

***Hedychium spicatum* Buch.Ham. – An Overview**

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Summary

Hedychium spicatum Buch. Ham. (Zingiberaceae), commonly known as spiked ginger lily, is found in the entire Himalayan region. Traditionally, the rhizomes are used in the treatment of respiratory disorders, fevers, tranquilizer, hypotensive, antispasmodic, CNS depressant, analgesic, anti-inflammatory, antimicrobial, antioxidant, antifungal, pediculicidal and cytotoxic activities. The aim of the present paper is to give a detailed literature review on Pharmacognosy, phytochemistry and pharmacological activities reported till date.

Key words: *Hedychium spicatum*, Pharmacognosy, Phytochemistry, Pharmacological activities, review.

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Introduction

Hedychium spicatum Buch. Ham. (Zingiberaceae), commonly known as spiked ginger lily, is found in the entire Himalayan region^{1,2}. Traditionally, the rhizomes are used in the treatment of respiratory disorders, fevers, tranquilizer, hypotensive, antispasmodic, CNS depressant, analgesic, anti-inflammatory, antimicrobial, antioxidant, antifungal, pediculicidal and cytotoxic activities^{3,4,5,6}. The aim of the present paper is to give a detailed literature review on Pharmacognosy, phytochemistry and pharmacological activities reported till date.

PLANT PROFILE:

Hedychium spicatum Buch. Ham (Fam: Zingiberaceae) is commonly known as Spiked ginger lily, has a rich history of use in India. It is a perennial rhizomatous herb, commonly found in Western and Central Himalayas at altitudes 3500-7500 ft. The rhizomes are an article of commerce which is called as Kapur kachari in Indian bazaar. It has been valued in the Traditional

System of Medicine for possessing variety of therapeutic properties like carminative, expectorant, tranquilizer, stomachic, antiseptic, vasodilator, analgesic, anti-inflammatory, antimicrobial, antifungal, antioxidant, pediculicidal and cytotoxic activities^{3,4,5,6}.

Fig 1: Fresh Rhizomes [Chopped]



CLASSICAL NAMES³:

Shati, Suvrata, Gandhamulika, Gandharika, Gandhavadhu, Prithu palashika, Gandhapalashi.

VERNACULAR NAMES⁶:

- ❖ English - Spiked ginger lily.
- ❖ Hindi - Kapurkachari.
- ❖ Bengali - Shati, Kachri, Kapurkachari.
- ❖ Gujarati - Kapurkachari, Kapurkachali, Kapur.
- ❖ Kannada - Goul kachora, Seena kachora, kachora, Gandhashati.
- ❖ Malayalam - Katcholam, Katchooram.
- ❖ Marathi - Kapurkachari, Gablakachari.
- ❖ Punjabi - Kachur, kachoor, Bankela, Kachur, Banhaldi, Shalwi, Sheduri.
- ❖ Tamil - Poolankizangu, Kichili Kizongu.
- ❖ Telugu - Gandhakachuralu.
- ❖ Oriya - Gandhasunthi.

SCIENTIFIC CLASSIFICATION:

Kingdom : Plantae.

Division: Magnoliphyta.

Class: Liliopsida.

Order: Zingiberales.

Family: Zingiberaceae.

Genus: *Hedychium*.

Species: *spicatum*.

BOTANICAL DESCRIPTION OF THE PLANT:

It is a perennial rhizomatous herb, up to 1 mt. tall with elongate stem. It closely resembles *Hedychium coronarium* but the leaves are glabrous beneath and the white ascending flowers are borne in dense terminal spikes and hence the name spiked ginger lily. Leaves are about 30 cm or more in length, oblong, lanceolate, very variable in breadth, glabrous. Spike is 30 cm, dense flowered; bracts large, oblong, obtuse, green, 2.5-3.8 by 2 cm broad, 1-flowered, calyx shorter than bract; flowers white, ascending and closely imbricate. Corolla tube 5-6.3 cm; segments 2.5 cm; linear; staminodes 2.5 cm; lanceolate, lip cuneate, deeply bifid, 13-20 mm, broad, not at all clawed, lobes 2, rounded; stamen rather shorter than the lip; filament pale red; anther linear, 6-8.5 mm. Fruit is capsule type; glabrous and globose^{7,8}.

Rhizomes are 15-20 cm long; 2.0-2.5 cm in diameter, externally yellowish-brown, but change to dark brown on storage, drug available in pieces of 2.5 cm diameter and one edge of each piece is covered by a rough reddish brown layer marked with numerous scars and circular rings; rudiments of rootlets are visible⁹.

DISTRIBUTION:

It is a perennial rhizomatous herb, growing in the parts of Western and Central Himalayas at altitudes of 3500-7500 ft^{1,3}.

PARTS USED: Rhizomes.

CULTIVATION:

This plant requires a rich moist soil and sunny weather. It can be grown in a sunny border as a sub-tropical bedding plant, tolerating temperatures down to -2°C. Plant has been known to withstand temperatures down to -16°C in Germany. It is immune to the predation of rabbits. The tubers should only be just covered by the soil⁹.

TRADITIONAL USES:

The rhizomes are white and starchy within and are employed in the preparation of Abir, a fragrant colored powder used during Holi festival and in religious ceremonies. They are considered to have insect-repelling properties and are used for preserving clothes. They may be employed as an auxiliary in dyeing to impart a pleasant smell to fabrics. They are used with henna to produce perfumed cloth known locally as Malagiri cloth. Pounded rhizomes are reported to be used also for perfuming tobacco. The rhizomes are stomachic, carminative, stimulant, tonic and are used in dyspepsia in the form of powder or decoction. They enter into the preparation of cosmetic powders used for promoting hair growth. They are used in Bengal, after frying or mixing with other ingredients as chars or perfumed baits for fish. They are much used in veterinary medicine. The powdered rhizome in divided doses is used in conditions like bronchial asthma, cough, chest heaviness, sleeplessness, loss of appetite and pulmonary eosinophilia. The rhizomes are also used in dyspepsia, diarrhea, piles, liver complaints, ulcers, skin diseases and rheumatoid arthritis. The essential oil of the rhizome is used to check seed-borne diseases of crops and has mild tranquilizing activity. The rhizomes showed significant analgesic, anti-inflammatory, cytotoxic, antimalarial and pediculicidal activity. It also acts as antidote for snake-bite. It is used in conditions like poor circulation due to thickening of blood vessels. It forms one of the ingredients of herbal vanishing cream^{2,3}.

AYURVEDIC PROPERTIES:

Rasa - Katu, Tikta, Kashaya.

Guna - Laghu, Teekshna.

Veerya - Ushna.

Vipaka - Katu.

Doshagnata - Kaphavatashamaka.

Rogagnata - Sandhishotha, Shoola, Dantashoola, Mukhadurgandha, Vrana, Apatantraka, Amavata, Aruchi, Agnimandhya, Adhamana, Udarashoola, Atisara, Arsha, Hriddaurbalya, Raktarikara, Pratishyaya, Kasa, Shwasa, Hikka, Twagdosha.

Karma - Shothakara, Vedansthapana, Durgandhanashana, Mukhashodhana, Keshya, Rochana, Deepana, Shoolaprashamana, Grahi, Uttejaka, Rakthashodhaka, Jwaraghna, Shwasahara, Hikkani-grahana².

DOSE: Rhizome powder 1-3 g.

PHARMACOGNOSY

Morphological examinations

Organoleptic evaluation of the rhizomes:

Color: Reddish brown bark outside; white and starchy inside.

Size: 0.5 inch or less in diameter and up to 0.25 inch in thickness.

Odour: Strong aromatic odour.

Taste: Bitter camphoraceous taste.

Surface characteristics: Rhizomes are thick, knotted with fibrous rootlets attached here and there¹⁰.

TRANSVERSE SECTION OF RHIZOME:

Transverse section of rhizomes shows an outermost thick layer of submersed, dark brown cells of outer cork consisting of 10-15 or more layers of irregular parenchymatous cells; inner cork consisting of a few layered light brown, rectangular, radially arranged cells followed by a wide zone of cortex. Some cortical cells are filled with flattened and oval-oblong starch grains, numerous oleo-resinous cells are also found in this region which has submersed cells containing green-yellow oil. Central cylinder is distinguished by the presence of peripheral plexus of irregular congested vascular bundles with poorly developed mechanical tissues. Vascular bundles, scattered throughout the ground tissue are closed and collateral, possessing group of two or more xylem elements. Ground tissue is composed of large parenchymatous cells with abundant starch grains and oil^{11,12}.

POWDER MICROSCOPY:

Powder is light brown in color, with aromatic odor and characteristic bitter taste. The powder microscopy reveals

Fragments of parenchymatous cells, vessels.

Fragments of cork cells

Fragments of abundant calcium oxalate crystals.

Fragments of cells with oleo-resinous matter filled inside.

Fragments of fibers^{11,12}.

QUANTITATIVE STANDARDS¹¹:

Table No: 1. Table representing the quantitative standards of *H. spicatum*.

Sl no.	Physical parameter	Constant values
1	Foreign matter	NMT 1 % w/w
2	Total ash	NMT 8 % w/w
3	Acid insoluble ash	NMT 2 % w/w
4	Alcohol soluble extractive	NLT 4 % w/w
5	Water soluble extractive	NLT 8 % w/w

Determination of physical constants of yellow essential oil:

Specific gravity: 0.934; acid value: 1.13; ester value: 140.53 and saponification value: 141.67 were determined¹.

FORMULATIONS AND PREPARATIONS:

Eranda paka, Shribahushalo guda, Dantodbhedagantaka rasa, Katphaladi churna, Pippalyadi taila, Aravindasava, Ushirasava, Chandanasava, Sarivadyasava, Amritaprasha ghrita, Pradarantaka lauha, Agastyaharitaki rasayana, Shatyadi kvatha².

TRADE AND COMMERCE:

Retail market price – rhizome Rs 175/kg (1999)¹³.

SUBSTITUENTS AND ADULTERANTS:

Rhizomes of *Kaempferia galanga* Linn. are also used under the same name Shati¹³.

PHYTOCHEMICAL REVIEW:

Various types of phytochemical investigations have been carried out for *Hedychium spicatum*. All of these investigations explored novel compounds from the plant which is summarized below.

CHEMICAL CONSTITUENTS:

α - pinene, β - pinene, limonene, 1,8 - cineole, 2 - alkanones, linalool, camphor, linalyl acetate, β - terpineol, borneol, β - caryophyllene, γ - cadinene, humulene, terpinolene, p - cymene, benzyl cinnamate, benzyl acetate, linalyl acetate, γ - terpinene, β - phellandrene, methyl paracumarin acetate, cinnamic ethyl acetate, ethyl - p- methoxy cinnamate, ethyl cinnamate, d - sabinene, sesquiterpene - cadinene, sesquiterpene alcohols, sesquiterpene hydrocarbons, drimane and labdane derivatives, drim - 8(12) - en -11- al, 11- nordermi - 8 - en -12 - al, trans - 5,5,8 - alpha - trimethyldecal - 2- one and γ - bicyclohomofarnesal (ambral), drim - 8(12) - ene, 15,16 - bisnorlabda - 8(17) - dien -14 - al (essential oil)^{14,15,16,17}; diterpene 6 - oxo - labda, 7,11,13 - trien - 16 - oic acid lactone, hedychenone¹⁸, 7 - hydroxyhedychenone¹⁹; 6-oxo-labda-7, 11,13-trien-16-oic acid lactone²⁰; cineole, limonene, β - caryophyllene, β - terpineol, linalool, β -phellandrene, p-cymene; 7-hydroxy hedychenone, benzyl cinnamate, 1, 8-cineole, benzyl acetate and linalyl acetate^{21,22}; 7- hydroxyl hedychenal and spicatanic acid²³ and spicatanol and spicatanol methyl ether²⁴.

PHARMACOLOGICAL REVIEW:

The following are the pharmacological actions of *Hedychium spicatum* reported till date.

TRANQUILIZING ACTION:

Essential oil of rhizomes of *H. spicatum* was reported to possess mild tranquilizing action of short duration. It depressed conditioned avoidance response, rota rod performance and potentiated the phenobarbitone hypnosis and morphine analgesia in rats²⁵.

ANALGESIC AND ANTI-INFLAMMATORY ACTIVITY:

The benzene extract of rhizome of *H. spicatum* possessed significant analgesic activity in acetic acid induced writhing in mice whereas 50 % ethanol and hexane extracts of rhizome was found to possess significant anti-inflammatory activity in carrageenan induced hind paw edema in mice²⁶.

PEDICULICIDAL ACTIVITY:

The essential oil extracted from the rhizomes of *H.spicatum* was evaluated for *in vitro* pediculicidal activity. At 5 %, 2 %, 1 % concentration, the essential oil showed more significant activity than 1 % permethrin based product²⁷.

ANTIMICROBIAL ACTIVITY:

Essential oil extracts from the rhizome of *H. spicatum* showed antimicrobial activity. Petroleum ether and chloroform extracts showed inhibitory activity against gram (+), gram (-) bacterial cultures, including a strain of methicillin and vancomycin resistant *Staphylococcus aureus* and fungal cultures²⁸.

Terpenoid compositions of the rhizome of *H.spicatum* also showed significant antimicrobial activity against *Staphylococcus aureus*, *Shigella flexneri*, *Pasteurella multocida* and *Escherichia coli*²⁹.

Ethanol extract of fruits of *H. spicatum* was reported to possess antibacterial and antifungal properties against *Salmonella* sps. *Escherichia coli* and filamentous fungi³⁰.

ANTIOXIDANT ACTIVITY:

Terpenoid compositions of rhizome of *H. spicatum* were found to possess antioxidant activity. The rhizome essential oils of *H.spicatum* collected from three different regions exhibited difference in the relative content of essential oils which were studied for their antioxidant activity by DPPH radical scavenging activity, reducing power, and effect on the chelating properties of Fe²⁺. The rhizome essential oil from all the regions exhibited moderate to good Fe²⁺ chelating activity where as the essential oil exhibited a completely different DPPH radical scavenging profile²⁹.

ANTIMALARIAL ACTIVITY:

The 50 % extract of the rhizome of *H. spicatum* showed antimalarial activity against *Plasmodium berghei* strain (NK 65)³¹.

CYTOTOXIC ACTIVITY:

Phytochemical investigation of CHCl₃ extract of rhizomes of *H.spicatum* led to the isolation of two new labdane type diterpenes. All the isolates were tested for their cytotoxic activity against Colo-205 (Colo-cancer), A-431 (Skin- cancer), MCF-7 (Breast- cancer), A-549 (Lung -cancer), and Chinese hamstar ovary cells (CHO). The two new labdane diterpenes exhibited good cytotoxic activity³².

HYPOCHOLESTEROLEMIC EFFECT:

Chronic administration of β -sitosterol subcutaneously to rats for 60 days was well tolerated and there was no clear cut evidence of any gross or microscopic lesions either in the liver or kidney. Liver and kidney function tests were assessed by determining the blood/serum parameters like hemoglobin, blood glucose, serum protein, serum bilirubin, serum cholesterol, serum GPT and serum GOT. All the parameters were in the normal range except serum proteins and serum cholesterol. Serum cholesterol was the only variable which depleted markedly in both the sexes in a dose dependent manner suggesting intrinsic hypocholesterolemic effect of sterol³³.

ANTHELMINTIC ACTIVITY

The anthelmintic activity of rhizomes of *H. spicatum* against adult Indian earthworms, *Pheretima posthuma* was evaluated. The time taken for each worm for paralysis and death was determined. The results were compared with that of standard i.e., piperazine citrate. Methanol extract of *H. spicatum* produced dose dependent anthelmintic activity whereas aqueous extract was not all effective. Methanol extract showed better anthelmintic activity when compared with the standard drug piperazine citrate³⁴.

CLINICAL TRIALS:

BRONCHIAL ASTHMA.

The powdered rhizome of *H. spicatum*, given 10 g in divided doses to 25 patients with recurrent paroxysmal attacks of dysopnea (bronchial asthma) for 4 weeks, completely relieved dysopnea, cough and restlessness in all the patients. The ronchi completely disappeared in 36 % of the patients. The mean respiration rate was reduced by 25 % and the vital capacity was increased by 20 %. The mean absolute eosinophil count also declined by 55.6 %. In another study 16 patients of bronchial asthma were given 1 g of powder thrice daily for 21 days, with plain water. The chief complaints like breathlessness, cough, chest heaviness, loss of appetite, uneasiness during exercise and sleeplessness etc were relieved with varying degree of relief in all the patients³⁵.

PULMONARY EOSINOPHILIA.

In a clinical study, 15 patients of tropical pulmonary eosinophilia were treated with the powder of *H. spicatum* in the dose of 6 g b.i.d. After 4 weeks of treatment, the eosinophil count was reduced by 60.54 %³⁶. In another clinical study conducted on children suffering from tropical pulmonary eosinophilia, *H. spicatum* was found to give relief in signs and the symptoms and reduce the blood eosinophil level in dose of 70 mg/kg of body weight. Though most of the symptoms were relieved within one to three weeks period, radiological findings and lymphadenopathy were normalized after a considerably prolonged period³⁷.

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