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A REVIEW ON PHARMACOGNOSTIC AND PHARMACOLOGICAL APPROACH OF DIFFERENT SPECIES OF HEDYCHIUM

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Abstract:
Kapur kachari is commonly known as "spiked ginger lily", "white butterfly lily". Botanically it is called as Hedychium coronarium belonging to family Zingebereceae. The Hedychium genus recorded more than 80 different species. Medicinally Hedychium spicatum & Hedychium coronarium species have reported pharmacological activities viz. anti-diabetic, anti-microbial and anti-fungal, antioxidant, anti-inflammatory etc. Hedychium coronarium is found in Himalaya region in India, and tropical and subtropical region of Asia and Africa. Hedychium coronarium mainly contains 93% - 99% of volatile oil viz. 1, 8-cineole, β-pinene, and α-terpineol, linalool. The present review is designed to evaluate phytopharmacological screening and different traditional uses of Kapur kachari. Both flowers and rhizomes of Hedychium coronarium have been used traditionally to cure cough, asthma, nausea, local inflammation as well as used in modern medicine. The medicinal importance of this plant is mentioned in Ayurveda, Charaka Samhita and Sushruta Samhita. Hedychium is perennial rhizomatous herbs, light greyish-green externally. Leafy shoot 20–50 cm high, slanting with erect inflorescence. Flowers are long and white, orange-red or creamy colored.

Keywords: *Hedychium coronarium, Ayurveda, Volatile oil, Zingebereceae, phytopharmacological* .

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INTRODUCTION:

***Hedychium coronarium* Plant Profile:-**

Natural products have been used traditionally to cure many diseases. The medicinal plants are rich in secondary metabolites, which are potential sources of drugs and essential oils of therapeutic importance. Medicinal plants are widely used in various ailments, because of their safety besides being economical, effective and their easy availability [1]. Now a day's secondary metabolites from natural sources like alkaloids, glycosides, volatile oils etc. used in commercially available traditional medicines. *Hedychium coronarium* J. König is a perennial growing to 1.5 m (5 ft) by 1 m (3 ft 3in) herb. It is in flower from Aug to October [3]. Another species of Hedychium; *Hedychium spicatum* grows well in moist soil, sunny position and wide range of climatic conditions of forest margins from 1500 to 2800m altitude. Plants seem to be immune to the predations of rabbits. The tubers should only just be covered with soil. The plant prefers light (sandy), medium (loamy) and heavy (clay) soils. The plant thrives better in acid, neutral and basic (alkaline) soils. It cannot grow in the shade and susceptible to frost [6].

Hedychium coronarium J. König is belonging to family Zingibereceae. Kapur kachri is hard, perennial, tall-growing herb. The flowers are hermaphrodite (have both male and female organs). The seed is aromatic, carminative and stomachic [2]. The medicinal value of this plant in the therapeutic field is mentioned in Ayurveda, Charaka Samhita and Sushruta Samhita. The rhizomes gave furano-diterpene, hedychenone, an anti-inflammatory principle, and also cytotoxic principles as labdane-type diterpenes [4]. The leaves are simple arranged in alternate manner; flowers are white in color with pleasant fragrance. The rhizomes of *Hedychium coronarium,* which have a strong aromatic odour, are a well-known crude drug used as an aromatic stomachic in China and India.

PHARMACOGNOSY OF *Hedychium coronarium* [5,7]:

Common Name:- Garland flower, ginger lily, and kahili ginger.
Family: - Zingiberaceae.
Habitat:- Throughout the moist parts of India, up to 2000m. Also grown in gardens of Assam and South India.
English: - Ginger Lily.
Ayurvedic: - Shati (related species).
Flower color & Characteristic: Pleasant fragrance; summer flowering; fall flowering.
Leaf arrangement: Alternate and simple. 30 cm long and slightly broader.
Shrub, Tubers:- Thick, oblong, potato like and scented.
Plant bears flowers and fruits in rainy season.
External use: - In arthritis and wounds
Internal use:- Anti-diabetic, anti-microbial and anti-fungal, antioxidant, anti-inflammatory anti inflammatory, antirheumatic, febrifuge, tranquilizer, Carminative, Appetizer

PHYTOCHEMICAL DESCRIPTION OF DIFFERENT SPECIES OF *HEDYCHIUM*:

1) *Hedychium coronarium*:- *Hedychium coronarium* contains secondary metabolites like glycosides, terpenoids etc. In 2015 Yogendra et al. has reported the GC-MS analytical data of the medicinally important secondary metabolite like α-Terpineol, vanillin and many other aromatic compounds from the rhizomes of *Hedychium coronarium*. About 48 numbers of bioactive compounds were identified from nature grown rhizome viz. 2-propanone, 1,3-dihydroxy; hydroxy methyl furfural; 2-methoxy-4-vinylphenol etc. and 44 bioactive compounds were identified from in vitro regenerated rhizome extract, viz. pyrazine, 2,5-dimethyl; butyrolactone; guanosine etc. About 64 phytochemicals were identified from methanol extract sample of H. coronarium callus [8,9]. In another publication; the major constituents of dried rhizome oil were 1,8-cineole (37.44%), β-pinene (17.4%), α-pinene (6.73%), α-terpineol (6.7%), whereas the major constituents of fresh rhizome oil were 1,8- cineole (41.42%), β-pinene (10.39%), α-terpineol (8.8%), cymene (4.08%), α-pinene (4.06%), terpinen- 4-ol (3.55%) [10,11].

2) *Hedychium ellipticum*:- *Hedychium ellipticum* contains labdane-type diterpenes: coronarin E; (E)-15,16-bisnorlabda-8,11-dien-13-one; Zerumin A; Zerumin B; Coronarin D; Ellipticine, The major components of essential oil of H. ellipticum were 1,8-cineole (33.0%), sabinene (22.2%), terpin-4-ol (14.3%), γ-terpinene (5.3%) and β- caryophyllene (5.6%). etc. Nuntawong stated that, *Hedychium ellipticum* contains ten labdane diterpenoids which shows different phytochemistry than other species of *Hedychium.* [12,2].

3) *Hedychium larsenii*:- *Hedychium larsenii* contains 81.47% of the yellow colored leaf oil. Raj et.al. was reported the major constituents of leaf oil were monoterpenes (4.76%), oxygenated monoterpenes (6.31%), sesquiterpene hydrocarbons (34.49%) and oxygenated sesquiterpenes (35.91%). The sesquiterpene hydrocarbon ar-curcumene (24.75%) is

identified as the major constituent. The other constituents detected in significant amounts are caryophyllene oxide (7.85%), bisabol-11-ol (4.50%), β-pinene (3.94%) and spathulenol (4.33%). Analysis of the colorless inflorescence oil showed thirty-eight constituents amounting to 96.24% of the oil. Higher amounts of monoterpene hydrocarbons with ρ-cymene (18.57%) and γ-terpinene (10.51%) as major constituents were detected in the inflorescence oil. The study was done by Gas chromatography–flame ionization detection (GC–FID) and Gas chromatography–mass spectrometry (GC–MS) analytical techniques [13,14].

4) *Hedychium spicatum:-* *Hedychium spicatum* contains an essential oil as major constituent, other terpenoids like like p-methoxy cinnamate 67.8%, ethyl cinnamate (10.2%), d-sabinene (4%), sequiterpenes (5.5%) etc. in 1977 furanoditerpenes were discovered by Sharma et.al [15,16]. Chemically, the rhizome is reported to contain sitosterol and its glucosides, furanoid diterpene-hedychenone and 7- hydroxyhedychenone. Total phenolic content from plant contains xanthophyll, αcarotene, β-carotene and DL-α-tocopherol [17]. The extracts revels the presence of alkaloids, carbohydrate, protein, resins, saponins, steroid, tannin, starch and glycosides in aqueous extract while flavonoids and tritepenoids were only present in ethanolic extract [18]. The essential oils of H. spicatum rhizomes were marked by the presence of high amount of oxygenated monoterpenes (18.3-75.7 %), followed by oxygenated sesquiterpenes (8.1-43.8 %), sesquiterpene hydrocarbons (1.6-25.3 %) and monoterpene hydrocarbons (0.9-10.0 %). Oxygenated monoterpenoid compound 1,8-cineole was the most abundant constituent (15.5-58.2 %). Other monoterpenoid compounds were α-pinene (0.1-4.4 %), β-pinene (0.5-3.2 %), linalool (0.8-10.6 %), terpinen-4-ol (0.7-15.2 %), α-terpineol (0.3-2.3 %) [19].

MEDICINAL USES:

Anti-diabetic activity:- An overground part of *Hedychium coronarium* Koenig in lowering blood glucose, increasing insulin levels and treating and/or preventing diabetes without overly reducing blood glucose in a subject; i.e., not reducing blood glucose in a fasting Subject. The effect of ethanol extract of leaves and pseudostem of *Hedychium coronarium* Koenig in reducing blood glucose in normal rats [20]. Kaur et.al. has reported significant decrease by administration of the oral dose of *Hedychium spicatum* Essential Oil (HEO) of 0.3 ml/ rat for 14 days on the blood glucose and urea level of the rats [21].

Antimicrobial and antibacterial activity:- Extracts from rhizomes of *Hedychium spicatum* extracts (20 mg/disc) and essential oil (500 µl/disc showed antimicrobial and antifungal activity against various strains of microorganisms like *Staphylococcus aureus, Escherichia coli , Pseudomonas aureginosa*, *Salmonella typhi* and *Aspergilus fummigatus*, *Aspergilus niger, Penicilium monotricales* respectively [22]. Methanolic extract of *Hedychium spicatumI* L. could inhibit Gram positive bacteria were *B. cereus* and *S. epidermidis* while two Gram negative bactreria were *E. aerogenes, P. vulgaris* [23]. Ethanol extract of fruits of *H. spicatum* was reported to possess antibacterial and antifungal properties against *Salmonella* sps. *Escherichia coli* and filamentous fungi [24]. The strongest activity of leaf oil was observed against *C. glabrata,* followed by *M. furfur* and *C. albicans*, whereas the strongest activity of H. *coronarium* rhizome oil was observed against *C. glabrata*, followed by *C. albicans* and *M. furfur* [30].

Anti-inflammatory and analgesic activity: - Y. Lu et. al was studied and reported intradermal injection of carrageenan induced a local inflammation reached maximum edema after 3hrs. and then treated with *H. coronarium* oil at doses of 100 mg/kg (*p.o.*) significantly inhibited paw edema 1-5 h essential oil of *H. coronarium* produced a pronounced anti-inflammatory effect in both first and second phases of carrageenan-induced oedema due to release of histamine, serotonin, bradykinin and prostaglandin respectively [25,26]. Methanolic extract of HC at dose 200 and 400 mg/kg, p.o [26] and hexane soluble extract of HC at dose of 200 mg/kg to mice and 100 mg/kg to rats has showed maximum reduction in inflammation [27].

P. V. Kiem et al. studied and reported three new labdane type diterpenes named coronarins G–I as well as seven known terpenoids namely coronarin D, coronarin D methyl ether, hedyforrestin C, (E)-nerolidol, b-sitosterol, daucosterol, and stigmasterol were evaluated the effects of all isolated compounds in the inflammatory response by bone marrow-derived dendritic cells (BMDCs), the effect due to potently inhibited IL-6 and IL-12 production LPS-stimulated BMDCs; significantly inhibited stimulation of TNF-a, IL-6, and IL-12 [28].

Antioxidant activity: - The total antioxidant activity of phenolic content of *Hedychium spicatum* is influenced by climatic change. By comparing antioxidant activity by all three methods shows significantly higher linear relationship between DPPH scavenging assay and FRAP reducing

antioxidant assay than ABTS method. This may be due to, FRAP assay is based on reduction of a ferric analogue. The Fe2+ complex of tripyridyltriazine (Fe(tripyridyltriazine)3+) to the intensely blue-colored Fe(TPTZ)2+ in the presence of any antioxidant at acidic pH. In in-vitro analysis of antioxidative capacity of the essential oil and methanolic and aqueous extracts of *H. coronarium* was found to be inhibited by DPPH. DPPH assay is a radical scavenging of 1,1-diphenyl-picryl-hydrazyl radical and some water soluble antioxidant phenolic compounds might be strong scavenger of DPPH radical which reacts with different antioxidant at different molar ratio and ABTS assay is reducing properties of 2,2- azinobis-(3-ethylbenzoline sulphonate) radical [30-32]. The significant correlation between DPPH radical scavenging and reducing power suggesting due to presence of polyphenolic content in *H. spicatum* Buch rhizomes [32,33].

Other uses:- The aqueous and ethanolic extracts of the dried rhizome of *H. spicatum* for anti-histaminic and ulcer-protective, an initial dose-dependent antihistaminic action of both the extracts with dose 100, 200 and 400 mg/kg was performed against histamine-induced bronchospasm in guinea pigs; and anti-inflammatory activity by using rats. At the dose 200 mg/kg of aqueous extract shows good bronchoconstriction, inflammation and associated pain in guinea pigs and rats [34]. *H. coronarium* extract exerts its analgesic effect by preventing the synthesis or action of prostaglandins that may be due to the phytochemicals present in the extract. Induction of nociception thermally, indicates the narcotic involvement. In general, the centrally acting analgesics elevate the pain threshold of mice towards heat. *H. coronarium* extract significantly delayed the response time to the thermal pain sensation indicating narcotic involvement [35]. The efficacy of *Hedychium coronarium* for the cytotoxicity towards MCF-7 cells thus suggesting protection against breast cancer when MTT proliferation assay was carried out to determine the growth rate of cells. A linear relationship between the formazan generated and the number of viable cells was demonstrated, together with time-dependent growth characteristics for MCF-7 cells by *H.coronarium* [36].

CONCLUSION:

In the present manuscript, thorough literature revealed that Hedychium was found to be a versatile plant with many medicinal activities due to presence of terpenoids, and labdene type diterpenes as phytochemicals. Mainly, leaves and rhizomes of Hedychium species contains maximum amount of volatile metabolites which possess wide range of pharmacological activities. There is scope for the study of remaining parts of plant like inflorescence, flowers, roots etc for their pharmacological studies. Also based on the previous research, it could be concluded that, there is need to focus on molecular level phytochemical effect of plant extract.

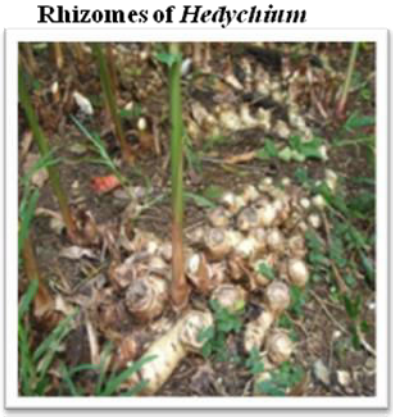
Plant arrangement of different species of Hedychium

a) Hedychium coronarium b) Hedychium ellipticum
c) Hedychium larsenii d) Hedychium spicatum
e) Rhizomes of Hedychium

Hedychium coronorium

Hedychium ellipticum

Rhizomes of *Hedychium*



Hedychium larsenii

Hedychium spicatum

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