worldwide, despite improvements in cancer treatment the survival rate is less than 20%. Therefore, due to high fatality, there is always room for improvement in the treatment according to the GLOBOCAN estimate of incidence and mortality of 26 cancers done in 2018 the new cases of the lungs were highest with 2,093,876 followed by breast cancer of 2,088,849 out of 18,078,957 total new cases of cancer including 34 other types of cancer making both around 11.6% where the mortality was 18.4% and 6.6%.[26]

Cyclin-dependent Kinases (CDKs) are enzymes that regulate the transition of the cell cycle in mammals. They work together with cyclins, and CDK2, CDK6, and CDK2 complexes are responsible for controlling the interphase of the cell cycle. Overactivation of CDKs can cause uncontrolled cell proliferation, making it an attractive target for anti-cancer treatments. Recent studies have shown that PPI can inhibit the growth of non-small cell lung cancer (NSCLC) and also reverse the co-resistance of palb. When combined with palb, PPI has a synergistic effect, which can be beneficial in the treatment of NSCLC.[27][25] Two steroidal saponins, namely PVI and PVII, have been found to inhibit the proliferation of lung cancer in both A549 and NCI-HI299 cell lines. Additionally, they have been observed to induce apoptosis in the G2/M cell cycle. Furthermore, PVI and PVII have been shown to upregulate the tumor suppressor protein P52, and downregulate cyclin B1.[3]

3. **Breast cancer**: Apoptosis was induced by P. polyphylla, and detected using an ELISA kit that measures cytoplasmic histone-associated DNA fragmentation.[25][3][23] Polyphyllin D (PD) is a powerful anti-cancer compound that is found in the roots and rhizomes of Paris polyphylla Sm. It has been shown to be effective against various types of cancers. However, it is currently unclear whether PD-induced cell death in breast cancer cells involves autophagy, and the underlying molecular mechanism has yet to be fully understood. The study revealed that Polyphyllin D inhibits cell proliferation and induces caspase-dependent apoptosis in breast cancer cells. Moreover, it was found

that PD likely induces autophagy by activating the JNK1/Bcl-2 pathway. The addition of the autophagy inhibitor 3-methyladenine significantly increases PD-induced apoptosis, as shown by the increased percentage of cell death[22] Polyphyllin D is capable of reducing mitochondrial membrane potential.[4]

4. Esophageal cancer: Ethanol extract of roots induced apoptosis in esophageal cancer cells at concentrations of 25, 100, and 200 mg/ml by upregulating the expression of connexin26, a known cancer suppressor gene, at both the mRNA and protein levels.[2]

5. Colon cancer; According to the study conducted by Lian, the ethanolic extract of Polyphylla was found to suppress the growth of DLD-1 colorectal carcinoma cells, with or without chemotherapeutic drug treatment. The study showed that after 24 or 48 hours of treatment with 3.13-50 micrograms/ml ethanol extract of P. Polyphylla, there was a decrease in the cell viability of colorectal cells. The results indicated cytotoxicity in colorectal carcinoma cells. Additionally, an increase in the tumor cell suppression gene was found, which led to apoptosis and autophagic cell death in DLD-1 cells.[24][2]

6. Prostate cancer Paris plant ethanol extract induced apoptosis in PC3 and DU145 prostate cancer cells. The positive cisplatin control was compared to PPEE and found to have better inhibition of prostate cancer cells.[2] Polyphyllin I induced cell cycle arrest in prostate cancer cells at G0/G1 phase concentration dependently by upregulating P21 expression. Additionally, it was demonstrated that Polyphyllin I upregulated P21 expression through the upregulation of IL6 expression.[14]

7. Immune-stimulating properties: The study explored how three diosgenyl saponins derived from *Paris polyphylla* influence immune activity in mouse macrophage cells. These compounds included: 3-O-α-L-rhamnopyranosyl-(1→4)-α-L-rhamnopyranosyl-(1→4)-[α-L-rhamnopyranosyl-(1→2)]-β-D-glucopyranoside, diosgenin-3-O-α-L-rhamnopyranosyl-(1→2)-α-Larabinofuranosyl-β-D-glucopyranoside, and diosgenin itself. The research focused on three key immune responses: phagocytosis, respiratory burst, and nitric oxide production. Results showed that all three saponins significantly boosted phagocytic activity in macrophage cells. This effect increased with concentration, peaked, and then gradually declined at higher doses. The saponins containing sugar chains also triggered a strong respiratory burst—an immune response linked to reactive oxygen production. This response rose with increasing concentrations and then declined after reaching a peak. Interestingly, diosgenin alone (without the sugar moiety) did not initiate a respiratory burst when cells were stimulated with PMA.[14][6]

8. Anti-microbial

I. anti-bacterial

Paris polyphylla contains volatile oils that have shown strong antibacterial effects against *Micrococcus*, *Canthomonas*, *Aerobacter*, and *Brevibacterium*. The roots of the plant have also demonstrated antibacterial activity against various pathogens such as *Bacillus* species, *Salmonella typhi*, *Salmonella paratyphi*, *E. coli*, *Staphylococcus*, and *Neisseria meningitidis*. In addition, researchers identified 25 compounds in the stem and leaves of *P. polyphylla*, 11 of which showed strong antibacterial activity against *Propionibacterium acnes*, a common cause of acne. The aerial parts of the plant were effective against *Bacillus subtilis*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *E. coli*, and *Salmonella flexneri*. Interestingly, the rhizome extract was found to be active specifically against *Staphylococcus aureus*.[14]

II. anti-Fungal- The rhizomes of *Paris polyphylla* have shown antifungal activity against *Cladosporium cladosporioides*, *Magnaporthe oryzae*, and several strains of *Candida albicans*. In addition to this, they have also exhibited antibacterial and antiviral properties.[11]

III. Anti-viral; Methanol extracts from the leaves of *Paris polyphylla* have shown activity against the chikungunya virus, with an IC_{50} value of 8.74 µg/mL. Additionally, Polyphylla saponin I, a compound isolated from the plant, has demonstrated antiviral effects against the influenza A virus.[2]

9. Spermicidal action: The extract of the plant showed strong spermicidal effects on both rat and human sperm. When applied vaginally at a dose of 100 mg per animal, it successfully prevented pregnancy in about 60% of the rabbits tested**.**[25][2]

10. Anti- Leishmania: *Paris polyphylla* has shown mild to moderate activity against Leishmaniasis, a parasitic disease caused by about 20 different species of *Leishmania*. The disease is transmitted by the bite of female *Phlebotomine* sandflies, which include more than 90 known species. Steroidal saponins extracted from the plant's rhizome have demonstrated anti-leishmanial effects, particularly in extracts prepared using chloroform, ethyl acetate, and butanol.[4][2]

11. Anti-uterine bleeding: Abnormal uterine bleeding (AUB) remains a major concern for gynecologists across the globe. Recently, researchers have isolated some spirostanol glycosides from *Paris polyphylla* that act as a new type of compound capable of stimulating uterine contractions. The total steroidal saponins from the rhizome extract of Paris Polyphylla vat. Yunnainensis shows uterotonic activity justifying their usage in the therapy of AUB. It was reported that pennogenin-3-0-alpha -L rhamnopyranosyl (1-4) [alpha-L-rgamopyranosyl(12)]-beta- D-glucopyranoside (PARG)identified in TSSP, was responsible for the

stimulation of myometrial contraction. In Nepal, Paris Polyphylla rhizome has long been used in at least 26 different ways. In China Paris polyphylla is used to treat liver cancer where Indian folklore it has been applied for curing burns, cuts, diarrhoea, dysentery, fever, stomach-ache and wounds.[5][3][2]

ADVERSE EFFECT

Paris polyphyllin I and II are the primary active compounds found in *Paris polyphylla*. However, concerns about liver toxicity from long-term use have limited their progress in clinical research. This hepatotoxicity is mainly linked to disruptions in lipid metabolism and energy balance. PPVI and PPVII are types of pennogenin compounds extracted from *Paris polyphylla*, and although they have potential medicinal value, they have been linked to liver toxicity in humans. The exact mechanism behind this toxicity is still not fully understood. To investigate their effects, a study was carried out using zebrafish as a model. The results showed that even at sub-lethal doses, exposure to PPVI and PPVII led to visible liver changes, including swelling and degeneration of liver cells, increased cell death (apoptosis), and disruptions in key liver function indicators. Due to the potential for harmful effects, especially in pregnant or breastfeeding women, caution is advised when considering treatments involving these compounds—even though the exact reasons for these risks remain unclear.[1][6]

MARKETED FORMULATION

As stated by the Chinese Pharmacopoeia Commission (2015), *Paris polyphylla* is commonly used in traditional Chinese medicine to treat a variety of conditions, including boils, snake bites, carbuncles, sore throat, and injuries causing pain or swelling. It is also an active ingredient in several patented medicinal formulations.

Table no. 4: market formulation of Paris Polyphylla.

Marketed formulation	form	price	Company name
Yunnan Baiyao	Capsules	50.66 cny	Yunnan baiyao group cp., LTD
Gong Xue Ning (GXN) capsule	Capsule/ pills	26.00usd	Wing quon enterprise Ltd.
Jidesheng Sheyaopian			

Saponin extracts from *Paris polyphylla* var. *yunnanensis* have been used to help manage abnormal uterine bleeding. One well-known product, Yunnan Baiyao, is particularly valued for its ability to stop bleeding (haemostasis) and is also used as a treatment for ulcers.[2][18]

CONCLUSION

The review is based on the perennial endangered herb Paris Polyphylla which is of enormous uses such as anti-diabetic, arthritis, snake bite, anti-inflammatory, anti-fungal, anti-bacterial, anti-uterine bleeding conditions, the review is based on the medicinal uses of Paris polyphylla various part of the plant of ethanolic and methanolic extract. The ethanolic extract of plants has high potential to be an anti-cancer drug as various research have proven that the ethanolic extract of Paris polyphylla is potent against the cancer cell lines and inhibits the growth of cell lines by inducing autophagy and necrosis i.e., breast, and colorectal, lungs and prostate cancer. Despite of the huge advantages of Paris Polyphylla, it has come to sight that the drug has high hepatotoxicity adverse effect which is also related to the lipid metabolism and energy metabolism disorder. The long-term use of RPS rhizomic Paris saponin was tested in the pharmacological model zebrafish and rat which showed the phenotypic changes in the rat therefore showing the prominent hepatotoxicity on long term use. The hepatotoxicity is the one of the main reason the is the blocking block for the Paris polyphylla in clinical trials and impeding it to be one of the successful medicines as anti-cancer. However, in traditional Chinese medicines the Paris polyphylla is quite renowned and certain patented medicines are marketed in China namely, Yunnan Baiyao, Gong Xue Ning (GXN) and jidesheng sheyaopian.

REFERENCES

1. Zhiqi Li, Qiqi ean et.al The interaction between polyphyllin I and SQLE protein induces hepatotoxicity through SREBP-2/HMGCR/SQLE/LSS pathway J. of pharma analysis, 2022; 13: 39-54.
2. Thapa CB, Paudel MR, et al Bioactive secondary metabolites in Paris Polyphylla sm. And their biological activities: A review. Heliyon jr. e08982, 2022; 8: 1-7.
3. Puwein A, Thomas Sc. An overview of Paris Polyphylla, a highly vulnerable medicinal herb of eastern Himalayan Region for sustainable exploitation the Natural products jr., 2020; 10: 3-14.
4. Tariq M, Paul Shilpi et al polyphylla smith: an important high value Himalayan medicinal herb: Int. J. adv. Res, 2016; 4(11): 850-857.
5. Kunwar RM et al distribution, use, trade, and conservation of Paris Polyphylla sm. In Nepal ELSEVIER, 2020; 23: 1-9.
6. Shah SA, Choudhary MD medicinal properties of Paris Polyphylla Smith: A review J. of herbal and toxicology, 2012; 6(1): 27-33.
7. Thakur. U, Shashni S. A review on Paris polyphylla Smith: A vulnerable medicinal plant species of a global significance: Journal of applied Research on medicinal and Aromatic plant, 2023; 33: 3-4.

8. DANXUE, HONGXIANG YIN Application of Microscopy in Authentication and Distinguishing of 11 Paris species in west Sichuan, national library of medicine, 2009; 72(10): 744-754.
9. Ramanujam S, Kumar S. species adulteration in the Herbal trade: causes, consequences and mitigation, speinger international publishing Switzerland, 2017; p.no. 2-3.
10. MAYIRNAO H.S, BHAT A.A, Evaluation of Antioxidant and antimicrobial activity of Paris polyphylla SM. Asian journal of pharmaceutical and clinical Res, 2017; 10: 315-319.
11. Arunkumar phyrailatpam, Anju Chaudhary college of Horticulture and Forestry, Arunachal Pradesh, India. Paris Polyphylla: An Important Endangered medicinal plant of Himalayan Foothills. Intech open, 2022; 1-14.
12. Bhat ahmad, Fayaz Myfida. Paris Polyphylla, highly exploited medicinal plant in the Indian Himalayan region jr. of chemical and pharmaceutical sciences, 2017; 10(3): 1205-1213.
13. Tian, Ye and Gong. Anticancer effects of polyphyllin I; An update in 5 years. J.cbi, 2020; 25: 316.
14. Zhang Panel Xiu-feng, Yan cui abc Immuno-stimulating properties of dosgenyl saponins isolated from Paris polyphylla Pubmed, 2007; 1: 17.
15. Zhang D et al polyphyllin 1 induces cell cycle arrest in the prostate cancer cell via the upregulation of IL6 and P21 expression, National library of medicine (Baltimore), 2019; 98(44): 1-7.
16. Puwein A, Thomas s, A review on Paris polyphylla Smith: As an effective and alternative treatment of cancer international journal of Pharmaceutical science invention, 2018; 9(21): 6-12.
17. Paul A, gajurel PR threats and conservation of Paris polyphylla an endangered, highly exploited medicinal plant in the Indian Himalayan region Biodiversities, 2015; 16(2): 295-302.
18. Xu Zhe-qi et al the efficacy of Yunnan baiyao on haemostasis and antiulcer: a systemic review and meta analaysis of randomized controlled trials national library of medicine pubmed, 2014; 7(3): 461-481.
19. Wang G.-X., Han J. Anthelmintic activity of steroidal saponins from Paris polyphylla NIH, Phytomedicine, 2010; 17(14): 1102-1105.
20. Chauhan H. Paris polyphylla, love apple the IUCN red list of threatened species. IUCN red list threatened species, 202; 1-7.
21. Roy Jk, ahmed Mf report on unstainable wild collection of Paris polyphylla [smith 1813], a high valvued medicinal plant from Dibang valley, Arunachal Pradesh, India 200's print journal, 2018; 33(7): 19-21.
22. Liu, et al polyphyllin D induces apoptosis and protective autophagy apoptosis and protective autophagy in breast cancer cells through JNKl-BCl-2 pathway J. of ethnopharmacology, 2022; 282.
23. Lee MS. et al effects of polyphyllin D, a steroidal saponin in Paris polyphylla, in growth Inhibition of Human breast cancer cells and Xenograft national Library of medicine, 2005; 4(11): 1248-1254.
24. Liang-Tzung et al Paris Polyphylla inhibits autophagy and enhancing the efficacy of chemotherapeutic drug Doxorubicin national library of Medicine, 2019; 24(11): 2102.
25. Kumar M.H, Dhiman V anticancer activity of Hydroalcoholic extract from Paris polyphylla rhizomes against human As49 lung cancer cell lines using MTT assay. International research journal of pharmacy, 2014; 5(4): 290-294.
26. Sung H.et al Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. A Cancer Journal of Clinicians, 2021; 71(3): 209-249.
27. Shen z. et al, polyphyllin l, a lethal partner of palbociclib, suppresses non-small lung cancer through activation of p21/CDK2/RB pathway in vitro and in vivo taylor and francis group, 2021; 20(23): 2494-2506.