

Pharmaco-Botanical Studies on Some Powdered Herbal Drugs for Their Diagnostic Characterization-II

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Abstract

The identity of ingredients is basic requirement to establish the quality of a herbal formulations. To identify a powdered herbal drug organoleptic, macro and microscopic evaluation is essential requirement diagnostic characteristics for reference. In the present studies powdered herbal drugs viz. *Acorus calamus* Linn., *Asparagus racemosus* Willd., and *Calotropis procera* R.Br. are subjected for pharmaco-botanical studies leading to their diagnostic characterization. These findings can be employed to establish the identity of powdered herbal ingredients in a formulation or dosages form.

Keywords: *Acorus calamus* Linn., *Asparagus racemosus* Willd., *Calotropis procera* R.Br.. Powdered herbal drug.

Introduction

The identity of ingredients in a herbal formulation is utmost requirement to ensure the quality, safety and efficacy of medicine. Ayurvedic, Siddha and Unani formulations consists majorly ingredients of plant origin. A number of classical and patent and proprietary medicines are available in powdered form. Churna, Kvatha Churna (in ayurveda), Churnam and Kudineer Churnam (in siddha) and Sufoof (in unani) are classical dosages in powdered form. Other dosages forms such as Vati, Gutika (in ayurveda), Mathirai, Vadagam (in siddha), Huboob, Aqras (in unani), tablets and capsules also comprise powdered ingredients which are indenticale. The identity of powdered herbal drug either as an independent ingredient or in a dosages form can be established by pharmaco-botanical studies (macroscopic, organoleptic and microscopic evaluation). In this communication diagnostic characteristics of powdered herbal drugs derived from of *Acorus calamus* Linn. (rhizome), *Asparagus racemosus* Willd. (root) and *Calotropis procera* R.Br. (root) are studied. These herbal drugs are specifically used in a number of formulations of Ayurveda, Siddha and Unani medicines.

Acorus calamus Linn. (Family-Araceae) is botanical source of ayurvedic drug 'Vacha'. It is an aromatic marshy herb and its rhizomes are credited with a number of medicinal properties in different pathies viz. ayurveda, siddha, unani and modern medicine. It is official in Ayurvedic, Siddha and Unani Pharmacopoeia of India. It is the *Calamus aromaticus* of mediaeval writers and possibly the 'Acorn' of the Greek physicians. The derivation of generic name of the plant is supposed to be form *Acorn* (a-primitive), *kore* (pupil of the eye), with reference to its medicinal properties. It is a native of Eastern Europe and Central Asia, but has become widely diffused by cultivation. It was introduced in India

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at a very early time. Besides medicinal utility of the plant, the leaves and rhizomes are employed for flavouring drinks, for perfumery and for insecticides. The rhizome possess insecticidal activity against bed bugs, moths, lice etc. The plant is described in classical texts of Ayurveda such as Abhidhanmanjari, Ashtang Hridaya, Bhav Prakash Nighantu, Charak Samita, Haridayapriya, Raj Nighantu, Sushruta Samhita etc. The drug is often adulterated with *Alpinia galanga* Willd. (Family-Zingiberaceae) and *A. officinarum* Hence (Herman, 1868; Watt, 1889-93; Anonymous, 1948, 1978; Chunekar, 1972).

Asparagus racemosus Willd. (Family-Liliaceae), a straggling undershrub is source of 'Shatavari' which is an official Ayurvedic drug. The generic name of the plant is derived from *A(-intensive)* and *sparasso(-to tear)* due to some of the species being armed with strong prickles. It is native of East Indies. The plant is reputed for a number of medicinal properties and is also employed in veterinary practices as a demulcent. In ancient literature of Ayurveda e.g. Abhidhanmanjari, Ashtanghridaya, Bhav Prakash Nighantu, Chakradutta, Charak Samhita, Kabhidhanmanjari, Nighantu Ratnakar, Raj Nighantu, Shaligram Nighantu, Sharangdhar, Shushruta Samhita etc. The drug is prescribed for a number of ailments. The source of the drug is referred from different species of *Asparagus*. The other species attributed for the source of 'shatavari' are *A. adscendens* Roxb., *A. currilus* Buch.-Ham., *A. fillicinus* Buch.-Ham., *A. gonocladus* Baker, *A. sarmentosus* Linn. etc. These species are generally substituted for the prescribed official species in commerce (Herman, 1868; Anonymous, 1948, 1978; Chunekar, 1972).

Calotropis procera R. Br. (Family-Asclepiadaceae) is equated with 'Arka' which is regarded as an official Ayurvedic drug. It is an evergreen, hardy undershrub and in traditional medicine. It is used as a substitute for Ipecacuanha (*Cephaelis ipecacuanha*(Stokes) Baill, Family-Rubiaceae) in dysentery. The fresh milk of the plant is said to be employed for infanticide. The generic name *Calotropis* taken from *Kalos(-beautiful)* and *tropis (-a keel)*, alluding to the keel of the flower. The plant is native of Persia. The plant is attributed medicinal in number of classical texts of Ayurveda e.g. Astang Hridaya, Bhav Prakash Nighantu, Dhanvantari Nighantu, RajNighantu, Shaligram Nighantu, Sushruta Samhita etc. The roots of the *C. gigantea* Ait. are substituted for drug (Herman, 1868; Anonymous, 1950, 1978; Nadkarni, 1854; Chunekar, 1972).

Material and Methods

The herbal drugs *Acorus calamus* Linn. (rhizome), *Asparagus racemosus* Willd. (root) and *Calotropis procera* R.Br. (root) selected for present study were collected from the natural habitats and authenticated by complying the

macroscopical characteristics of these drugs with that of standard reference drug samples available in the museum-cum-herbarium of the Pharmacopoeial Laboratory for Indian Medicine, Ghaziabad, India. To study the powder microscopy, the drugs were first washed thoroughly under running tap water to remove any dust or soil particles and then air dried for few days at room temperature or in shade. The dried drugs were then powdered and pass through 120 µm sieve. The fine powder obtained through sieve 120 µm was then subjected to various histo-chemical tests and the temporary mounts of powder prepared to observe under light microscope (Jackson and Snowdon, 1968; Johansen, 1940; Youngken, 1951).

Results and Conclusion

Powdered herbal drugs derived from *Acorus calamus* Linn. (rhizome), *Asparagus racemosus* Willd. (root) and *Calotropis procera* R.Br. (root) were subjected for evaluating organoleptic characteristics (Table-2). Powdered herbal drug were

Table 1: Status of Herbal drugs in different official compendium and systems of medicine

S. No.	Botanical Name	Official Name	Pharmacopoeia	Formulary
1.	<i>Acorus calamus</i> Linn.	Vaca	Ayurvedic Pharmacopoeia of India, Part-I, Vol.-II	Ayurvedic Formulary of India, Part-I
		Waj Turki	Unani Pharmacopoeia of India, Part-I, Vol.-V	-
		Waj-e-Turki	-	National Formulary of Unani Medicine, Part-I
		Vasambhu	-	Siddha Formulary of India, Part-I
2.	<i>Asparagus racemosus</i> Willd.	Satavari	Ayurvedic Pharmacopoeia of India, Part-I, Vol.-IV	Ayurvedic Formulary of India, Part-I
		Tannirvittan kilanku	Siddha Pharmacopoeia of India, Part-I, Vol.- II	-
		Thannirvittan	-	Siddha Formulary of India, Part-I
		Satawar	Unani Pharmacopoeia of India, Part-I, Vol.-VI	-
		Satawar	-	National Formulary of Unani Medicine, Part-I
3.	<i>Calotropis procera</i> R.Br.	Arka	Ayurvedic Pharmacopoeia of India, Part-I, Vol.-I	Ayurvedic Formulary of India, Part-I
		Aak	Unani Pharmacopoeia of India, Part-I, Vol.-IV	-

examined under microscope and characteristics cellular elements and ergastic contents observed in these drugs are given in Table-3. The characters observed may serve as diagnostics for identification of these drugs in a various powdered formulation. TLC/HPTLC are frequently used for detecting and identifying herbal

Table 2: Organoleptic characteristics of herbal drugs

S. No.	Botanical Name	Organoleptic Characteristics	
		Entire drug	Powdered drug
1.	<i>Acorus calamus</i> Linn.	The drug consists of dried rhizome which are sometimes scrapped or peeled. The rhizome is dark brown in colour, sub-spongy, cylindrical, slightly flattened and branched. It is longitudinally splitted into sub-cylindrical pieces which are 7.9-10.5 cm in length and 1.0-3.5 cm in diameter. The surface of the unpeeled drug has annulate nodes due to remanents of bud scales. Upper surface exhibits the triangular leaf scars and hair like fibers. The undersurface of the rhizome has the remanents of root which are prominent. The older rhizome is marked with alternately arranged broadly triangular large transverse leaf scars which almost encircle the rhizome. The rhizome after drying is much shrunken and deeply wrinkled longitudinally. The peeled rhizome is cream-yellow in colour and root scars are comparatively fewer. The rhizome breaks easily with sharp, short fracture exhibiting porous, whitish interior differentiated into central and peripheral region.	The powder drug is brownish in colour with characteristics strong aromatic odour. It has bitter slightly acrid in taste.
2.	<i>Asparagus racemosus</i> Willd.	The drug comprises of dried tuberous succulent roots which arise adventitiously from the root stock. The tuberous dry roots are cylindrical in the middle, tapered towards the ends and brown in colour. Surface of fresh roots are easily removable covering glistening material inside. The drugs are either entire roots or longitudinally broken pieces. The drug in dimension measure 10.0-24.0 cm in length and 0.5-2.5 cm in diameter. Surface of dried roots exhibit deep irregular longitudinal furrows and minute transverse wrinkles due to shrinkage during drying. The broken pieces of the drug have irregular uneven transverse surface and hollow cavity in the center. The broken pieces of the drug have tapering end or middle portion of the drug devoid of tapering ends. The drug is hard, however, it breaks with a short fracture.	The powdered drug is brown in colour, odourless and slightly mucilaginous in taste. The taste retain bitter blend if chewed for a little time.

S. No.	Botanical Name	Organoleptic Characteristics	
		Entire drug	Powdered drug
3.	<i>Calotropis procera</i> R.Br	The dried matured tap roots are used as drug. The roots designated as drug are either in entire form or without bark. Sometimes root bark is also utilized as drug. The roots are simple, whitish-grey in colour with wrinkles, curved woody appearance and exhibit marks of sap exudation on the surface. The covering bark is spongy, more or less fissured lengthwise and longitudinally furrowed imparting rough appearance to root. The inner portion of peeled bark is smooth and mucilaginous. The roots are generally cut into pieces with vary in sizes, generally measure 6.0-18.0 cm in length and 1.5-6.0 cm in diameter. The pieces of root of upper origin nearby to stem are with prominent and somewhat rounded top and rest of the portion is spirally curved bearing scars or remains of root branchlets. The roots exhibit characteristic short transverse cracks on the outer side of the bends. It has incomplete fracture and the bark gets easily separated from the root.	The powder drug is pale yellowish in colour with bitter taste and has no specific odour. The root is bitter in taste and has no specific odour.

Table 3:Diagnostic microscopic characteristics of powdered herbal drugs

S. No.	Botanical Name	Diagnostic Microscopic Characters		
		Cellular elements	Ergastic contents	
			Starch Grains	Calcium Oxalate Crystals
1.	<i>Acorus</i>	Fragments of thick-walled epidermis, a few fibers of fibro vascular bundles, abundant spherical to oval thin walled parenchymatous cell of ground tissue of cortex and stele containing starch grains occasionally some cells are also filled with yellow globules of volatile oil, lignified vessels are either single or in groups, often fragmented and have annular, reticulate, scalariform or spiral thickening. A few fibers which are thin walled and pitted are also found in fragments and some of them are partially associated with an inconspicuous calcium oxalate prism sheath.	Starch grains are small, spherical to ovoid and fairly abundant.	Calcium oxalate crystals are prismatic in nature and are found independently or enclosed in cells.

S. No.	Botanical Name	Diagnostic Microscopic Characters		
		Cellular elements	Ergastic contents	
			Starch Grains	Calcium Oxalate Crystals
2.	<i>Asparagus racemosus</i> Willd.	Fragments of piliferous layer, occasionally with remains of root hairs; abundant thick walled, irregularly outlined, compact, parenchymatous cells of outer cortex, thin walled, circular to oval parenchymatous cells with intercellular spaces of inner cortex and pith. Occasional pitted stone cells which are in either single or in groups of two to three cells or associated with parenchymatous cells are also present, lignified vessels with reticulate or pitted thickening are fragmented and found singly or in small groups.	–	The acicular crystals of calcium oxalate; which are fairly common are found scattered either complete or in fragments. Most of the crystals in raphide form fill some of the parenchymatous cells.
3.	<i>Calotropis procera</i> R.Br	Fragments of phellem cells, abundant parenchymatous cells of phelloderm, some of them containing starch grains or occasionally crystals of calcium oxalate, very occasional fragments of phloem showing patches of small celled sieve tubes embedded in phloem parenchyma and a few medullary ray cells filled with starch grains, vessels which are singly or in groups are fragmented and have bordered pits or occasionally scalariform thickening, fibers are not very common and wherever observed were found to be fragmented or singly or in groups, lactiferous vessels which did not commonly occur, appeared as slender anastomosing stered containing fine granular material.	Starch grains are fairly abundant, which are either simple with simple hilum or compound with two components.	The prismatic and rosette crystals of calcium oxalate which are not fairly common, are also found scattered or occasionally in the parenchymatous cells.

ingredients in formulations, but the pharmaco- botanical evaluation to confirm the presence or absence of the herbal ingredients in the formulations have advantage over chemical methods as later is simple and inexpensive. In addition, the pharmaco-botanical evaluation of herbal preparations is also helpful to detect any deviation from the official formulation not declared on the label. Microscopical examination of herbal drugs also reveals the presence/absence of adulterant, substitute, foreign matter and contamination in drug. Pharmaco-botanical evaluation of powdered herbal drugs is a rapid and simple test to establish the identity utilizing less amount of sample.

References

- Anonymous, 1948. The Wealth of India (Raw Materials), Vol. I (A-B). C.S.I.R., New Delhi.
- Anonymous, 1950. The Wealth of India (Raw Materials), Vol. II (C). C.S.I.R., New Delhi.
- Anonymous, 1978. The Ayurvedic Formulary of India, Pt. I. Ministry of health & Family Welfare, New Delhi.
- Anonymous, 1981. National Formulary of Unani Medicine, Part-I, (English ed.), Govt. of India, Ministry of Health & Family Welfare, New Delhi.
- Anonymous, 1984. Siddha Formulary of India, Part-I, (Tamil ed.), Govt. of India, Ministry of Health & Family Welfare, New Delhi.
- Anonymous, 1986. The Ayurvedic Pharmacopoeia of India, Part- I, Volume-I First edition, Govt. of India, Ministry of Health & Family Welfare, New Delhi.
- Anonymous, 1999. The Ayurvedic Pharmacopoeia of India, Part- I, Volume-II, First edition, Govt. of India, Ministry of Health & Family Welfare, New Delhi.
- Anonymous, 2004. The Ayurvedic Pharmacopoeia of India, Part- I, Volume-IV, First edition, Govt. of India, Ministry of Health & Family Welfare, New Delhi.
- Anonymous, 2007. The Unani Pharmacopoeia of India, Part-I, Vol. -IV, Govt. of India, Ministry of Health & Family Welfare, New Delhi.
- Anonymous, 2008. The Unani Pharmacopoeia of India, Part-I, Vol. -V, Govt. of India, Ministry of Health & Family Welfare, New Delhi.
- Anonymous, 2009. The Unani Pharmacopoeia of India, Part-I, Vol.-VI, Govt. of India, Ministry of Health & Family Welfare, New Delhi.
- Anonymous, 2010. The Siddha Pharmacopoeia of India, Part-I, Vol.-II, Govt. of India, Ministry of Health & Family Welfare, New Delhi.

- Chunekar, K.C., 1972. Glossary of Vegetable drugs in Brahatrayi. Chowkhambha Sanskrit Series Office, Varanasi.
- Herman, Samuel, 1868. Paxton's Botanical Dictionary-comprising the names, history and culture of all plants known in Britain. Bradury, Evans & Co., Bouverie, London.
- Jackson, B.P. and D.W. Snowdon, 1968. Powdered Vegetable Drug. Churchill Ltd., London.
- Johansen, D.A., 1940. Plant Microtechnique, MC Graw Hill Book Co., New York.
- Nandkarni, A.K. 1954. K.M. Nandkarni's Indian Materia Medica. Vol. I & II. Popular Book Depot. Bombay.
- Watt, G., 1889-93. A Dictionary of Economic Products of India, 6 Vols. (Index 1896). Govt. Printing Press, Calcutta.
- Youngken, H.W., 1951. Pharmaceutical Botany, 7th ed., The Blackistan Company, Toronto.

