COMPARATIVE PHARMACOGNOSTICAL STUDY BETWEEN MARKET SAMPLES OF MEDA (Polygonatum cirrhifolium Royle) RHIZOME AND ITS SUBSTITUTE SATAVARI (Asparagus racemosus Willd) ROOT
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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 name of Satavari. Asparagus racemosus (Satavari, 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 seeds. 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 disorders.

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 abracteolate. 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 x ca. 0.15 mm, papilllose; anthers 2–2.5 mm. Ovary 2.5 mm. Style 2 mm. Berries red or purple-red, 8–9 mm in diameter 4–9-seeded.

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, part-IV and part-VI respectively, collected from different markets according to their habitat and availability.

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 taste.

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 taste.

**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 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 samples were examined under a dissecting microscope. The samples were made into small pieces 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 glycerol.

**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, etc.

**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 books.

**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 methods. 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 AxioLab AX10 LabA1 microscope, 20x objective lense and DIC reflector, being peeled. Show no presence of epiblom 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. Phloem consists of pitted, lignified or non-lignified cells having intercellular spaces.

**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, 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

<table>
<thead>
<tr>
<th>Sl. no</th>
<th>Characteristics</th>
<th>Satavari</th>
<th>Meda</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Texture</td>
<td>Fine powder</td>
<td>Fine powder</td>
</tr>
<tr>
<td>2</td>
<td>Odour</td>
<td>Characteristic odour</td>
<td>Not distinct</td>
</tr>
<tr>
<td>3</td>
<td>Colour</td>
<td>Yellowish cream</td>
<td>Dark brown</td>
</tr>
<tr>
<td>4</td>
<td>Taste</td>
<td>Sweet bitter</td>
<td>Sweet</td>
</tr>
<tr>
<td>5</td>
<td>Fracture of the root</td>
<td>Short and granular</td>
<td>Short</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Characteristics</th>
<th>Satavari</th>
<th>Meda</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Total Ash</td>
<td>3.55%</td>
<td>4.7%</td>
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<tr>
<td>2</td>
<td>Moisture content</td>
<td>10.04%</td>
<td>6.5%</td>
</tr>
<tr>
<td>3</td>
<td>Acid insoluble Ash</td>
<td>0.38%</td>
<td>0.54%</td>
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<tr>
<td>4</td>
<td>Water soluble extract</td>
<td>40.5%</td>
<td>63.15%</td>
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<td>5</td>
<td>Alcohol Soluble extract</td>
<td>6.53%</td>
<td>18.76%</td>
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<td>6</td>
<td>Methanol extract</td>
<td>0.58%</td>
<td>1.28%</td>
</tr>
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</table>

Table 3: Phyto chemical constituents of Satavari and Meda powder

<table>
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<tr>
<th>Sl. No</th>
<th>Phyto chemical</th>
<th>Aqueous</th>
<th>Methanol</th>
<th>Ethanol</th>
<th>Chloroform</th>
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<td></td>
<td></td>
<td>Sat</td>
<td>Meda</td>
<td>Sat</td>
<td>Meda</td>
</tr>
<tr>
<td>1</td>
<td>Alkaloids</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
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<tr>
<td>2</td>
<td>Tannins</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Flavonoids</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>4</td>
<td>Saponins</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
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<tr>
<td>5</td>
<td>Glycosides</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
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<td>6</td>
<td>Phenols</td>
<td>+</td>
<td>-</td>
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<td>7</td>
<td>Reducing Sugars</td>
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<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>11</td>
<td>Diterpenes</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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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
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, greyish 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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