



## RESEARCH ARTICLE

# Occurrence, phenology and traditional uses of *Helminthostachys zeylanica* in northeastern terai region of Uttar Pradesh, India

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### Abstract

*Helminthostachys zeylanica* (L.) Hook. is a terrestrial sciophyte fern growing on moist ground belonging to family Ophioglossaceae, commonly known as Kamraj (King of Potency). Extensive uses of the plants in form of rhizomes because of its ethnic, ayurvedic, food and medicinal value, it becomes rare flora of India. The present study includes distribution, description, phenology and uses of *H. zeylanica* in different forms. The occurrence is restricted to a few geographical locations and areas due to destruction of their true natural and potential habitat. The utilization of *H. zeylanica* as neurogenic tonic and potency enhancer in many formulations in Ayurvedic/Domestic medicine. Natural exploitation causes extinction and warrant us to protect and conserve the plant in different localities of their natural habitat as well as in *ex-situ* condition.

**Keywords:** *Helminthostachys zeylanica*, Sciophytes, Ethnic medicine, Extinction, Conservation.

### Introduction

*Helminthostachys zeylanica* is herbaceous fern growing on moist ground, bears underground rhizome and many stipes with leaf. Underground rhizomes are creeping, short and thick. Erect stipes are 15 to 30 cm in length. Leaf grows singly from rhizome, characteristic in shape. The plant bears umbrella like leaf blade, commonly regarded as Kamraj (King of Potency) in India. Leaf blade divided into three segments; each segment again divided into two to five segments. Last segments are lanceolate 7 to 15 cm long and 2-4 cm in breadth, spiked mature leaves are 7-20 cm in length, extends upward from leaf base. Spike contains sporangium with many powdered spores in upper parts. *H. zeylanica* plant reproduce through spores and by means of an underground rhizome.

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### Material and methods

#### Study area

The North-Eastern terai region of U.P situated on the foot hills of Himalayas having landscapes in North India. It is drained by two important tributaries of River Ganga viz. Rapti and Gandak. The landscape comprises a mosaic of cultivation, human habitation and natural vegetation including forests that has been heavily used by people (Pandey *et al.* 2010, Pandey *et al.* 2019).

In the present study, field visits were made in different localities of forests of Maharajganj District for *H. zeylanica* which is found to occur in Pakri Range Forest (27° 12' 19" N latitude 83° 28' 52" E longitude), Laxmipur Range Forest (27° 22' 52" N latitude 83° 33' 56" E longitude), and Nichloul Range Forest (27° 19' 18" latitude 83° 44' 44" E longitude). (Figure 1)

#### Habitat

The plant species is herbaceous fern growing on moist soil. The rhizome is creeping horizontal, underground, tuberous and cylindrical up to 12 mm in diameter. It bears many thick fleshy roots. Lanceolate leaves arises from rhizome. Single staked leaf, cylindrical in nature, without hairs produced each year from the rhizome. It is about 30 cm in length. Tripartite leaf with lamina appears round in shape. Some leaves are sterile while some leaves are fertile. Solitary fertile leaf arised from the base of leaf blade. It bears 7-11 cm spike which contain many expanded clusters of sporangia. Powdered spores are present in sporangium.

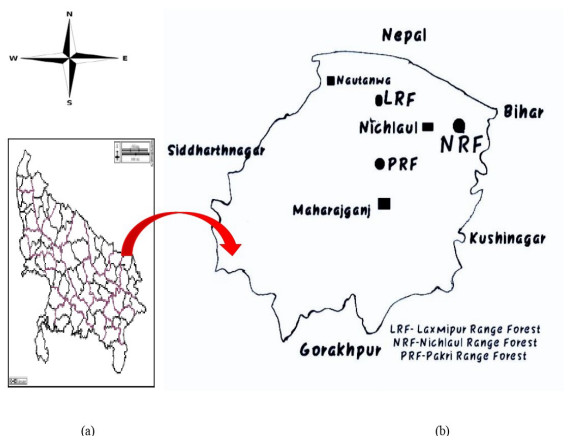


Figure 1: (a) Map of U.P. India. (b) Distribution/location of *Helminthostachys zeylanica* in District Maharajganj.

The propagation takes place by spores. These spores spread with air and water and germinated into a new plant. (Kumar and Ved, 2000) (Figure 2).

**Distribution**

*Helminthostachys zeylanica* is a terrestrial fern with limited distribution in Indian subcontinent viz India, Srilanka and Malaysia. In India, it is distributed in North India mainly in U.P., West Bengal, Assam and Uttarakhand. Plants are mainly growing on moist shady places in forest, sea shore and banks of rivers. New fronds usually initiated at the beginning of the rainy season. It is a cryptogamic vascular plant, distributed in restricted geographical areas due to alteration of their potential habitat. Propagation mainly occurs through rhizomes due to poor spore germination. *H. zeylanica* is distributed in Tehrighat, Nichloul, Pakari range, Chauk and Banki range. However, it is also found in Tinkonia forest of Gorakhpur. Declined propagation is recorded in nature due to over exploitation of rhizome from natural habitats. So, major attention is to be given on propagation and conservation of the highly useful and critically endangered form of this ancient plant. (Barik et al. 2018).

**Phenology**

*Life Form*

The lifeform germinates mostly through rhizome because of poor germination of spores in natural habitat. The rhizome propagates and produces leaves with fertile spike. The fertile spike contains many expanded clusters of sporangia. The powdery spores dessemiated and germinates to new ones. (Kumar and Ved, 2000)

*Life Cycle*

Spores and root germinate and perinate in late April after first rainfall and continue till late May. The Plant is facultative sciophyte having a period of vegetative growth from May to



Figures 2 (A-F) A: Young Plants. B: Plants in group with spike. C: Mature Plant with spike. D: Fertile Spike. E: Rhizome of *H. zeylanica*. F: Powder of Rhizome.

early July. In late July and early August, the powdery spore gets mature and disperse with water. The plant after August begin to get old and leaf become yellow and in January to February the plants begin to die and in late February to April the plant disappears. With the arrival of first rainfall, the plant reappears with fertile spike.

**Variability**

The plant is susceptible to heat stress although variability can be seen in fertile spikes, in length, breadth and spore bearing capacity. The morphological variability appears on the plant size and length (Banerji 1951, Namphy and Madhusoodan 1994)

**Germination**

Germination is through spores and underground rhizomes. The germination of spores in nature is poor which it compensates by germination through rhizome.

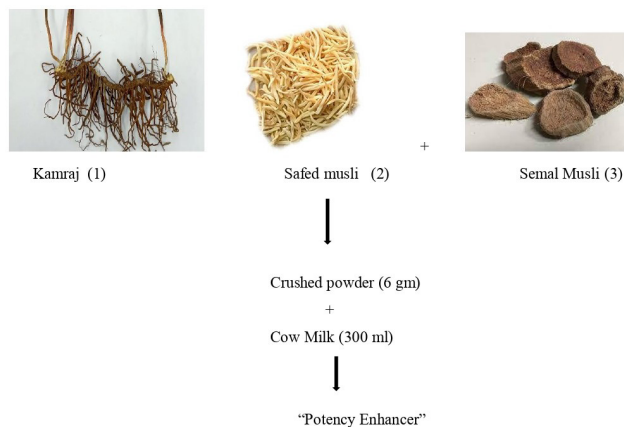
**Ethnomedicinal Use**

Folkore is ethnic science which pave the way to forward for treatment of many diseases (Pandey and Dubey 2014). The entire plant is used as medicinal purpose all over the

world including India as based on literature available across scientific fraternity (Huang *et al.* 2003, Suja *et al.* 2004, Chen *et al.* 2014, Shah *et al.* 2020). For curing impotency, the plant rhizome is used in the form of decoction. Leaf juice is used to treat blisters of tongue. Five gm of rhizome is given for the treatment of vitality and as a brain tonic along with cow milk (Srivastava, 2007). Cow milk and decoction of rhizome, which is crushed and deeply boiled in water. It is given along with black pepper (*Piper nigrum*) for the treatment of leucorrhoea (Bhatt *et al.* 2010). The rhizome powder is used in the treatment of spermatorrhoea and improving memory power (Joshi, 2011, Benjamin and Manickam, 2007). The mixture of rhizome of Kamraj (*Helminthostachys zeylanica*), Safed Museli (*Chlorophytum tuberosum* Roxb. Baker) and root of *Bombax ceiba* are made into powder (1:2:3) and given to the patient with cow milk (Fig. 3) of waist pain as tonic as well as potency enhancer in India (Singh *et al.* 1989). The plant is used as mild laxative in Moluccas (Kritikar and Basu, 1975). The young leaves and fertile spike are cooked as leafy vegetable in different ethnic community. Forest dwellers and ethnic group of Maharajganj district using its young leaves and fronds as leafy vegetables (Observed and verified by authors in 2020). Sarker *et al.* (2012) reported that powdered mixture of roots of *H. zeylanica* and *Lygodium flexuosum* were used for treatment of fever, red urine and pain in urinary bladder (Table 1) (Figure 3).

### Phytochemical Analysis

Phytochemical analyses showed presence of many secondary metabolites through various solvent system as antioxidants, flavonoids, stilbenes, glucosides etc (Chen *et al.* 2003, Yamauchi *et al.* 2013, Gupta *et al.* 2016, Singh *et al.* 2018).



**Figure 3:** Administration of thizome of *H. zeylanica* with root of *Chlorophytum tuberosum* and root of *Bombax ceiba* (1:2:3) ratio Potency Enhancer in folk medicine.

### Discussion

Forests of North Eastern Terai region of U.P. India, harbours natural resources and rich green lush vegetation with full of biodiversity. Natural resources and biodiversity yield many minor forest products viz. food, medicine, fibre and many more in addition to timber, main product of forest. Many tribal people and forest dwellers residing in and around the forest areas. They depend on forest products for their day to day needs as and when required. The sustainability depends solely on the relation of plants and people (Pandey, 2016, Pandey *et al.* 2021).

*H. zeylanica* is an indigenous plant that on the verse of depletion due to excessive use of rhizome in ethnomedicine. Many pharmaceutical companies used the plant for their pharmaceutical products and exploited it commercially.

**Table 1:** Traditional utilization of *H. zeylanica* in ethnomedicine

S. N	Parts used	Uses	Mode of Preparation	References
1.	Rhizome	Vitality and Brain Tonic	Dried Powder	Srivastava 2007
2.	Rhizome	Leucorrhoea	Decoction	Bhatt <i>et al.</i> 2010
3.	Rhizome	Spermatorrhoea	Dried Powder	Benjamin and Manickam 2007, Joshi 2011
4.	Rhizome	Waist Pain and tonic	Paste	Singh <i>et al.</i> 1989
5.	Whole plant	Laxative	Paste	Kritikar and Basu 1975
6.	Young leaves and fertile spike	Vegetable	Boiled and fried with oil and salt	Ethnic interaction by authors
7.	Rhizome of <i>H. zeylanica</i> and <i>Lygodium flexuosum</i> .	Fever, red urine and Urinary bladder pain	Decoction of powdered Mixture	Sarker <i>et al.</i> 2012
8.	Kamraj Rhizome+Safed Musli+semal Musali	Neurogenic tonic and pain Potency Enhancer	1:2:3 dried powder with cow milk	Observed by Authors (2020) during survey Fig.3
9.	Young leaves	Vegetable	Boiled in Water and Decoction to 1/3 <sup>rd</sup> part	Observed by Authors (2020) during survey

Poor propagation through spore and rhizome is the main cause of rare in nature so, the plant cannot grow well and flourish. The habitat of plant is getting fragmented due to climatic changes, deforestation, and excessive exploitation. The plant needs special attention for conservation so, that it can be used properly in sustainable manner. By the conservation of plant and nature we can procure back to the nature and society. The medicinal property of plant needs to be explored and its agro-techniques for cultivation and multiplication so that the plant can be used as food and medicine and become an alternative source of income to farmers and ethnic people.

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