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PHARMACOGNOSTICAL ANALYSIS OF MARKET SAMPLES OF MUSALI FROM KERALA AND COMPARATIVE PHARMACOLOGICAL ASPECTS OF TWO VARIETIES OF MUSALI, SWETA (CHLOROPHYTUM BORIVILI1ANUM, ASPARAGUS ADSCENDENS) AND KRISHNA (CURCULIGO ORCHIODES)

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ABSTRACT

Ayurveda medicines make use of the natural flora for the preparation of various formulations. Nowadays, increased demand and shortage in the availability of raw materials along with high cost has led to substitution and adulteration of these drugs. Regional disparity in their distribution and unscientific collection of raw materials further deteriorates the condition. As a result, the use of the inferior quality materials has significantly affected their therapeutic efficacy. Hence, quality standardization of the drugs has got greater importance in various formulations. *Musali* is a versatile drug with variety of pharmaceutical significances. This drug is an ingredient of variety of *yogas* such as *Musalikhadiradi kashayam, Satavari gulam*, which are quite common in gynecological treatments. *Sweta musali* and *Krishna musali* are the two varieties mentioned in *Raja Nigantu,* among this, *Krishna* is preferred over *Sweta* due to their superior pharmacological properties. *Chlorophytum borivilianum* and *Asparagus adscendens* are used as *Sweta musali* and *Curculigo orchioides* as *Krishna musali*. In API *Krishna musali* is mentioned as *Talamuli* (*Curculigo orchiodes)*. In this study, we attempt to understand which variety is used in Kerala market. We have pharmacognostically analyzed the market samples collected from selected districts of Kerala and also compared the phytopharmacological aspects of these drugs (*Chlorophytum borivilianum, Asparagus adscendens* and *Curculigo orchiodes)*.

Keywords: Pharmacognosy, Musali*, Chlorophytum borivilianum, Asparagus adscendens, Curculigo orchiodes.*

INTRODUCTION

India is well known for their rich plant biodiversity. The diverse climatic condition of the country favors these vast herbal resources. Plant genetic diversity is a major factor in any system of medicine as an important raw material for drugs [1]. Herbal drugs constitute the major component of Ayurvedic formula-

tions. Nowadays, the adulteration and substitution of Ayurvedic drugs is a serious concern in this field. The usage of commercially available inferior quality of drugs has compromised the therapeutic efficacy of Ayurveda. Hence, the quality standardisation of drugs has got greater importance in Ayurveda[2]. Pharmacognostic techniques, includes both macroscopic and microscopic evaluation, are the major tool in identifying the adulteration and substitution. Macroscopic evaluation was carried out with the help of visual observation by understanding the features such as size, shape and external characters. Microscopic evaluation helps in understanding the drugs from its anatomical characters [4]. *Musali* is a versatile drug with variety of pharmaceutical significance. This drug is an important ingredient in the formulations widely prescribed in the gynaecological conditions such as *Musalikhadiradi kashayam, Satavari gulam*. Two different varieties of *Musali* explained in the *Raja Nigantu* are *Sweta Musali* and *Krushna Musali*. *Pandit Narahari* also indicated about the inferior quality *Sweta Musali*[3]. *Chlorophytum borivilianum, Asparagus adscendens* are used as *Sweta musali* and *Curculigo orchioides* are used as *Krishna musali.* In API *Krishna musali* is mentioned as *Talamuli* under the botanical identity of *Curculigo orchiodes*.[4] This study aims at determining the variety of Musali used in the Kerala market by pharmacognostically comparing the features of the samples collected from selected districts of Kerala (Trivandrum, Kottayam and Ernakulam). This study also comprises the comparison of pharmacological aspects of the drugs, *Chlorophytum borivilianum, Asparagus adscendens* and *Curculigo orchiodes* by compiling the information regarding these drugs in various published journals and reports.

Materials and Methods

Procedure: Genuine sample of roots of Musali was collected from the herbal garden of Govt. Ayurveda College, Tripunithura, Kerala. Market Samples of Musali roots were collected from the markets of Thiruvananthapuram, Kottayam and Ernakulam districts. Macroscopical characters of genuine as well as market samples were examined and transverse sections of the roots were taken and compared with genuine samples.

Pharmacognostical Studies: The transverse section was taken with razor blade. The sections were then suspended in the water in a watch glass and a few drops of safranine stain were added to the water containing thin section. The section was transferred on a clean slide with the help of the hair brush. Once the section was completely stained, the stained section was mounted at the centre of the slide and a drop of glycerine was added on the section. Later, the section was covered with a cover slip without getting air bubble between the slide and cover. The stained slide was viewed at a power of 10X for visualizing the histological parameters [5].

Pharmacological review

A review was made on the pharmacological aspects of the *Curculigo orchioides, Chlorophytum borivilianum* and *Asparagus adscendens* by compiling the information published in various peer reviewed journals and reports. Comparison of these drugs was made on the basis of the similarity in the activity.

RESULTS AND DISCUSSION

Pharmacognostical analysis and macroscopic evaluation of market samples (Fig 1) is as follows. Gross appearance in the market, small pieces; shape, cylindrical pieces; size, 2-5 cm long; external characters, surface with numerous shallow wrinkles, transverse cracks, nodes, root fibers present; colour, brownish black in colour externally and creamish white internally; fracture, short, mucilaginous; odour, aromatic; taste, slightly bitter.

Fig 1: Market samples of Musai from different localities A. Genuine sample B. Thiruvanathapuram C. Kottayam D. Ernakulam - Microscopic features of market samples

Microscopic evaluation

Narrow strip consisting of 4-6 rows of thick-walled brown coloured cork cells, secondary cortex consists of thin-walled 15-20 rows parenchymatous cells with intercellular space, densely filled with starch grains and acicular crystals of calcium oxalate, either isolated or in bundles. Lysigenous cavities were also found. Numerous collateral fibro-vascular bundles found scattered throughout the region of endodermis, mostly towards peripheral region having phloem consisting of a few xylem vessels having annular and spiral thickenings. Microscopic features were shown in the figure 2-5.

Pharmacological review

The comparison of the pharmacological aspects of the three drugs revealed that these drugs have similar activities such as antioxidant, anticancer, anti-inflammatory, antihyperglycemic, spermatrogenic, aphrodisiac, and uterine stimulantactivity [6,7,8,9,10,11,12]. The comparison was made on the basis of the study conducted in the animal models. The comparisons of the activities of these three drugs are given in the table 1.

Comparison of antioxidant activity

The antioxidant activity was determined in these drugs by DPPH radical scavenging essay. The percentage of inhibition was calculated. A review on the antioxidant activity revealed that *Curculigo orchioides* have higher percentage of inhibition than the other two drugs [6,7,8]. Comparison of the results of antioxidant activity was shown in the table 2.

Comparison of Anti-inflammatory activity

The anti-inflammatory activity was assessed by inducing paw odema by carragenean. Later, the percentage inhibition of paw edema was calculated. The review on the anti-inflammatory activity showed that *Curculigo orchioides* have greater percentage of inhibition than the other two drugs [7,8,9]. The results of comparison were given in the table 3

Comparison of spermatogenic activity- Treatment for 30 days

The review of published information on the spermatogenic activity indicated that there is a significant increase in the tubular diameter and number of spermatocytes after the treatment with *Curculigo orchioides* for 30 days [7,10,11]. The results on review were shown in the table 3.

Comparison of aphrodisiac activity

The treatment with the following drugs were given for 30 days and mount latency, intromission latency, post ejaculatory latency and penile erection index were calculated. A review of papers showed that the aphrodisiac activity is higher in *Curculigo orchioides* than the other two drugs [7,10,12]. The results of the comparison were shown in the table 4

CONCLUSION

The macroscopic features of market samples have resemblance with *Curculigo orchiodes*. Microscopic features of the market samples showed the presence of 15-20 rows of parenchymatous cells with starch grains, acicular crystals of calcium oxalate, lysoginous cavities, and scattered vascular bundles. A microscopical feature resembles that of the genuine samples of *Curculigo orchiodes*.

A review on the comparison of pharmacological properties indicated that *Curculigo orchiodes, Chlorophytum tuberosum* and *Asparagus adscendens* have similar pharmacological actions, among this *Curculigo* found to be superior that other two [6,7,8,9,10,11,12]. This substantiates the classical claim in the *Raja Nigantu*, that *Krishna musali* is superior to *Sweta musali* [4]. *Curculigo orchiodes* are marketed as *Musali* in Kerala markets and other two varieties are not available in the market.

Fig 2: Genuine samples of *Curculigo orchiodes* (A Cork region, Secondary cortex region showing acicular calcium oxalate crystals; B, Scattered collateral vascular bundles; C, Lysigenous cavities and Xylem vessels)

Fig-3: Market samples of *Musali* from Kottayam (A, Cork region, Secondary cortex region showing acicular calcium oxalate crystals; B, Xylem vessels; C Scattered collateral vascular bundles)

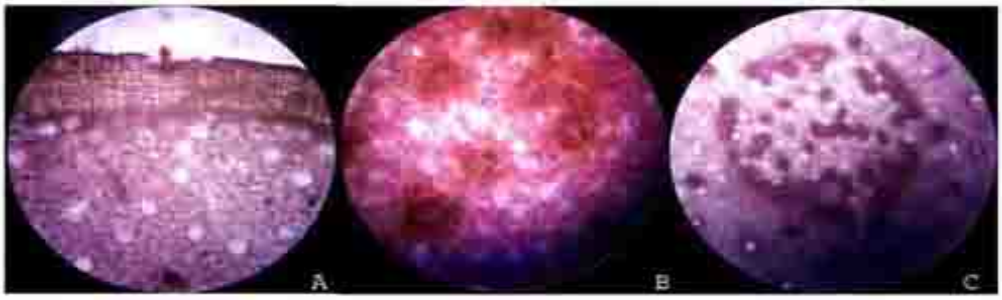

Fig-4: Market samples of *Musali* from Trivandrum (A, Cork region, Secondary cortex containing acicular calcium oxalate crystals; B, Xylem vessels; C Scattered vascular bundles)

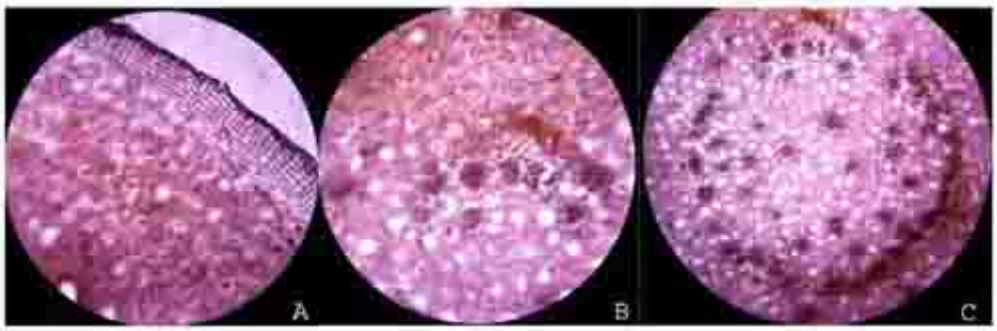

Fig-5: Market samples of *Musali* from Ernakulam (A, Scattered vascular bundles; B, Cork region, Calcium oxalate crystals; C Xylem vessels, Lysigenous cavities)

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Table 1: Comparison of Pharmacological aspects of *Curculigo orchioides, Chlorophytum borivilianum and asparagus adscendens*

Curculigo orchioides	***Chlorophytum borivilianum***	***Asparagus adscendens***
Antioxidant activity	Antioxidant activity	Antioxidant activity
Anticancer	Anticancer	Anticancer
Anti inflammatory	Anti inflammatory	Anti inflammatory
Antihyperglycaemic	Antihyperglycaemic	Antihyperglycaemic
Spermatogenic	Spermatogenic	Spermatogenic
Aphrodisiac	Aphrodisiac	Aphrodisiac
Estrogenic activity	Uterine stimulant	
Uterine stimulant		
Antiosteoporotic		
Antibacterial		
Analgesic		
Cardiovascular		

Table 2: Comparison of antioxidant activity by DPPH radical scavenging activity		
Drug	**Dose**	**Percentage inhibition**
Curculigo orchioides	500 mg/kg bw	74.56±0.435
Chlorophytum borivilianum	500 mg/kg bw	40.0 ± 2.8
Asparagus adscendens	500 mg/kg bw	29.0± 1.3

Table 3: Comparison of anti-inflammatory activity		
Drug	**Dose**	**Percentage inhibition**
Curculigo orchioides	200 mg/kg	56.14 (at 5th hour)
Chlorophytum borivilianum	200 mg/kg	40.48 (at 5th hour)
Asparagus adscendens	200 mg/kg	36.28 (at 5th hour)

Table 4: Comparison of spermatogenic activity			
Drug	**Tubular diameter**	**No of spermatocytes**	**No of spermatogonia**
Curculigo orchioides	308.8±41.5	107.46±6.07	12.56±1.99
Chlorophytum borivilianum	154	10	35
Asparagus adscendens	124	6	25

Table 5: Comparison of Aphrodisiac activity				
Drug	Mount latency	Intromission Latency	Post ejaculatory Latency	Penile erection index
Curculigo orchioides	128.1±3.2	262.7±6.4	426.6±7.4	38.2±1.4
Chlorophytum borivilianum	88 ±4.3	100.2±3.2	200±5.2	15.2±1.3
Asparagus adscendens	13.0 ± 0.32	18.2 ± 2.12	187.4 ± 1.91	13.5 ± 0.3

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