Research Article

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COMPARATIVE PHARMACOGNOSTICAL STUDY BETWEEN MARKET SAMPLES OF MEDA (*Polygonatum cirrhifolium* Royle) RHIZOME AND ITS SUBSTITUTE SATAVARI (*Asparagus racemosus* Willd) ROOT

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ABSTRACT

Asparagus racemosus commonly known as Satavari is used in traditional systems of medicine as a Uterine tonic, as a Galactagogue, in Hyperacidity, Oligospermia and as a general health tonic. Meda is one of the Astavarga's mentioned in literature has been currently enlisted under rare and endangered species. Satavari has been advised as a substitute for Meda in the 16th century by Acharya Bhavamisra. So the present work has been taken up to study the extent of Satavari as a substitute for Meda by detailed Pharmacognostic study based on its Physicochemical, Macroscopic, Microscopic features, Physicochemical parameters such as Loss on drying, Solubility in different solvents, Ash content, Acid insoluble Ash, Water soluble Ash, were determined by standard methods. Both the drugs show presence of cortex, endodermis, pericycle, radial vascular bundles, pith and the elements identified under transverse section of Meda rhizome were multilayered epidermis, multilayered thick walled cork, ground tissue, loose round parenchyma, scattered vascular bundles and xylem raphides. Phytochemical screening revealed the presence of Flavonoids, glycosides, saponins and reducing sugars commonly in Satavari and Meda and alkaloids and tannins are seen in Satavari.

Keywords: *Asparagus racemosus*, *Polygonatum cirrhifolium*, Pharmacognostic study, Microscopic features, Physicochemical and phytochemical analysis.

INTRODUCTION

Asparagus racemosus is an important plant in traditional medicine in tropical and subtropical India. Its medicinal usage has been reported in the Indian and British Pharmacopoeias and in traditional systems of medicine such as Ayurveda, Unani and Siddha. *Asparagus racemosus* is the accepted botanical source of Satavari¹. *Asparagus racemosus* (Satavar, Shatavari, or Satamuli) is common throughout India. More commonly found in north India. Satavari has small pin-needle-like phylloclades (photosynthetic branches) that are uniform and shiny green 6-12mm. In July, it produces minute, white flowers on short, in groups and in September is the month of fruiting producing blackish-purple, globular berries which are red in colour on ripening consisting 1-2 seeds². It has an adventitious root system with tuberous roots that measure about one meter in length, tapering at both ends, with roughly a hundred on each plant. The roots are used in medicine, following a regimen of processing and drying. *Asparagus racemosus* is recommended in Ayurvedic texts for the prevention and treatment of gastric ulcers, dyspepsia and as a galactagogue. *A. racemosus* has also been used for nervous disorders³.

P. cirrhifolium is a perennial growing herb up to 1.2 m (4ft) having tender leaves and young shoots. Flowering is from May to July, and the seeds ripen from Sep to October. The flowers are bisexual (having both male and female organs) and are self pollinated by bees. The plant is self-fertile. Suitable for sandy, loamy and clay soils and prefers well drained soil with suitable pH of acid, neutral and basic (alkaline) soils. It can grow in full shade (deep woodland) or semi-shade (light woodland). It prefers moist soil. Rhizome is moniliform or terete tuberous, 1--2 cm in thickness. Stem is erect or scandent, 30--90 cm in

height, and glabrous. Leaves are arranged in whorl phyllotaxy of 3--6 rarely, also a few alternate in proximal part of stem, sessile, narrowly linear to linear-lanceolate, very rarely oblong lanceolate, 4-9 (12) cm × 2-8 (15) mm, apex is usually cirrose at anthesis. Inflorescence is usually 2-flowered, peduncle is 3--10 mm, bracts are 1--2 mm, scarious, veinless, or abacteolate. Flowers are pendulous; pedicel is 3--8 mm. Perianth white, greenish, or pale purple, subcylindric, slightly constricted in middle, 8--11 mm, lobes 2 mm. Filaments 0.6--0.8 × ca. 0.15 mm, papillose; anthers 2--2.5 mm. Ovary 2.5 mm. Style 2 mm. Berries red or purple-red, 8--9 mm in diameter 4--9-seeded⁴.

MATERIALS AND METHODS

Satavari root and Meda rhizome essential for the study have been identified based on its morphological and macroscopical characters taking the standard reference of API (Ayurvedic Pharmacopoeia of India) part-I VOL-IV and VOL-VI respectively, collected from different markets according to their habitat and availability⁵.

Macroscopic features of Satavari root

Root is tuberous, 10 to 30 cm in length and 0.1 to 0.5 cm thick, tapering at both ends with longitudinal wrinkles, cream in colour, sweetish in taste⁶.

Macroscopic features of Meda rhizome

Rhizome is tuberous, branched or show large circular scars where they have broken off, outer surface is smooth, grayish in colour, longitudinally wrinkled when dried, marked with transverse rings of leaf scars and also shows scars of aerial stem

on upper side, numerous roots arise from surface, fracture is short, fibrous, odour is aromatic and bitter in taste⁷.

MICROSCOPICAL IDENTIFICATION

Transverse section of root and rhizome

For anatomical examination of entire roots and rhizomes, they are cut into transverse and longitudinal sections. For this, soft small pieces of roots with heating in glycerol solution for 1-3 days, depending on their hardness. The softened roots are straightened with the help of a scalpel in the right direction and then a section is taken with the razor. First thicker entire slices were sectioned and then made into thin, smaller sections. The entire slices were stained with phloroglucinol and concentrated hydrochloric acid or with safranin. The specimens were examined under a dissecting microscope. The samples were made into small pieces or scrapping of roots or rhizomes and boiled them for 3-5 minutes in caustic alkali, or in nitric acid and then made pressed specimen and immersed them in glycerol⁸.

Powder microscopy of root and rhizome

Several specimens were prepared of the powder on slides in *chloral hydrate solution* and performed the above mentioned standard tests for detection of starch, fixed oil, inulin, lignified elements, anthraquinone derivatives, tannins, mucilage, etc⁹.

Photomicrographs:

Microscopic descriptions of tissues were supplemented with micrographs wherever necessary. Photographs of different magnifications were taken with Nikon Labphot 2 Microscopic Unit. For normal observations bright field was used. For the study of crystals, starch grains and lignified cells, polarized light was used. Since these structures have birefringent property, under polarized light they appeared bright against dark background. Magnifications of the figures were indicated by the Scale-bars. Descriptive terms of the anatomical features are as given in the standard Anatomy books¹⁰.

Qualitative and Quantitative analysis of phytoconstituents

The chemical tests for different organic constituents were carried out using alcohol extract of the plant material by standard methods¹¹. The quantitative analysis of sugar was carried out by Fehling's solution method. All the reagents used were of GPR grade.

OBSERVATIONS AND RESULTS

Root transverse section

The transverse section of Satavari root was performed under Carl Zeiss Axio Lab AX10 LabA1 microscope, 20x objective lense and DIC reflector, being peeled. Show no presence of epiblem in the transverse section. The outermost layer is 6-8 layered cortex having outer collenchymatous cells and inner parenchymatous cells, some of which may be pitted, wavy-walled, overlapping and may have mucilage content. Endodermis is 1-2 layered, lignified, pitted and continuous. Pericycle is 1-2 layered and consists of thin walled parenchymatous cells. Vascular bundles are radial, a characteristic feature of monocot root. Pith consists of pitted, lignified or non-lignified cells having intercellular spaces.

Root fine powder microscopy

The powder microscopy of fine powder of Satavari root was performed under Carl Zeiss AxioLab AX10 LabA1 microscope, 40x objective lense and DIC reflector, elements like Epidermis, fragments of lignified thick-walled epidermis with simple pits, pieces of raphides, scalariform xylem vessels, (fig.5) raphide bundle, fibers, (fig.6) starch grains, (fig.7) scalariform pitted vessel element, (fig.8) vessel bundle (fig.9) have been identified.

Rhizome transverse section

The transverse section of Meda rhizome was performed under Carl Zeiss Axio Lab AX10 LabA1 microscope, 20x objective lense and DIC reflector shows about multi layered epidermis, multi layered thick walled cork cambium, followed by ground tissue, (fig.10) with numerous loosely scattered vascular bundles, (fig.11) cells of the ground tissue, raphides and xylem vessels (fig.12) ground tissue, vascular bundle with xylem and phloem (fig.13) collateral vascular bundles (fig.14) each associated with a group of fibres, usually arc-shaped or occasionally nearly surrounding the bundle, small and loosely arranged elements were identified.

Rhizome fine powder microscopy

The powder microscopy of light brown fine powder of Meda rhizome was performed under Carl Zeiss AxioLab AX10 LabA1 microscope, 20x objective lense and DIC reflector, elements like, fragments fibres, starch grains, raphides (fig.15) raphides and pitted xylem vessels (fig.16) pitted xylem vessels (fig.17) tracheids (fig.18) raphide bundle, (fig.19) stomata and trichomes (fig.20) have been identified.

PHYSICO CHEMICAL PROPERTIES

Physico chemical Analysis: The physico-chemical parameters of two samples of the plant materials were determined and the mean values obtained were taken. The values obtained for Moisture content, Total ash, Acid insoluble ash, Water and alcohol soluble extractives, are given in Table 1.

The organoleptic characters of Satavari root and Meda rhizome powder's on examination are found to be Fine in texture, Characteristic and Non distinct in Odour, Light and Dark brown in colour for Satavari and Meda, Sweet and Pungent taste and fracture is short-granular and short respectively. (Table 2)

The Table 3 shows the analysis outcome of preliminary phytochemicals like Alkaloids, Tannins, Flavonoids, Saponins, Glycosides, Phenols, and Reducing Sugars are found to be present in aqueous extract of Satavari root powder.

The preliminary phytochemicals like Alkaloids, Tannins, Flavonoids, Saponins, Glycosides, Phenols, and Reducing Sugars are present in methanol extract of Satavari root powder.

The preliminary phytochemicals like Alkaloids, Tannins, Flavonoids, Saponins, Glycosides, and Reducing Sugars have been detected in ethanol extract of Satavari root powder.

Flavonoids, Glycosides and Reducing sugars are found to be present in aqueous and methanol extracts of Meda rhizome powder.

Flavonoids, Reducing sugars and Diterpenes were found only in ethanol extract of Meda rhizome powder.

Flavonoids, Reducing sugars were traced in chloroform extract of Meda rhizome powder.

Comparatively it was observed that the more phytochemicals are present in aqueous and methanol extracts of Satavari.

Table 1: Organoleptic Characters of Satavari and Meda Powder

Sl. no	Characteristics	Satavari	Meda
1	Texture	Fine powder	Fine powder
2	Odour	Characteristic odour	Not distinct
3	Colour	Yellowish cream	Dark brown
4	Taste	Sweet bitter	Sweet
5	Fracture of the root	Short and granular	Short

Table 2: Physico-chemical Characters of Satavari Root And Meda Rhizome Powder

SL.No	Characteristics	Satavari	Meda
1	Total Ash	3.55%	4.7%
2	Moisture content	10.04%	6.5%
3	Acid insoluble Ash	0.38%	0.54%
4	Water soluble extract	40.5%	63.15%
5	Alcohol Soluble extract	6.53%	18.76%
6	Methanol extract	0.58%	1.28%

Table 3: Phyto chemical constituents of Satavari and Meda powder

Sl. No	Phyto chemical	Aqueous		Methanol		Ethanol		Chloroform	
		Sat	Meda	Sat	Meda	Sat	Meda	Sat	Meda
1.	Alkaloids	+	-	+	-	+	-	-	-
2.	Tannins	+	-	+	-	+	-	-	-
3.	Flavonoids	+	+	+	+	+	+	-	+
4.	Saponins	+	-	+	-	+	-	-	-
5.	Glycosides	+	+	+	+	+	-	-	-
6.	Phenols	+	-	+	-	-	-	-	-
7.	Reducing Sugars	+	+	+	+	+	+	-	+
11.	Diterpenes	-	-	-	-	-	+	-	-

Figure 1: Root of *Asparagus racemosus*

Figure 2: Fine root powder of *Asparagus racemosus*

Figure 3: Rhizomes of *Polygonatum cirrhifolium*

Figure 4: Fine rhizome powder of *Polygonatum cirrhifolium*

POWDER MICROSCOPY OF SATAVRI ROOT POWDER

Figure 5

Figure 6

Figure 7

Figure 8

Figure 9

TRANSVERSE SECTION OF MEDA RHIZOME

Figure 10

Figure 11

Figure 12

Figure 13

Figure 14

POWDER MICROSCOPY OF MEDA RHIZOME

Figure: 15

Figure: 16

Figure 17

Figure 18

Figure 19

Figure 20

EXTRACTS

Figure 21: Aqueous extract

Figure 22: Ethanol extract

Figure 23: Methanol extract

Figure 24: Chloroform extract

DISCUSSION

The macroscopical features of Satavari root on observation found to be tuberous, 10 to 30 cm in length and 0.1 to 0.5 cm thick, tapering at both ends with longitudinal wrinkles and the Meda rhizome is tuberous, branched or show large circular scars where they have broken off, outer surface is smooth, grayish in colour, longitudinally wrinkled when dried, marked with transverse rings of leaf scars and also shows scars of aerial stem on upper side, numerous roots arise from surface, fracture is short, fibrous.

The transverse section's of Satavari root and Meda rhizomes were performed under Carl Zeiss Axio Lab AX10 LabA1 microscope under 20x objective lense with DIC reflector show the presence of cortex, endodermis, pericycle, radial vascular bundles, pith and the elements identified under transverse section of Meda rhizome were multilayered epidermis, multilayered thick walled cork, ground tissue, loose round parenchyma, scattered vascular bundles and xylem raphides.

The powder microscopy of Yellowish-cream, Satavari root and Meda rhizome fine powders were performed under Carl Zeiss

Axio Lab AX10 LabA1 microscope, and DIC reflector, with 40x and 20x objective lense respectively. The elements identified in Satavari powder are scalariform xylem vessels, and the elements identified in Meda rhizome powder are pitted xylem vessels, tacheids, trichomes and stomata.

The common elements found in both the samples are starch grains, raphides, fibres, and raphide bundle.

Physico-chemical analysis

The physicochemical analysis of Satavari root and Meda rhizome powder have shown the values as -Total Ash – 3.55 % and 4.7%, Moisture content – 10.04% and 6.5%, Acid insoluble Ash – 0.38% and 0.54% Water soluble extract – 40.5% and 63.15% and Alcohol soluble extract – 6.53% and 18.76%.

The analytical results showed that the total ash, acid insoluble ash, water soluble extractive and alcohol soluble extractive of Satavari and Meda are 3.55% and 4.7 %, 0.38% and 0.54% respectively which are within the limits as mentioned in API. The water soluble extractive and alcohol soluble extractive values are 40.5% and 63.15%, 6.53% and 18.76% respectively.

Phyto-chemical analysis

Both the drugs were subjected to different extracts like aqueous, ethanol, methanol and chloroform. The different tests done for phytochemical screening revealed the presence of both Flavonoids, glycosides, saponins and reducing sugars commonly in Satavari and Meda and alkaloids and tannins are seen in Satavari.

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