Evaluation of Medicinal plant-lore and Pharmacognosy of Cyperus kyllinga Endl. (Nirvisha): A Potential folk Medicine of India

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Abstract

Cyperus kyllinga Endl. syn. Kyllinga monocephala Rottb. is known as 'Nirbisi' in the different medicinal plant-lore of India. Its rhizome and roots are widely used as ethnomedicine among different tribal communities. Some scholars of Indian system of medicine reported that the plant may consider as 'Nirvisha' (antidote or anti poison) of old Sanskrit literature. The detailed studies on their macro and micro morphological characters, histo-chemical test, physico-chemical studies and fluorescence analysis are discussed here for the consideration and evaluation of the plant for proper utilization in Ayurveda system of medicine.

Key words

Pharmacognosy; Cyperus kyllinga; 'Nirvisha'; Cyperaceae; folk medicine

Introduction

Cyperus kyllinga Endl. (Cyperaceae) is an herb and used in different medicinal plant-lore of India. Dymock, et. al. (1890) considered this plant as 'Nirvisha' of old Sanskrit literature and described that the root is useful to relieve thirst in fevers, diabetes, prurites of the skin and promotes the action of liver. The medicinal properties and uses of this plant have been described by many others like Kirtikar & Basu (1935) mentioned its use as an antidote. The drug is given in tumours and icterus (Bodding, 1927; Jain & Tarafder, 1970; Asolkar, 1992)

The plant is considered as diuretic, stomachic, anthemintic and is given for fistula, pustules, tumours and stomach and intestinal complaints (Anonymous, 1959). The root decoction is refrigerant, demulcent and tonic. It is given in torper of the liver. It is alternative of mind and phelgam (Nadkarni, 1954; Khory and Katrak, 1984). Root is a refrigerant for fevers, poison and antidote (Jain, 1991). The rhizome of the plant is taken in tuberculosis, gland T.B. snakebite, uterus cancer and filarial (Hembrom, 1991)

Available literature (Iyenger, 1976; Mitra, 1985; Srivastava et. al, 1995) reveals that no pharmacognostical studies have been carried out on this plant hence, the present studies are undertaken.

Materials and Methods

The crude drug materials were collected from the natural sources of Santhal Pargana region of Jharkhand. The voucher specimen has been lodged.

For the study of micromorphological characters, free hand sections were used and staining techniques were followed as given by Johansen (1940). The representative diagrams were drawn with the help of Camera lucida. The Micro-chemical tests for histological zones were performed according to the methods given by Kay (1938), Johansen (1940), Trease & Evans (1972) and Wallis (1967), physico-chemical constant values of the powdered drug and extractive values for petroleum ether, Benzene, Chloroform, Methanol and Water were determined according to the method given by Peach & Tracy (1955). Preliminary and qualitative analysis for phytochemical investigations (Peach & Tracy, 1955; Harborne, 1973), Thin layer chromatography for knowing the relation to front (Rf) value. (Stahl, 1969), ash value (I.P. 1966), determination of inorganic constituents (Vogel, 1953) and Fluorescence studies (Chase and Pratt, 1949, Kokoski et al. 1958) were made.

Botanical Description

Glabrous and erect plant, stem slender up to 25-30 cm. tall, oftem 1-3 and upto 7 in linear succession, compressed, triquetrous, 1.1-1.6mm thick erect from a slender creeping rhizome.

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Leaves several, liner, acuminate, shorter than to as long as the stem, 1.5-3.4 mm broad, Inflorescence capitate, usually 3 but sometimes 4 bracts foliaceous, 5-18 cm long, subglobose spike, solitary, 5-9 mm broad, greenish white in flowers, brownish in fruit, obliquely lanceolate elliptic or ovate – elliptic, numerous spikelets, congested, 2.5-3.0x1mm, 1-2 flowered. Glumes Keeled, serrulated, mucronulate, 3-nerved on each side of the prominently winged, acuminate, 5-7 nerved, in upper half and keel lunately crested, Stamens – 3, anthers 0.5-0.9 mm long, entire crest or crestly ovate, styles bifid, Nut suborbicular or obovoid – oblong or obovate, much compressed, yellowish-brown or blackish brown.

Cyperus kyllinga Endl. Cat. Hort. Acad. Vindob. 1:94:1842; Kuekenth, loc. Cit. 606; kern in FI. Males Ioc cit 659. 1974; Srivastava, F.G. 339. 1976 Kyllinga monocephala Rottb. Descr. & Icon. 13, t. 4, fig. 4.1773; FBI 7:588; 1872-97; FUGP2: 397, 1903-1929. BBO 4: 907, 1925.

Distribution

Throughout India from sea level to 2100m. in field. Growing as weed in garden near moist solid canal, ponds, river, forest margins, wastelands wide spreads (Haines, 1925) in united provinces to Bengal.

Vernacular Names

Hindi	-	Nirbishi
Bengali	-	Nirbishi, Swetgothubi
Malyalam	-	Mottenga, Pimottenga
Marathi	-	Mustu
Telgu	-	Anuang

Macroscopic Characters

Rhizome-Aromatic, 1.1-2.6mm thick, 1-8 cm long, creeping, smooth, reddish brown in colour, brown imbricating scales, semisolid, bearing tufted root, shining in fresh condition.

Root- Reddish-brown or brownish-black in dry condition, up to 2-3 cm long, 0.5mm thick near the base of rhizome.

Microscopical Characters

Rhizome

The histological study of rhizome reveals that it is 2.0-2.5mm thick in diameter. The outline of T.S. (Fig. 1) is almost round encircled by single layer epidermis. Beneath the epidermis a broad cortex is present. It is usually made up of 10-12 layers of parenchymatous cells. At the inner side of cortex often a sinuous zone of cells (Fig.2) with thickened walls of U-shaped endermoid layer are present. Below the above layer a thin and small layer of cells or sheath are seen which is compacted with outer vascular bundle. The stele or apparent of vascular bundles lies within the cylinder bounded by the endodermoid layer. In this region many vascular bundles are seen. It tends to be at the centre of the rhizome. There is two layers of vascular bundles are present. In close with endodermoid and sheath layer there are 10-12 vascular bundles and towards the centre 6-8 vascular bundles are seen, vascular bundles is apparently amphivasal. In the centre pith cells are thick walled.

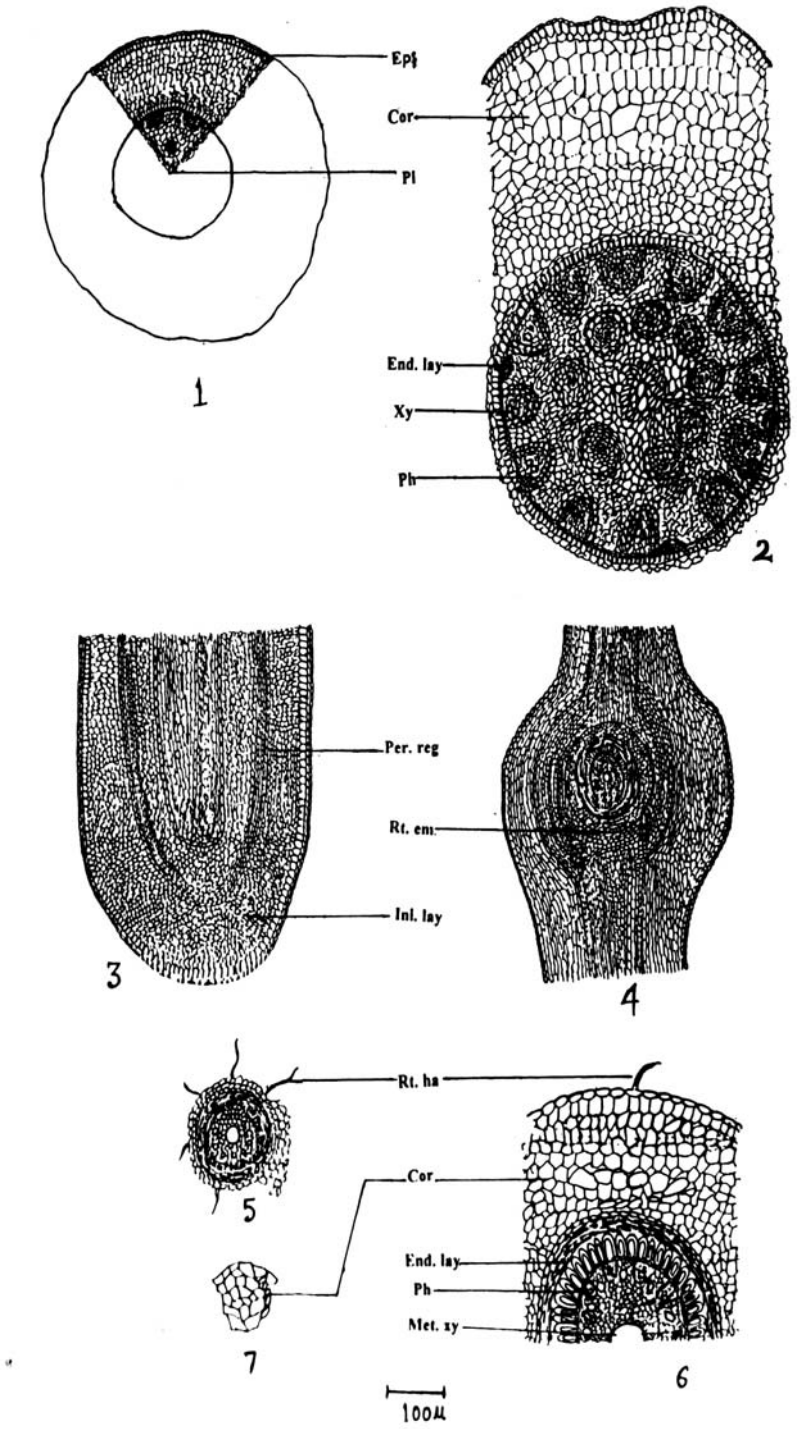
The L.S. (Fig. 3) of rhizome reveals that the apex is hemispherical. It shows an apical meristem. It is covered by two layered thickening. Below this layer there is an initial layer of meristem which is 2-3 layered cells. In the centre there are 8-10 layers of cells which are arranged in regular files. In the L.S. of a part of rhizome (Fig. 4) shows that in the centre there is a root emarginated. In the middle about 22.5 μ diameter of a root section are present where the cortex and endodermal layer are seen. In the central ground tissue there is 1 large metaxylem, 10-12 xylem vessels are obvious. Histological, the root structure are recognized with the layer of promeristem, 6-7 layers of peripheral zone and 4-5 layer of central zone.

Root

The diameter of root is almost 0.7-1.2mm. Transverse section (Fig. 5) shows that root hairs are represented by out growth from epidermal cell or thin walled epidermis. Below the epidermis the layer of polygonal cells are present. It is often cortex of parenchymatous zone. In the cortex air cavities are present which may due to break down of cortex cell usually from middle region. The air cavities may be schizo-lysigenous. It is oval shaped. The layer of endodermis is composed of tall rectangular cells (Fig. 6) with uniformly thickened walls. It is thick walled in older roots. The cells are radially elongated and it is like U-shaped. Below

the endodermis a dark pericyclic region is present. The central ground tissue of parenchymatous. There is 1 conspicuous central and large metaxylem which is composed of tracheal element and stand out from neighboring cells with large diameter. There is 10-12 small xylem elements are present. Phloem is small in between the xylem.

Powder: Fragments (Fig. 7) of cortex cell are observed in powder. It is 0.31 mm x 0.12 mm. in size.



Legends to figures

Fig.1 – T.S. of rhizome, Fig. 2 – T.S. of rhizome (apart cellular), Fig. 3 – L.S. of rhizome, Fig. 4- L.S. of rhizome (A view reveals a root emarginated in the centre), Fig. 5- T.S. of root, Fig. 6 – T.S. of root (A part cellular), Fig. 7 – Powder particles.

Abbreviations

Cor – cortex, End. lay- endodermal layer, Epi – epidermis, Ini. lay- initial layer, Met. xy – metaxylem, Peri. reg – peripheral region, Ph - phloem, Pi- pith, Rt. em – root emarginated, Rt. ha – root hair.

Mircometry

Table – 1: Measurement of different cells in microns (μ)

	Cells	Measurement in Micron (μ) (Length x Width)
Rhizome	Epidermis	9-11-13.5x11.5-14-18
	Cortex	13-32.5-49.4x18.2-34.6-45.1
	Endodermoid layer	6.9-14.2-18.4x9.1-13.6-18.5
	Xylem	6.7-7.5-9x4.5-8-9.5
	Phloem	9-11.5-13.5x4.5-6-7.5
	Pith	40-45x35-40
Root	Epidermis	9-12.6-13.5x4.5-5.2-6.75
	Cortex	18-24.6-27x9-15.4-22.5
	Endodermis	13.5-34.5-36x9-11.5-13.5
	Metaxylem	42.7x40.5
	Xylem	15.7-16.5-18x13.5-14.5-17
	Phloem	9-10.5-11.2x4.5-7.5-9

Microchemical test

Table – 2 Showing Microchemical test of histological zone by chemical reagent.

Reagent	**Test for**	**Histological zone**			
		Nature of colour change	**Rhizome**	**Nature of colour change**	**Root**
Iodine solution	Starch	Blue	Cortex endodermoid layer	Light blue	Ground tissue
Phloroglucinol + Conc. HCI + Alcohol	Lignin	Light violet	Cortex Sheath	Pink	Polygonal cell
Sudan III Solution	Oil globule	Light red	Cortex	Light red	Polygonal cell
Aqueous ferric chloride solution	Tannin	Blue	Endodermoid layer, pith		
Liberman – Burchard reagent	Terpene	Pink	Cortex	Pink	Cortex
Dragandorff's reagent	Alkaloid	Light orange	Endodermoid layer		

Physico – chemical study

Organoleptic test

Odour	-	Mild aromatic
Colour	-	Dark Brown
Taste	-	Astringent
Touch	-	Rough

Physical constant values

Ash values

Table – 3; Physical constant of powder drug.

	Percentage (%)
Total ash	16.72
Acid insoluble ash	9.5

Extractive values

Table – 4: Extractive values of different solvents, percentage of extractability and colour of extract.

Solvent used	Percentage of Extractibility	Colour of extract
Petroleum ether	3.8%	Brownish-yellow
Benzene	1.2%	Brownish-yellow
Chloroform	4.9%	Yellowish-brown
Methanol	7.2%	Yellowish-brown
Water	18.4%	Brown

Fluorescence analysis:

Table – 5: Fluorescence characters of the powder drug under Ultra Violet (UV) light.

Powder & reagent	Colour in ordinary light	Colour in UV Light
Powder as such	Reddish brown	Deep Brown
Powder + Nitrocellulose	Light black	Black
Powder + NaOH in Methanol	Blackish brown	Black
Powder + NaOH in Methanol + Nitrocellulose	Brown	Deep brown
Powder + 1N NaOH in water	Brownish yellow	Brown
Powder + 1N NaOH in water + Nirtocellulose	Light gray	Grey black
Powder + HCI	Light brown	Deep brown
Powder + HCI+Nitrocellulose	Brown	Purple
Powder + HNO_3 (1:1)	Orange brown	Orange red
Powder + H_2SO_4 (1:1)	Light brown	Reddish brown

Analysis of Inorganic constituents:

Table – 6: Inorganic constituents and their presence

Inorganic constituents	Result
Calcium	+
Iron	++
Potassium	+
Sodium	+
Corbonate	+
Sulphate	++

Preliminary phytochemical investigations:

Table – 7: Preliminary qualitative analysis of phytochemical constituents.

Extracts	Alkaloid	Steroid	Reducing Sugar	Glycoside	Phenolics	Amino acid
Petroleum ether	-	+	-	-	-	-
Benzene	-	+	-	-	-	-
Chloroform	-	+	-	-	+	-
Methanol	+	-	-	+	+	-
Water	-	-	-	+	+	+

Relation to Front value:

Table – 8: Relation to front (Rf) value of different extract of solvent.

Solvent	Rf value
Petroleum ether	0.12, 0.27, 0.41, 0.63
Benzene	0.13, 0.30, 0.57, 0.85
Chloroform	0.18, 0.33, 0.51, 0.78
Methanol	0.10, 0.32, 0.58, 0.75, 0.93

Discussion

Cyperus kylinga Endl. is used as 'Nirbisi' by different tribal communities in medicinal plant-lore of India. The same vernacular names for this plant were reported by Bodding (1927), Jain (1991) and Hembrom (1991). Dymock et. al. (1890) in his 'Pharmacographica Indica' mentioned that this plant may be 'Nirvisha' of old Sanskrit literature. It is also described by Nadkarni (1954) and Dutta (1922). The properties and uses of 'Nirvisha' have been described in Raj Nighantu (Piplaydi Varg., 218) as an anti kaph, anti vata, antidote and wound healer in the following sloka:

Nirvisha katuka soushna kaphvatstradoshnuta I
Anek vishdoshghani vran saropini ch sa II (Raj Nighantu, PV/218)

However at present the plant Delphinium denudatum is regarded as 'Nirvisha'. The aims and objectives of the studies of the above works are to highlight the plant as 'Nirvisha' to use in Ayurveda. Morphologically the crude drug or rhizome of Cyperus kyllinga Endl. can be identified by reddish brown colour and 1.1 – 2.6 mm. thickness. Microscopically inner sincuous zone of cells like endodermis endodermoid U-shaped layer and two layers of vascular bundles are present. The root is characterized by 1 conspicuous central and large metaxylem which is composed of tracheoid element as apparent in T.S. The maximum extractive value is 18.4% in water. The study may be

useful to enrich the Ayurvedic Pharmacopoea.

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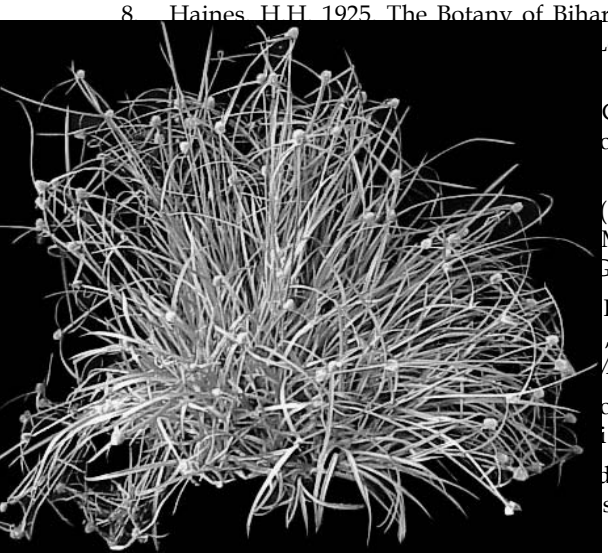

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