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Review Paper

A review account on medicinal value of *Hedychium spicatum* Buch-Ham ex Sm: Vulnerable medicinal plant

Dinesh Giri*, Sushma Tamta and Aseesh Pandey

Plant Tissue Culture Laboratory, Department of Botany, D.S.B. Campus K. U. Nainital, Uttarakhand 263002 India.

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The objective of this study was to compile a review note on distribution, medicinal properties, trade value and problems associated with an important medicinal plant, *Hedychium spicatum* Buch-Ham ex Sm (Zingiberaceae). The underground part (rhizome) is useful in preparation of indigenous medicine like the crude extract of the rhizome has been used in preparation of an anti cancerous drug. Essential oil (commercially known as 'Kapur Kachri Oil') from rhizomes showed antimicrobial activity against both Gram-positive and Gram-negative bacteria. On the basis of comprehensive study of literature it has been found that this species is commercially exploited from its natural habitat. Hence, prioritization needs to be done for propagation and conservation of *H. spicatum*.

Key words: Zingiberaceae, medicinal plant, rhizomes, anti-cancerous drug, propagation and conservation.

INTRODUCTION

The unique topography of the Indian Himalayan region (IHR), covering an area of about 250,000 km^2, supports diverse habitat along an altitudinal gradient, that is, approximately 200 - 8,000 m (Samant et al., 2007). The occurrence of about 18,440 plant species in various habitats (Singh and Hajra, 1997), 1,748 medicinal plants (Samant et al., 1998), 675 wild edible plants (Samant and Dhar, 1997), 118 essential oil plants with medicinal values (Samant and Palni, 2000), 155 sacred plants (Samant and Pant, 2006), and 279 fodder plants (Samant, 1998) justifies the diversity and uniqueness of the IHR. The diversity of medicinal plants in the region is also manifested by the presence of the 31% native, 15.5% endemic and 14% threatened plants of total Red Data Book plant species of Indian Himalaya region (Dhar et al., 2000). This rich plant diversity is utilized by the native communities in various forms including food and medicine. During the past several years, some important contributions have been made on ethnobotanical knowledge and medicinal plants of Central Himalaya (Samant et al., 1998; Singh and Pundeer, 2004). World health organization (WHO) estimates approximately 80% population in developing countries depends on traditional medicine for primary health care needs. A major portion of this involves the use of medicinal plants (Bennerman et al., 1983). Zingiberaceae comprised 52 genera and about 1500 species, distributed throughout tropical Asia (Sirirugsa and Larsen, 1995). The genus *Hedychium* consists of about 50 species and is one of the most popular genera of Zingiberaceae because of its attractive foliage, diverse and showy flowers, and sweet fragrance (Hamidou et al., 2008). Kirtikar and Basu, 1984 reported eight species in Western Himalaya. That is, *H. ellipticum*, *H. thyrsifoxine*, *H. elatum*, *H. coccineum*, *H. autantiacum*, *H. cotonarium*, *H. spicatum* var. acuminatum.

Botanical description of plant

H. spicatum commonly known as Kapoor Kachri or Ginger lilly is a Himalayan plant. It is distributed in subtropical Himalaya in the state of Assam, Arunanchal Pradesh and Uttarakhand within an altitudinal range of 1000 to 3000 m. It is tall stout herb with fleshy aromatic rhizomes, thick straight stem with broadly lanceolate leaves. Different developmental stages like flowering, fruiting in nature are shown in the photo plates (Plates 1 A B C, D and E). Flowers are fragment white with an orange

*Corresponding author. E-mail: giri_gld@rediffmail.com.

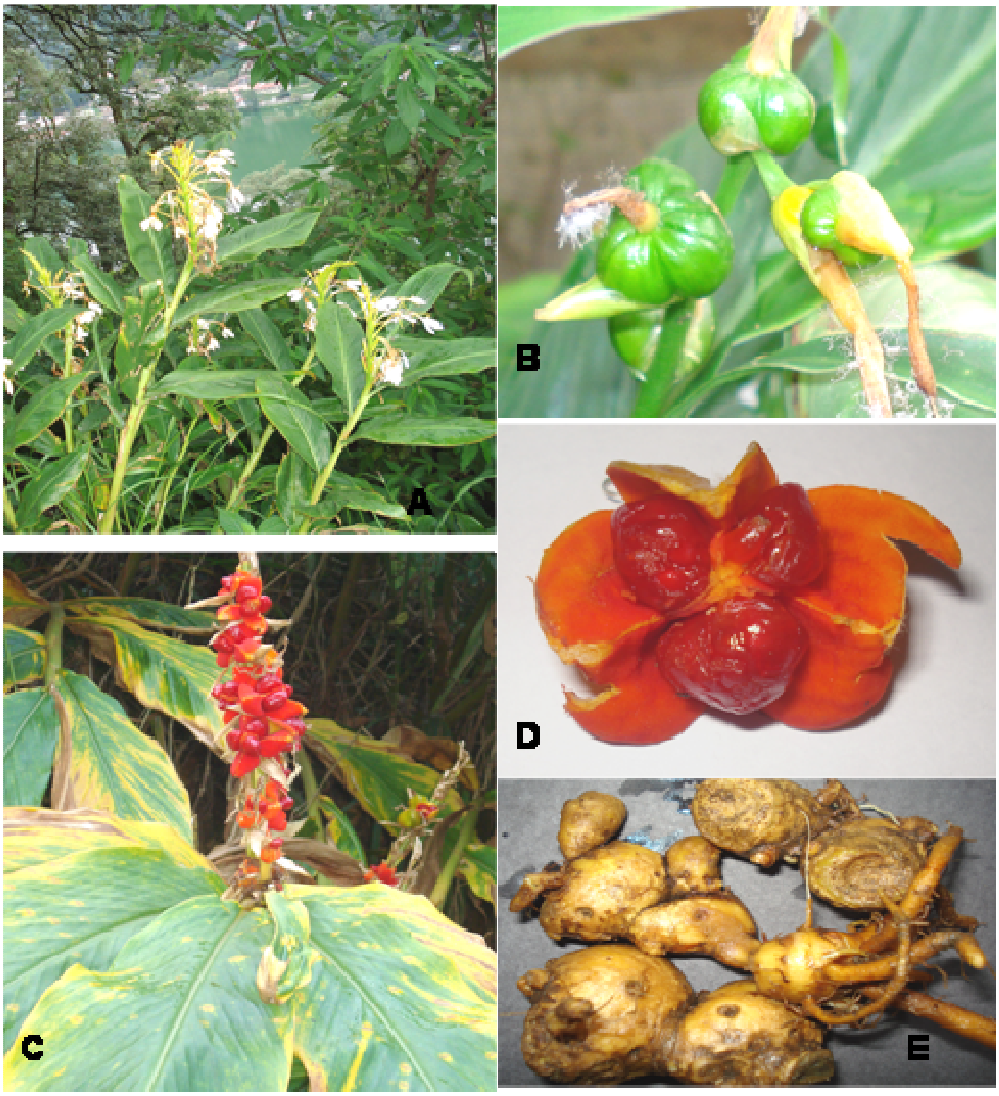

Plate 1. *Hedychium spicatum.* (A) Flowering in H. spicatum, photograph taken in the month of August. (B) Seed formation during the last week of August. (C) Seed bearing plant in nature, photograph taken in the month of September. (D) Mature fruit with seeds. (E) Rhizomes of the plant.

red base in a dense terminal spike borne on a robust leafy stem. The fruit is globosely capsule; when ripe the three valves are reflexed exposing numerous small black seeds embedded in a red aril (Plate 1D) (Naithani, 1984; Thakur et al., 1989). Flowering in the plant occurs in the months of July- August and seed formation occurs in September -October.

Medicinal properties of the species

Zingiberaceae family constitutes a vital group of rhizomatous medicinal and aromatic plants characterized by the presence of volatile oils and oleoresins of export value. Generally, the rhizomes and fruits are aromatic, tonic and stimulant, occasionally they are nutritive. Some are used as food as they contain starch in large quantity while others yield an astringent and diaphoretic juice (Joy et al., 1998). *Hedychium* is one of the plant species which is commonly used in preparation of indigenous medicine. The rhizome extract, contains essential oil, starch, resins, organic acids, glycosides, albumen and saccharides, which is administered for blood purification, bronchitis, indigestion, treatment of eye disease and inflammations (Srimal et al., 1984; Prakash and Singh, 2001). Chemically, the rhizome is reported to contain sitosterol and its glucosides, furanoid diterpene-hedychenone and 7- hydroxyhedychenone.

Essential oil contains cineole, terpinene, limonene, phellandrene, p-cymene, linalool and terpeneol as major

Table 1. Chemical composition of essential oil from rhizome of *Hedychium spicatum* (Bottini et al., 1987).

	Garg et al. (1977)	Dixit et al. (1977)	Nigam et al. (1979)	Bottini et al. (1987)
Monpterpenes				
Δ3-carene……	-	1.4	-	-
1,8-cineole……..	56.2	37.2	27.1	29.7
p-cymene……	-	5.0	9.6	-
limonene…….....	-	1.3	17.0	b
linalool……	6.8	18.0	16.6	4.4
ß-phellandrene……	-	4.5	7.0	-
α-pinene……..	-	1.4	1.8	b
ß-pinene……..	-	1.4	4.5	b
terpinen-4-ol……...	-	-	-	0.7
α-terpineol……..	1.6	-	6.5	1.0
ß-terpineol……..	-	-	1.8	-
Sesquiterpenes				
(-) – α- cadinol……..	-	-	-	5.3
ß-caryophyllene……..	0.1	24.1	3.5	-
ß-caryophyllene oxide……	-	0.5	-	-
(+)- elemol…….	-	4.2	-	8.5
(-)_10-epi-γ-eudesmol……	-	-	-	5.1
(+)- α-eudesmol……...	-	-	-	4.8
(+)- ß-eudesmol……...	-	-	-	12.6
Seven unknown alcohols				
(C15H26O)……	-	-	-	6.2

b Total monoterpene hydrocarbons: 5.9%.

Table 2: Carotenoids and vitamin content in *Hedychium spicatum* (Bhatt et al., 2008).

Antioxidants (mg/100 g)	Planted	Wild
Total phenolics	218.00	181.00
Xanthophyll	0.23	1.65
α-Carotene	6.90	20.50
ß-Carotene	19.30	61.80
DL-α-tocopherol	4.90	1.10

constituents (Table 1). In addition to its medicinal values, the plant rhizome is also reported to possess anti-inflammatory, hypoglycaemic, vasodialator, spasmolytic, atiasthmatic and hypotensive (Husain et al., 1992) properties as well as antimicrobial activity against both Gram-positive and Gram-negative bacteria (Bisht et al., 2006). The aromatic volatile oil commercially known as 'Kapur Kachri Oil' has a metoxycinnamate as major chemical constituent and has been extracted form the plant rhizome (Iyenger, 1991). Recently the crude extract of the rhizome has been used in the preparation of an anticancerous drug, PDMA 28 (Nayab et al., 2004). Phenolics carotenoids and vitamins are well known for its antioxidant activity (Kahkonen et al., 1999; Javanmardi et al., 2002) and repeatedly been used as natural antioxidants in fruits, vegetables and other plants like caffeic acid, ferulic acid, and vanillic acid which are widely distributed in the plant kingdom (Larson, 1988). Mazumder et al. (1997) reported that rosamarinic acid is an important phytochemical that could be a potent active substances against human immunodeficiency virus type-1 (HIV -1).

Recently the antioxidant phytochemical study of *H. spicatum* was done by Bhatt et al. (2008) and concluded that the phenolics and DL –α- tocopherol content was significantly ($p<0.01$) higher in one year old planted rhizome as compared to those which are collected from the wild (Table 2). α- tocopherol is known to have a number of biological activities such as immune stimulation, inhibition of nitrosamine formation and alteration of metabolic activation of carcinogene (Sun, 1990).

Trade value of plant's rhizome

Trade value of *H. spicatum* for treating liver diseases in different markets of the country is high. That is, Delhi 1015 Rs/Kg., Ramnagar 812 Rs/Kg., Sharanpur 1618 Rs/Kg., Tanakpur 818 Rs/Kg (Samant and Pant, 2006). The crude extract of rhizome is used as a major ingredient in making syrup and tablets with brand name vomicure and vominil, respectively and is being sold in National and International market at the rate of $ 40/bottle (www.suryaherbal.com).

Problems associated with the species

According to the threat status of the World Conservation Union (International Union for Conservation of Nature and Natural resources; IUCN) criteria *H. spicatum* has become vulnerable due to reduction in population of over 20% in the last ten years. It is also listed in the near threatened category of the essential oil bearing plants (Kemp, 2003; Samant and Palni, 2000). This plant is slow growing and takes 2 to 3 years to reach maturity and bear fruits and seeds (Negi, 2001). Vegetative propagation via rhizome is also very slow. Over exploitation of rhizomes in pharmaceutical (Awasthi et al., 1996), oil and other industries indicates a threat to its existence. Grazing, trampling and weed proliferation have a negative effect on its seed germination. Samant et al. (2007) reported that *H. spicatum* is commercially exploited from its natural area.

CONCLUDING REMARKS

On the basis of the present study, it has been concluded that this is an important IHR medicinal plant with high trade value of its rhizomes. Due to its high medicinal properties and the use of its rhizome extract in making various types of drugs, including anti cancerous drug, this species was illegally and indiscriminately exploited from nature, thereby dwindling from its natural habitat rapidly. Therefore, prioritization needs to be done for propagation and cultivation of this species at large scale. Using plant tissue culture techniques and conventional methods, we could propagate this species not only for mass and rapid propagation, but also for their *ex-situ* conservation of this vulnerable medicinal plant.

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