A COMPARATIVE PHARMACOGNOSTICAL STUDY OF RHIZOMES OF MUSTAKA AND NAGARMUSTAKA

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ABSTRACT

Mustaka was held in high esteem by the ancient sages of India. This super bulb has been used throughout the ages for the treatment of numerous illnesses. It is an aquatic or semi-aquatic herb and found throughout India. Like Mustaka, Nagarmustaka is a perennial herb which grows in aquatic and semi-aquatic regions especially on banks of streams and rivers. Rhizome is the useful part of both the plants. Both the drugs have high therapeutic value in day to day medical conditions like obesity, hyperlipidemia, acute & chronic fevers, diarrhoea, skin diseases, cough, digestive disorders, intestinal worms etc. But there is some confusion about their identity because both were considered as synonyms as well as varieties in ayurvedic texts and in most of the markets also, the raw drug sellers are selling a single drug under the name of Motha and Nagarmotha both. The present study was aimed to systematically classify Mustaka (Cyperus rotundus Linn.) and Nagarmustaka (Cyperus procerus Roth.) through their Pharmacognostical evaluation by microscopy, microscopy and powder analysis for their correct identification. Mustaka (Cyperus rotundus Linn.) and Nagarmustaka (Cyperus procerus Roth.) were collected from their natural habitat and botanically identified from BSI. Organoleptically study, transverse sections and powder microscopy of the rhizomes of both the species were carried out. Organoleptically, Rhiomzes of Mustaka (Cyperus rotundus Linn.) are ovoid, blunt and spindle in shape while the rhizomes of Nagarmustaka (Cyperus procerus Roth.) are elongated and cylindrical in shape. Microscopically, in the T.S of rhizomes, vascular bundles was more closely present in Nagarmustaka (Cyperus procerus Roth.) than the Mustaka (Cyperus rotundus Linn.) and bundle sheath was present around the bundles of Nagarmustaka (Cyperus procerus Roth.) while it was absent in Mustaka (Cyperus rotundus Linn.). Cell nuclei was found in the powder microscopy of Nagarmustaka (Cyperus procerus Roth.) only. This study will provides identifying features of Mustaka (Cyperus. rotundus Linn.) and Nagarmustaka (Cyperus procerus Roth.) for their correct identification. From this study it can be concluded that these are two different species from Cyperus.

Keywords: Mustaka, Nagarmustaka, Cyperus rotundus Linn., Cyperus procerus Roth., microscopy

INTRODUCTION

Mustaka and Nagarmustaka are important drugs of Ayurveda. The therapeutic utility of Mustaka and Nagarmustaka are wide ranging as these two drugs are used in the different classical formulations for the treatment of different diseases. Mustaka (Cyperus rotundus Linn.) is an erect and perennial glabrous herb with woody subterranean stoloniferous rhizome which is clothed with fibrous remains of leaf sheaths. Stems are nodose at base, 3-gonous and 10-60 cm high1. The rhizome of Mustaka i.e. Cyperus rotundus Linn. are cooling, intellect promoting, nerve tonic, diuretic, antiperiodic and used to treat diarrhoea, dysentery, leprosy, bronchitis, anemia, rheumatism and blood disorders2.

In ayurveda, Mustaka is considered to be best among Deepana, Pachan and Sangrahik drugs. It is used as an ingredient of many important formulations like Chyavanprash, Shadangapaniya, Trayamanaradya ghrita, Mahatikata ghrita, Navayasa loha, Anu taila, Phala ghrita, Yograj guggulu, Navak guggulu, Pushyanaag churna, Balchaturbdhikira churna, Sudarshana Churna, Brihat Manjishthadi Kwatha, Chandraprabha vati, Gokshuradi guggulu, Kumaraayasya, Dashmularista, Lakshadi taila, Gangadhara churna, Bilva taila, Narikela khandha, Maha yograj guggulu, Triphala guggulu, Vangeshvara rasa, Haridra khandha, Ashokarista etc. and use of different formulations of Mustaka have been mentioned in various diseases like Jvara (fever), Aritisara (Diarrhoea), Medo roga (Hyperlipidemia), Grahani roga, Arsha (Piles), Pandu roga (Anaemia), Raktapitta (Hemoptysis), Kasa (Cough), Yakshma roga , Chardi (Vomiting), Arochaka (Anorexia), Kubja, pangu, Ardhvargata (Hemiplegia) and other Vata vyadhi, Vatarakta (Gout), Amavata (Rheumatoid arthritis), Shula (pain) etc. It plays an important place among medicinal herbs in India since ancient times3-16.

Like Mustaka, Nagarmustaka is a perennial herb which grows in aquatic and sub-aquatic region. It is also very useful in treatment of various disorders like Jvara (Fever), Aruchi (Anorexia), Aritisara (Diarrhoea), Trishna (Thirst), Jantu roga (Worms) etc. Nagarmustaka (Cyperus procerus Roth.) is a herb grows 40-120 cm. tall, branches are long and with three edges. It is a larger plant than Mustaka (Cyperus rotundus Linn.) and rhizomes are also larger17.

Brihatayi, has only mentioned about the Mustaka and there is no description of Nagarmustaka. Description of Nagarmustaka is mainly found in different Nighantu. Nighantu created so much confusion regarding the identity of Mustaka and Nagarmustaka. Some considered the both as a synonyms and some described both as a varieties.
Organoleptic Study

Dhanwantari Nighantu, Bhavprakash Nighantu, Raj Nighantu and Shaligram Nighantu considered Mustaka and Nagarmustaka as a varieties. Sodhala and Madanpal Nighantu considered the both as a synonyms. But Priya Nighantu had only mentioned about the Mustaka and there is no description about Nagarmustaka in this Nighantu.

Mustaka is commonly known as Motha and Nagarmustaka is also known as Nagarmotha.

In the market of crude drugs also, mostly rhizomes of Nagarmustaka (Cyperus procerus Linn.) are being sold under the name of Motha and Nagarmotha while Mustaka is found abundantly throughout India. So, there is need to find out the pharmacognostical study of both the drugs for their correct identification.

MATERIAL AND METHODS

Plant Materials

The plants material which were taken for study are - Mustaka Nagarmustaka Cyperus rotundus Linn. is taken as a source of Mustaka and Cyperus procerus Rottb. is taken as a source of Nagarmustaka.

Collection of genuine sample from the field

- The genuine samples were collected after identifying the source of plant as per standard description.
- The genuine sample of Mustaka i.e rhizomes of Cyperus rotundus Linn. were collected from Rishikul Campus, Uttarakhand ayurved university, Haridwar District, State-Uttarakhand
- The genuine sample of Nagarmustaka i.e rhizomes of Cyperus procerus Rottb. were collected from Muni ki reti, State-Uttarakhand.
- From these sources as mentioned above, samples were collected, Herbarium were made and authenticated at Botanical Survey of India (BSI), Dehradun. (Figure 1)

Macroscopic/Organonoleptic Study

The fresh rhizome of Mustaka (Cyperus rotundus Linn.) and Nagarmustaka (Cyperus procerus Rottb.) were dried and studied organoleptically, with naked eye & magnifying lens, with the help of Pharmacognostical procedure i.e. Appearance, size, shape, colour, odour, taste, fracture and findings were recorded and comparative study was done.

Table 1: List of Plants with Herbarium account number

<table>
<thead>
<tr>
<th>S.no</th>
<th>Plant Name</th>
<th>Place Of Collection</th>
<th>Herbarium Account No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Cyperus rotundus Linn.</td>
<td>Rishikul Campus, Haridwar, Uttarakhand</td>
<td>116043</td>
</tr>
<tr>
<td>2.</td>
<td>Cyperus procerus Rottb.</td>
<td>Muni ki reti, Uttarakhand</td>
<td>116039</td>
</tr>
</tbody>
</table>

Microscopic Study

Microscopic sections were cut by Microtome sectioning. Numerous temporary and permanent mounts of the microscopical sections of the specimen were made and examined microscopically. Histochemical reactions were applied with staining reagents on transverse sections and on rhizome powder by reported methods. Powder characteristics Preliminary examination and behaviour of the powder with different chemical reagents was carried out and microscopical examination was carried out as per reported methods.

RESULTS

Organoleptic Study

Table 2: Comparative Organoleptic Study of Mustaka (Cyperus rotundus Linn.) and Nagarmustaka (Cyperus procerus Rottb.)

<table>
<thead>
<tr>
<th>S.No</th>
<th>Rhizomes</th>
<th>Genuine Sample of Mustaka (Cyperus rotundus Linn.)</th>
<th>Genuine Sample Of Nagarmustaka (Cyperus procerus Rottb.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Shape</td>
<td>Ovoid, bluntly conical and spindle shape</td>
<td>Elongated and cylindrical</td>
</tr>
<tr>
<td>2.</td>
<td>Size</td>
<td>1-2.5 cm in length and 0.5-1 cm. in thickness.</td>
<td>5-20 cm in length and 0.5-1.5 cm. in thickness.</td>
</tr>
<tr>
<td>4.</td>
<td>Surface</td>
<td>Rough with striations and covered with flexuous hairs.</td>
<td>Rough and covered with flexuous hairs.</td>
</tr>
<tr>
<td>5.</td>
<td>Odour</td>
<td>Pleasant</td>
<td>Pleasant</td>
</tr>
<tr>
<td>6.</td>
<td>Taste</td>
<td>Bitter, pungent &amp; astringent in taste</td>
<td>Bitter, pungent &amp; astringent in taste</td>
</tr>
<tr>
<td>7.</td>
<td>Fracture</td>
<td>Not easily breakable due to smaller size, Short exposing white interior with light brown dots</td>
<td>Fracture is somewhat flexible and fibrous exposing with creamish interior.</td>
</tr>
</tbody>
</table>
Transverse Section

Table 3: Comparative Study of Transverse Section of Mustaka (Cyperus rotundus Linn.) and Nagarmustaka (Cyperus procerus Rottb.) Rhizome

<table>
<thead>
<tr>
<th>S.NO</th>
<th>Parameters</th>
<th>T.S of Genuine Sample of Mustaka (Cyperus rotundus Linn.)</th>
<th>T.S of Genuine Sample of Nagarmustaka (Cyperus procerus Rottb.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Cortex</td>
<td>Cortex, wide and composed of uniformly round, thin walled, parenchymatous cells.</td>
<td>Cortex, wide and composed of uniformly round, thin walled, parenchymatous cells.</td>
</tr>
<tr>
<td>3.</td>
<td>Endodermis</td>
<td>Single layered</td>
<td>Single layered</td>
</tr>
<tr>
<td>4.</td>
<td>Vascular bundles</td>
<td>Small, rounded vascular bundles present inner to the pericycle.</td>
<td>The ground tissue inner to the pericycle contains a large number of small rounded vascular bundles.</td>
</tr>
<tr>
<td></td>
<td>a) Bundle sheath</td>
<td>Less in numbers</td>
<td>More</td>
</tr>
<tr>
<td></td>
<td>b) Oil globules</td>
<td>absent</td>
<td>More</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More</td>
<td>Less</td>
</tr>
<tr>
<td>5.</td>
<td>Starch</td>
<td>Cells of pith and cortex region contain starch.</td>
<td>Cells of pith and cortex region contain starch.</td>
</tr>
</tbody>
</table>

Powder Microscopy

Table 4: Comparative Powder Microscopy of Genuine Sample of Mustaka (Cyperus rotundus Linn.) and Nagarmustaka (Cyperus procerus Rottb.) Rhizome

<table>
<thead>
<tr>
<th>S.NO</th>
<th>Features</th>
<th>Genuine Sample of Mustaka (Cyperus rotundus Linn.)</th>
<th>Genuine Sample of Nagarmustaka (Cyperus procerus Rottb.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Tannins</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2.</td>
<td>cellulose</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3.</td>
<td>Mucilage</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>4.</td>
<td>Cutin</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>5.</td>
<td>Cell nuclei</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
Figure 2: Herbarium Authentication Certificate

Mustaka (Cyperus rotundus Linn.)
Nagarmustaka (Cyperus procerus Rottb.)

Figure 3: Rhizome

Short fracture exposing with starchy white interior
Mustaka (Cyperus rotundus Linn.) Rhizome

Fibrous and Flexible
Nagarmustaka (Cyperus procerus Rottb.) Rhizome

Figure 4: Organoleptic Study
T.S of Mustaka Rhizome (Cyperus rotundus Linn.)

T.S of Nagarmustaka Rhizome (Cyperus procerus Rottb.)

E : Epidermis, End : Endodermis, Ct : Cortex, Vb : Vascular bundles, OG : Oil globules, Pi : Pith

Figure 5: Transverse Section

Figure 6: Powder Microscopy
DISCUSSION

Organoleptic study of Mustaka (Cyperus rotundus Linn.) and Nagarmustaka (Cyperus procerus Rottb.) were reported in Table 2. Rhizomes of Mustaka (Cyperus rotundus Linn.) are ovoid, blunt and spindle in shape, vary in size and nearly about 1-2.5 cm in length and 0.5-1 cm in thickness while the rhizomes of Nagarmustaka (Cyperus procerus Rottb.) are elongated and cylindrical in shape and larger than the Mustaka which is about 5-20 cm in length and 0.5 – 1.5 cm. in thickness. Mustaka (Cyperus rotundus Linn.) rhizomes are not easily breakable due to smaller size and hardened nature and the fracture is short exposing white interior with light brown dots while the fracture is fibrous and flexible exposing with creamish interior in Nagarmustaka (Cyperus procerus Rottb.). (Figure 4)

Microscopic study of Mustaka (Cyperus rotundus Linn.) and Nagarmustaka Rhizome (Cyperus procerus Rottb.) were reported in Table 3.

T.S of Mustaka (Cyperus rotundus Linn.) and Nagarmustaka (Cyperus procerus Rottb.) rhizome were almost same. But the difference was present in vascular bundles of both. The vascular bundles were more in number and more closely present in the Nagarmustaka than the Mustaka.

In the transverse section, bundle sheath was absent in the vascular bundle of Mustaka (Cyperus rotundus Linn.) rhizome while it was present in the vascular bundle of Nagarmustaka (Cyperus procerus Rottb.) rhizome.

Oil globules were present more in Mustaka (Cyperus rotundus Linn.) rhizome than the Nagarmustaka (Cyperus procerus Rottb.) rhizome. (Figure 5)

Powder microscopy were reported in Table 4. Microscopic examination of powder shows presence of Tannin, Cellulose, Mucilage, Cutin in the genuine sample of Mustaka and Nagarmustaka both. The difference was cell nuclei is absent in genuine sample of Mustaka (Cyperus rotundus Linn.) while present in genuine sample of Nagarmustaka (Cyperus procerus Rottb.). (Figure 6)

CONCLUSION

The Comparative Pharmacognostical study of Mustaka (Cyperus rotundus Linn.) and Nagarmustaka (Cyperus procerus Rottb.) helps in the identification of these species. After the detailed study, it can be concluded that Mustaka and Nagarmustaka are two different species of Cyperus. In this present study standardization parameters such as macroscopy, microscopy and powder analysis were carried out which could help in authentication of Mustaka (Cyperus rotundus Linn.) & Nagarmustaka (Cyperus procerus Rottb.) and will serve as a reference for correct identification and distinguishing both the drugs.

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