

# *Hedychium spicatum* (Shati): A Comprehensive Review of its Pharmacological Activities and Phytochemical Constituents

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## ABSTRACT

Ayurvedic medicine, originating from historical Indian customs, is a comprehensive and revered treatment approach that recognizes the inter-connectedness of the body, mind, and spirit. *Hedychium spicatum* Buch-Ham (Zingiberaceae), sometimes called spiked ginger lily, is distributed throughout the Himalayan area. The rhizome contains around 4% essential oil, and its phytochemical analysis has revealed the existence of many terpenoids, including monoterpenoids, sesquiterpenoids, and diterpenoids. The rhizomes of *Hedychium spicatum* Buch. Ham are conventionally employed for treating pain, inflammation, asthma, respiratory problems, and fevers, tranquilizing, lowering blood pressure, reducing spasms, depressing the central nervous system, alleviating pain, reducing inflammation, acting as an antihistamine, fighting against microbes, acting as an antioxidant, combating fungal infections, eliminating lice, and exhibiting toxic effects on cells. *Hedychium spicatum* Buch-Ham is a rhizomatous plant utilized in the pharmaceutical, culinary, cosmetic, and fragrance sectors. This review article will provide a concise overview of many features of *Hedychium spicatum*, including its pharmacological effect and bioactive components.

**Keywords:** Ayurvedic Medicine, *Hedychium Spicatum* Buch-Ham, Inflammation, Anti-Histaminic.

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**Received:** 07-04-2025;

**Revised:** 16-06-2025;

**Accepted:** 25-08-2025.

## INTRODUCTION

Ayurveda is an ancient medicinal system that has been practiced for thousands of years on the Indian subcontinent. A basic theory of Ayurveda is the tridosha system, which is used to comprehend health and illness.<sup>[1]</sup> The notion of tridosha, which encompasses the three major doshas, of vata, pitta, and kapha, is a fundamental principle of Ayurveda. It originates from the initial chapter of the oldest Ayurvedic literature, known as the Charaka Samhita.<sup>[2]</sup> Ayurveda is often regarded as the most ancient kind of medical knowledge by several scientists. Ayurveda, derived from Sanskrit, translates to "The Science of Life." Ayurvedic wisdom has its origins in India more than five thousand years ago and is sometimes referred to be the "Mother of All Healing".<sup>[3]</sup> Ayurveda, derived from the Sanskrit words "Veda" meaning wisdom, and "Ayur" meaning life, is an ancient medicinal system that is still extensively used in the Indian region.<sup>[4]</sup> Ayurvedic treatment focuses on promoting health rather than combating disease. Ayurveda during daily life attempts to preserve a harmonious balance between nature and humans, thereby ensuring optimal

health. Allergy is an immune-mediated illness that encompasses conditions such as asthma, rhinitis, atopic eczema, and dermatitis syndrome.<sup>[5]</sup> Anaphylaxis is an exaggerated reaction to the linking of antigens with IgE antibodies attached to mast cells. This causes the mast cells to release various substances such as histamine, prostaglandins, proteases, leukotrienes, and pro-inflammatory and chemotactic cytokines.<sup>[6]</sup> These substances then trigger smooth muscle contraction, vasodilation, increased permeability of blood vessels, and excessive production of mucus.<sup>[7]</sup>

## Description of *H. spicatum* from a botanical and nativity perspective

This plant (Figure 1),<sup>8</sup> known as *Hedychium Spicatum*, belongs to the Zingiberaceae family. It is a resilient perennial herb that typically reaches a height of 1-2 m. The plant features vibrant green leaves and eye-catching orange-whitish flowers. It is commonly referred to as Shati in Ayurvedic texts, Kapoor Katcheri in Hindi, and is also known as "Spiked Ginger lily" in general. The leaves measure approximately 30 cm in length and have an oblong, lanceolate shape. They can vary in width and have a smooth surface. Spike measures 30 cm and is filled with an abundance of flowers. The bracts are sizable, elongated, and have a green colour. Flowers have both male and female reproductive parts, growing upwards and overlapping tightly. The corolla tubes measure 5-6.3 cm, with segments that are 2.5 cm long. The shape of the segments



DOI: 10.5530/pres.20252217

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is lanceolate, while the lip is cuneate and deeply bifid, appearing broad and not clawed. The filaments are pale red, and the anther is linear, measuring 6-8.5mm. The fruit has a capsule-like structure, with a smooth and round appearance. When it is ripe, the three valves open up, revealing many small black seeds surrounded by a red aril. The rhizomes (Figure 2)<sup>8</sup> measure 15-20 cm in length and have a diameter of 2.0-2.5 cm. They have a yellowish-brown color externally, which darkens to dark brown when stored.<sup>[9-13]</sup> *Hedychium spicatum* is a herb that is native to the southeast Asian regions<sup>[14,15]</sup> and is primarily found inside the Himalayan Zone.<sup>[16]</sup> The rhizomes of *H. spicatum* Buch-Ham are highly regarded in the Traditional System of Medicine for their wide range of therapeutic properties. These include carminative, expectorant, tranquilizer, stomachic, antiseptic, vasodilator, anti-inflammatory, analgesic, antibacterial, antihistaminic, antifungal, antioxidant, pediculicidal, and cytotoxic activities.<sup>[17,18]</sup>

### Exploring the chemical components of *H. Spicatum*: *Hedychium spicatum*

There are several applications for *Hedychium spicatum* rhizome extract and its byproducts in the agricultural and medical industries. Essential oil, starch, resins, organic acids, glycosides, albumen, and saccharides are all found in abundance in *H. scopatum*, which has been recommended for use in the treatment of bronchitis, diarrhea, inflammations, stomachic disorders, indigestion, and eye diseases. According to reports, the essential oil has anti-inflammatory, anti-histaminic, and anti-microbial properties against illnesses caused by bacteria and fungus.<sup>[19,20]</sup> About 4% of rhizome is made up of essential oil, and phytochemical studies have revealed the presence of many terpenoids, including monoterpenoids and diterpenoids.<sup>[21]</sup> *H. spicatum* essential oil has been found to contain  $\alpha$ -pinene, 7-hydroxyhedychenone,  $\gamma$ -terpinene, 1,8-cineole, d-sabinene,  $\beta$ -pinene, spicatanol, p-cymene, linalool,  $\beta$ -phellandrene,  $\gamma$ -cadinene, cinnamic ethyl acetate, 2-alkenones, ethyl cinnamate, benzyl acetate, spicatanic acid, ethyl-methoxycinnamate, sesquiterpene hydrocarbons, lindylactate, limonene, terpinolene, methyl paracumarin acetate, and  $\beta$ -terpineol.<sup>[22]</sup>

### Exploring the Therapeutic Application of *H. Spicatum*

#### Anti-histaminic Effect

Histamine is a biogenic amine that has a significant impact on a range of physiological and pathological procedures within the human body. When there is an allergic reaction or an inflammatory response, basophils and mast cells release it, which can lead to symptoms like itching, redness, and inflammation. Antihistamines are frequently employed to counteract the impacts of histamines. Antihistamines belong to a group of medications that counteract the effects of histamine by attaching to its receptors, providing relief from symptoms caused by histamine release. Understanding anti-histaminic activity involves studying the capacity of a substance, usually a medication, to hinder or

counteract the harmful effects of histamine. This activity is especially important in the context of allergic responses such as hay fever, urticaria, and various other diseases where histamine release plays a major role in causing symptoms.<sup>[23]</sup> Antihistamines work by attaching to the receptors for histamine, which come in two main types: H1 receptors as well as H2 receptors. The H1 receptors play a significant role in allergic symptoms and can be found in different tissues such as the skin, veins, and respiratory tract. H2 receptors are mainly found in the gastrointestinal tract and are involved in the secretion of gastric acid. First-generation antihistamines can bind both the H1 and H2 receptors, resulting in sedative effects. Second-generation antihistamines have a higher level of selectivity for H1 receptors, which reduces the likelihood of causing sedation.<sup>[24]</sup> Shati (*Hedychium spicatum*) and Badar (*Ziziphus jujube*) herbs are used in Shati Vati, an Ayurvedic concoction, as an anti-histaminic. Fever, colds, and respiratory conditions are treated with Shati Vati.<sup>[25]</sup>

#### Anti-Microbial Effect

Antimicrobial activity was demonstrated by essential oil extracts from *H. spicatum*'s rhizome. *Hedychium spicatum* extracts in petroleum ether and chloroform shown inhibitory action against both Gram (+) and Gram (-) bacterial cultures, including fungal cultures and a strain of Dimethylsulfoxide methicillin and vancomycin-resistant *Staphylococcus aureus*. While *Hedychium spicatum*'s ethanol fruit extract shown antibacterial qualities against *Salmonella* spp., the rhizome terpenoid component of the plant was found to have antimicrobial action against *Staphylococcus aureus*, *Shigella flexneri*, *Pasteurella multocida*, and *Escherichia coli*. Filamentous fungus and *Escherichia coli*.<sup>[26,27]</sup>

#### Anti-inflammatory Effect

The species' alcoholic extract has strong anti-inflammatory properties against carrageenan-induced hind paw oedema in



Figure 1: *Hedychium spicatum* Buch-Ham Plant.<sup>8</sup>



**Figure 2:** Rhizome of *H. spicatum* Buch-Ham.<sup>8</sup>

mice and rats.<sup>[28]</sup> The dry rhizome of *H. spicatum* was tested for antihistaminic and ulcer-protective properties in Guinea Pigs (GP), anti-inflammatory and analgesic properties in rats, and acute toxicity in mice using aqueous and ethanolic extracts.<sup>[29]</sup> This plant's rhizome is rich in flavonoids, essential oils, and other bioactive substances that support its anti-inflammatory properties. *Hedychium spicatum* may be used as a treatment for inflammatory diseases because of these chemicals' documented ability to suppress inflammatory mediators such as prostaglandins and cytokines.<sup>[30]</sup>

### Antioxidant Effect

Ayurvedic medicine has long utilised the medicinal herb *Hedychium spicatum*, sometimes referred to as Shati, for its therapeutic effects, which include antioxidant qualities. The bioactive components of Shati (*Hedychium spicatum*), a medicinal plant belonging to the Zingiberaceae family, such as flavonoids, phenolic acids, terpenoids, and essential oils, are responsible for its antioxidant action. These substances significantly reduce lipid peroxidation, scavenge free radicals, and boost natural antioxidant enzymes like catalase and superoxide dismutase. Its ability to reduce oxidative stress has been shown *in vitro* by assays such as DPPH, ABTS, and FRAP, which makes it useful for therapeutic applications in the treatment of ailments including inflammation, neurological diseases, and cardiovascular diseases.<sup>[30,31]</sup> Its significant antioxidant qualities further emphasise its potential for application in formulations for medications, nutraceuticals, and cosmetics.

### CONCLUSION

Shati (*Hedychium spicatum*), a well-known medicinal herb in traditional medical systems, has a wide range of pharmacological activities, such as antioxidant, antimicrobial, anti-inflammatory, and hepatoprotective properties, which are attributed to its rich

array of bioactive constituents, including flavonoids, terpenoids, phenolic compounds, and essential oils. The plant has a lot of therapeutic potential, especially in treating inflammatory conditions, respiratory disorders, and gastrointestinal problems. Despite the fact that research has shown that the plant has a variety of biological effects and a chemical profile, more thorough studies are required to clarify the molecular mechanisms behind its actions, optimise its extraction techniques, and assess its safety and effectiveness through clinical trials. This will open the door for its incorporation into contemporary therapeutic practices and the creation of new herbal formulations.

### CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

### SUMMARY

Ayurveda, a traditional Indian medicine practice, is based on the tridosha hypothesis, emphasizing environmental balance and human welfare. It's considered one of the oldest therapeutic sciences. Allergies, immune-related disorders, are caused by the interaction of antigens with mast cell IgE antibodies, leading to severe allergic reactions. This review article highlight a concise overview of many features of *Hedychium spicatum*, including its pharmacological effect and bioactive components.

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**Cite this article:** Joshi K, Sen A, Sen DB, Zanwar AS, Gujariya V. *Hedychium spicatum* (Shati): A Comprehensive Review of its Pharmacological Activities and Phytochemical Constituents. *Pharmacog Res*. 2025;17(4):1183-6.