

Pharmacobotanical Studies on Some Powdered Herbal Drugs for Their Diagnostic Characterization-III

Nitin Rai
and

*Rajeev Kr. Sharma

Pharmacopoeia Commission for
Indian Medicine & Homoeopathy,
(Ministry of AYUSH, Govt. of India)
PLIM Campus, Kamla Nehru Nagar,
Ghaziabad-201002 (U.P.)

Abstract

Quality of herbal formulations primarily depends upon the use of authenticated ingredients. Adulteration and substitution of herbal drugs in commerce leads to problem for quality of formulations. It can be duly addressed by use of identified herbal ingredients. The identification of herbal drugs involves organoleptic, macro and microscopic evaluation based on diagnostic characteristics of drug. In the present studies pharmacobotanical studies were carried on powdered herbal drugs viz. *Nardostachys jatamansi* DC., *Picrorhizakurroa* Royle ex Benth., *Plumbago zeylanica* Linn and *Withania somnifera* Dunal to establish their diagnostic characters for identification. These diagnostic characters can be employed for the identification of powdered herbal drugs in the composition of a formulation or dosage form.

Keywords: *Nardostachys jatamansi* DC., *Picrorhiza kurroa* Royle ex Benth., *Plumbago zeylanica* Linn., *Withania somnifera* Dunal, Powdered herbal drug.

Introduction

In manufacturing process herbal drugs are pulverized to convert into powdered form. Powdered herbal drugs are used as such in various classical dosages form in Ayurveda (Churna and Kvatha Churna), Unani (Sufoof) and Siddha (Churnam and Kudineer Churnam). Vati, Gutika (in ayurveda), Huboob, Aqras (in unani) Mathirai, Vadagam (in siddha), tablets and capsules are other dosages forms wherein powdered ingredients are intact and identifiable. To ensure the identity of herbal ingredients used in a dosages form pharmacobotanical studies (organoleptic, macroscopic and microscopic evaluation) is important tool. In the present studies pharmacobotanical studies are carried on powdered herbal drugs derived from of *Nardostachys jatamansi* DC. (rhizome), *Picrorhiza kurroa* Royle ex Benth. (Rhizome), *Plumbago zeylanica* Linn. (root), *Withania somnifera* Dunal. (root) are studied. Regulatory status of herbal drugs studied in presented in Table 1.

Nardostachys jatamansi DC. (Family-Valerianaceae) has been held in great esteem as 'Jatamansi' in commerce. It is an official drug of ayurveda, unani and siddha systems of medicine. The official tile of the drug is based on the eternal appearance of drug and refers to its bearded appearance. The drug has been mentioned in the classical treatises of Charak, Sushruta, Bhav Prakash, Vag Bhatta etc. It is an indigenous drug which has been mentioned by Dioscorides in his work. In modern medicine 'Jatamansi' is treated as a good substitute for 'Valarian' (*Valeriana officinalis* Linn.). The drug is often adulterated with *Selinum*

*Author for correspondence

vaginatum Clarke of the family Umbelliferae (Watt, 1889-93; Srivastava, 1954; Mehra and Jolly, 1963; Anonymous, 1966, 1978; Chunkar, 1972).

Picrorhiza kurroa Royle ex Benth. (Family-Scrophulariaceae) has been used in Ayurveda, Unani and Siddha systems of medicine. It is an official drug in all these systems of medicines and titles as 'Katuka', 'Kutki' and 'Katukurohini'. The drug referred in common parlance as 'Kutki' appears to have originated from its Sanskrit names 'Katuka', 'Tikta', 'Katurohini' and many other synonyms all of which literally described its bitter taste. This drug is spoken as 'Dhanvantarigrasta'; the plant is eaten by Dhanvantri. It is mentioned in classical text of BhavPrakash, Charak, Dhanvantri, Sushruta etc. The drug is considered to have similar medicinal properties as 'Gentian' viz. improves appetite and stimulates gastric secretion. The drug is used either as an adulterant or as a substitute for Indian Gentian (*Gentiana kurroa* Royle) and true Gentian (*G. lutea* Linn.) (Watt, 1889-93; Anonymous, 1969 and Chunekar, 1972).

Plumbago zeylanica Linn. (Family-Plumbaginaceae) constitutes the drug 'Chitraka', 'Sheetraj Hindi' and 'Kodiveli' which are official drug in Ayurveda, Unani and Siddha systems of medicine. It is an erect or straggling perennial undershrub and native of East Indies. The generic name of the plant is based on 'Plumbum' - a disorder in the eye, which some species of this genus were formerly used to cure. The drug is described in Ashtang Hridaya, Bhav Prakash Nighantu, Charak Samhita, Dhanvantri Nighantu, Hridaya Priyam, Navanitake, Raj Nighantu, Sushruta Samhita etc. of Ayurvedic literature. In South India, the white flowered *P. zeylanica* Linn. which grows wild, as well as the red flowered *P. rosea* Linn. which is cultivated are used. The drug is substituted with *P. rosea* Linn. (Herman, 1868; Aiyer and Kolamal, 1953-66; Anonymous, 1969 and Chunekar, 1972).

Withania somnifera Dunal. (Family-Solanaceae) is botanical source of 'Ashwagandha' which has been used in Ayurveda since a long time. It is an official drug and one of the ingredients of a number of important Ayurvedic, Unani and Siddha formulations. It is an evergreen perennial undershrub. The generic name of the plant is in honour of H. Withan, a British geologist and writer on Paleobotany, in the nineteenth century. The drug finds mention in various literature of Ayurveda viz. Ashtang Hridaya, Bhav Prakash Nighantu, Charak Samhita, Raj Nighantu, Sushruta Samhita etc. The tender shoots of the plant are also used as vegetable and seeds are used as masticatory. The green berries are bruised and rubbed on ringworm in human beings and on animal sores and girth-galls in horse. They are also employed to curdle milk. The drug is substituted with *W. coaguland* Dunal. (Chopra *et al.*, 1949; Watt, 1889-93; Aiyer and Kolamal, 1953-66; Anonymous, 1976; Chunekar, 1972).

Table 1: Regulatory Status of Herbal drugs

SI.No.	Botanical Name	Official Name	Pharmacopoeia	Formulary	References
1.	<i>Nardostachys jatamansi</i> DC.	Jatamansi	Ayurvedic Pharmacopoeia of India, Part-I, Vol.-I	Ayurvedic Formulary of India, Part-I	Anonymous, 1978; 1986
		Sumbul-ut-Teeb	Unani Pharmacopoeia of India, Part-I, Vol.-I	-	Anonymous, 1998
		Balchhar	-	National Formulary of Unani Medicine, Part-I	Anonymous, 1981
		Catamancil	Siddha Pharmacopoeia of India, Part-I, Vol.- I	-	Anonymous, 2008
		Sadamanjil	-	Siddha Formulary of India, Part-I	Anonymous, 1984
2.	<i>Picrorhizakurroa</i> Royle ex Benth.	Katuka	Ayurvedic Pharmacopoeia of India, Part-I, Vol.-II	Ayurvedic Formulary of India, Part-I	Anonymous, 1978; 1999
		Katukurohini	Siddha Pharmacopoeia of India, Part-I, Vol.- I	Siddha Formulary of India, Part-I	Anonymous, 1984; 2008
		Kutki	Unani Pharmacopoeia of India, Part-I, Vol.-IV	National Formulary of Unani Medicine, Part-I	Anonymous, 1981; 2007
3.	<i>Plumbago zeylanica</i> Linn.	Citraka	Ayurvedic Pharmacopoeia of India, Part-I, Vol.-IV	Ayurvedic Formulary of India, Part-I	Anonymous, 1978;2004
		Kodiveli	-	Siddha Formulary of India, Part-I	Anonymous, 1984
		Sheetraj Hindi	Unani Pharmacopoeia of India, Part-I, Vol.-I	National Formulary of Unani Medicine, Part-I	Anonymous, 1981; 1998
4.	<i>Withania somnifera</i> Dunal.	Asvagandha	Ayurvedic Pharmacopoeia of India, Part-I, Vol.-I	Ayurvedic Formulary of India, Part-I	Anonymous, 1978;1986
		Asgand	Unani Pharmacopoeia of India, Part-I, Vol.-I	National Formulary of Unani Medicine, Part-I	Anonymous, 1981; 1998
		Amukkara	Siddha Pharmacopoeia of India, Part-I, Vol.- I	Siddha Formulary of India, Part-I	Anonymous, 1984; 2008

Table 2: Organoleptic Characteristics of Herbal Drugs

Sl. No.	Drug	Organoleptic Characteristics	
		Entire Drug	Powdered Drug
1.	<i>Nardostachys jatamansi</i> DC.	The drug consists of dried rhizomes which are brown in colour, cylindrical and covered with brown fibres. The rhizome is completely encircled by fibrous remain of leaf bases which arise at the nodes of rhizome. The rhizomes are 5.0-12.0 cm long and 1.0-2.5 cm in diameter including the fibres. The fibres are skeleton of leaf bases matted together forming a net which has appearance of tail of sable. The remains of older leaves are almost splitted into fibres. The scars or remains of adventitious roots are present on the rhizome which are hidden by fibres. The naked rhizome has rough surface showing annulated nodes, scars of leaf bases, aerial shoots and adventitious roots. Rhizomes are sometimes dichotomously and laterally branched. Drug is easily breakable and fracture is splitting.	Dark brown in colour with strong aromatic odour and acrid taste
2.	<i>Picrothiza kurroa</i> Royle ex Benth.	The drug consists of dried rhizome which are greyish brown in colour, cylindrical and surrounded by a tufted crown of withered leaf bases. The drugs are longitudinal pieces of the rhizome measuring 4.0-8.0 cm long and 0.5-1.5 cm in diameter. The surface of the rhizome have longitudinal wrinkles, transverse cracks, dotted scars and annulation of bud scales and stem remnants. The rhizome breaks with short fracture exhibiting black lacunar surface with whitish xylem ring on transverse plane of broken ends.	Blackish in colour with pleasant odour and bitter taste.
3.	<i>Plumbago zeylanica</i> Linn.	The drug consist of dried matured tap roots, dressed in pieces of varying dimension. The roots are cylindrical, hard and deep brown in colour. These are generally 15.0-25.0 cm in length and 0.2-3.5 cm in diameter. The surface is irregular fissured. The roots have small projections of secondary roots and scars of rootlets; fairly thick, shrivelled, smooth and brittle bark. The fracture of the root is short and the broken ends exhibit concentrically striated transverse plane	Brown in colour with slightly disagreeable odour and acrid taste.
4.	<i>Withania somnifera</i> Dunal.	The drug consists of dried and matured tap roots which are more or less straight and buff to grey yellow in colour. In commerce, roots are cut into pieces of varying length of 4.0-10.5 cm. The diameter of the roots vary with the age, ranging from 0.5-1.5 cm. The surface of the roots are smooth except a few occasional lenticels and longitudinal wrinkles. Some of the pieces of roots bear card like secondary roots or parts thereof. The root pieces which are cut with stem base bear root break with short and starchy fracture. The broken ends exhibit white transverse plane with scattered pores on them.	Yellowish brown in colour with mucilaginous, acrid and bitter taste, having no characteristic odour.

Table 3: Diagnostic microscopic characteristics of powdered herbal drugs

Sl. No.	Drug	Diagnostic Microscopic Characters		
		Cellular Elements	Starch grains	Ergastic Contents
1.	<i>Nardostachys jatamansi</i> DC.	Fragments of phellem comprising thick walled cells containing yellowish oil globules, abundant thin walled parenchymatous cells of phelloderm and pith, occasional parenchymatous cells of phloem with small patches of sieve elements and fairly numerous fragments of interxylary cork. Vessels are fairly present and are usually fragmented, singly or in small groups or associated with parenchymatous cells and have scalariform or spiral or reticulate thickening.	Absent	Calcium oxalate crystals Absent
2.	<i>Picrorhiza kurroa</i> Royle ex Benth.	Fragments of phellem comprising thick walled tangentially elongated cells containing granular resinous mass, usually attached to the part of phelloderm, abundant parenchyma of cortex and pith, composed of cells varying from rounded to polygonal or rectangular in outline and contain starch grains, oil globules and occasional groups of sieve tissue embedded in phloem parenchyma. The vessels occur singly or in small groups, associated with xylem parenchymatous cells and have pitted or annular or spiral or scalariform thickening.	The occasional starch grains are found scattered and are simple and compound with two to four component showing distinct hilum.	Absent
3.	<i>Plumbago zeylanica</i> Linn.	Fragmented phellem constituting the thin walled somewhat rectangular cells, some of the cells are filled with brown content; abundant thin walled polygonal parenchymatous cells of phelloderm, phloem and medullary ray. Most of the cells of varying shape and size are filled with starch grains. Some of the cells also contain yellow content, fairly common lignified xylem parenchyma cells and non-lignified and lignified thick walled fibres usually in group of two to four with narrow lumen. The vessels are found singly or in small groups, often fragmented and have pitted thickening. Some groups of sieve tissue composed of thin walled cells with faint sieve areas are also present.	Starch grains are abundantly present mostly simple, round and concentric, a few of the starch grains are compound with much more components forming clusters of twelve to twenty or more starch grains.	Absent
4.	<i>Withania somnifera</i> Dunal	Fragmented phellem cells composed of thin walls and or rectangular shape, abundant parenchymatous cells of phelloderm, phloem and medullary ray. Some of these are packed with starch grains or microsphenoidal crystals of calcium oxalate, very occasional fragments of sieve tissue composed of small elongated elements and vessels in group, mostly fragmented showing bordered pit or spiral or annular thickening. Lignified xylem parenchyma cells are also scattered and a few fragmented patches are associated with the vessels and fibres. A few elements of tracheid with pitted thickening and fibres having pointed or bifurcated ends are also present. Abundantly present starch grains are generally simple and have characteristic marking of fissured and eccentric hilum.	Starch grains are varying in shape and sizes and are ovoid to circular or reniform or club shaped. Compound starch grains are with two to three or more components.	Scattered micro-sphenoidal crystals of calcium oxalate, which are not abundant as most of the crystals are found enclosed in parenchyma.

Material and Methods

Nardostachys jatamansi DC. (rhizome), *Picrorhiza kurroa* Royle ex Benth. (rhizome), *Plumbago zeylanica* Linn. (root) and *Withania somnifera* Dunal. (root) selected for present study were procured 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 *Nardostachys jatamansi* DC. (rhizome), *Picrorhiza kurroa* Royle ex Benth. (Rhizome), *Plumbago zeylanica* Linn. (root) and *Withania somnifera* Dunal. (root) were subjected to pharmaco-botanical studies to draw out diagnostic characteristics in respect of organoleptic characters (Table-2) and microscopic characters (Table-3). The diagnostic characters observed are to be taken as a reference for the identification of powdered ingredients [*Nardostachys jatamansi* DC. (rhizome), *Picrorhiza kurroa* Royle ex Benth. (Rhizome), *Plumbago zeylanica* Linn. (root) and *Withania somnifera* Dunal. (root)] as such or in different dosage forms. Microscopic examination of powdered drug also entails the presence of foreign matter, biological contamination, adulterated or substituted ingredients in a dosage or formulation.

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