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COMPARATIVE PHARMACOGNOSY OF *CYPERUS ROTUNDUS* LINN. AND *KYLLINGA BULBOSA* P. BEAUV.

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ABSTRACT

Cyperus rotundus Linn. is the approved source of Musta is an important Ayurvedic drug used in India to cure number of diseases like fever, diarrhoea, cough, vomiting, thirst, epilepsy, eye diseases, vatarakta etc. Whereas in South Indian market the rhizome of *Kyllinga bulbosa* P. Beauv. is sold as Musta. In the present work detailed information related to Pharmacognosy of *Cyperus rotundus* and *Kyllinga bulbosa* (Cyperaceae) have been carried out to differentiate each other for the correct identification. The study revealed that the *Cyperus rotundus* is having stoloniferous rhizome with the maximum height of 40 cm and *Kyllinga bulbosa* is having creeping rhizome with 20 cm height; size of the tubers are big and small; spike is umbellate and capitate; number of flowers are more and less on spikelet and stigma are 3 and 2 respectively. Hypodermis made up of stone cells of 10 – 12 layers with polygonal shape and well developed pits in *Cyperus rotundus* and in *Kyllinga bulbosa* 6 – 8 layers with round and elongated cells with simple pits; ground tissue is made up of parenchyma cells with hexagonal and round to polygonal; amphivasal vascular bundles vary from 28 - 30 and 18 – 20 respectively. Tannin content in both cortex and ground tissue was noticed in *Kyllinga bulbosa*. Cell size of hypodermis, cortex, pericycle and phloem are bigger in the *Cyperus rotundus* compared to *Kyllinga bulbosa*.

Keywords: Pharmacognosy, *Cyperus rotundus*, *Kyllinga bulbosa*, Ayurveda, Musta.

INTRODUCTION

The botanical source of Ayurvedic drug Musta is *Cyperus rotundus*. In South Indian market, especially in Kerala, the rhizome of *Kyllinga bulbosa* P. Beauv. is sold as substitute of Musta. According to Ayurveda classical utilization, both the drugs have similar therapeutic action viz. as diuretic, stimulant, carminative, aphrodisiac, emmanagogue, astringent etc [1]. Moreover, both are used in jwara, rakta dosham, chronic fever and stone in bladder [2]. Raw drug having similar therapeutic actions can be used as substitute to genuine in the preparations and to be standardized with distinguishing diagnostic characters. Many such studies have been carried out in our Institute [3], [4], [5], [6], [7] and [8]. The literature survey revealed that the study of male gametophyte and obturator in *Kyllinga bulbosa* [9] and the life history of *Kyllinga* spp. discussed the outcome in relation with systematic position [10]. Similarly, the work on comparative account of embryo development Cyperaceae spp. [11] and morphological differentiation of *Cyperus rotundus* (Musta) with its substitute *Kyllinga bulbosa* and also the work on essential oil of *Kyllinga* spp [12]. Despite the usefulness of these two drugs, in indigenous system of medicine, no comparative

Pharmacognostical account of these drugs have not been recorded so far. Hence the present Pharmacognostical investigation on rhizomes of *Cyperus rotundus* and *Kyllinga bulbosa* was under taken to enlist the distinguishing diagnostic characters for scientific identification of genuine sample and substitute used to cure various human ailments.

MATERIAL AND METHODS

The rhizome of *Cyperus rotundus* were procured from Bangalore and *Kyllinga bulbosa* from the Kerala market. Microscopical study has been carried out by taking free hand sections of fresh rhizome. Thin sections were cleared with Chloral hydrate solution followed by water and stained with Safrannin [13] and [14]. A drop of HCl and Phloroglucinol were used to detect the lignified cells in sections. For the study of macerate rhizome cut into small pieces and transferred to a test tube containing 5 ml of concentrated Nitric acid and boiled. A pinch of Potassium chlorate added and warmed gently. After complete bleaching the tissue is crushed by using the glass rod by applying less pressure. Allow the material to settle, decant the supernatant liquid and basal material is washed with

fresh water until the acidity was removed. Transfer the material to a glass slide, add a drop of Glycerol and close with cover glass to observe under microscope [15]. Microphotographs have taken by using Digital camera (Model: COOLPIX 4500) fixed with the microscope (Model: LABOMED CXRII).

RESULTS

Morphologically both *Kyllinga bulbosa* and *Cyperus rotundus* are perennial herbs, having aromatic tuber and rhizomes; with spike inflorescence (Table. No. 1 and Figure. No. 1 - 2).

Microscopical studies of *Kyllinga bulbosa* and *Cyperus rotundus* have shown similarity in single layered rectangular epidermis; many layered hypodermis and ground tissue; single layered endodermis and scattered amphivasal vascular bundles (Table. No. 2 and Figure. No. 3 - 14).

Macerated materials of both *Kyllinga bulbosa* and *Cyperus rotundus* showed abundant xylem vessels; thin walled parenchyma cells; a narrow layered xylem vessel with helical thickening; thin walled parenchyma cells with starch grains, epidermis and endodermis cells are similar in diameter (Table. No. 3 and Figure. No. 15 - 26).

Figure 1. Herbarium specimen of *Cyperus rotundus* Linn. Whole plant with crude drug (Rhizome)

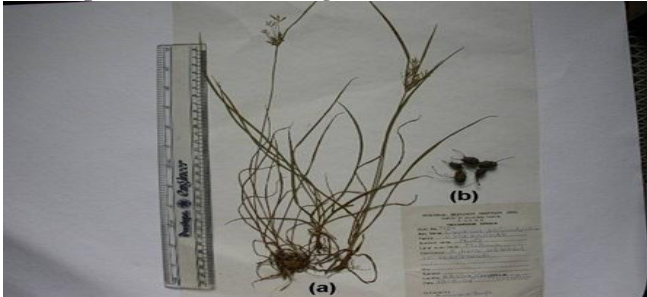


Figure 2. Herbarium specimen of *Kyllinga triceps* P. Beauv. Whole plant with crude drug (Rhizome)

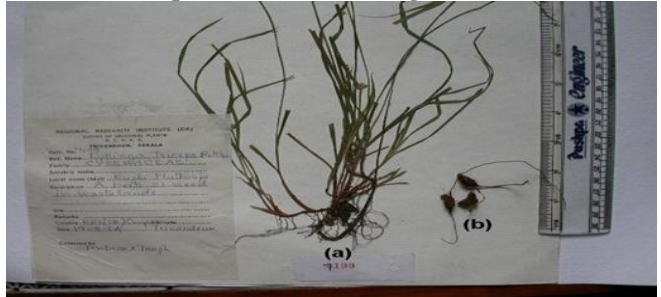


Figure 3. T. S. of Rhizome (Ground plan) of *Cyperus rotundus* Linn.



Figure 4. Epidermis of *Cyperus rotundus* Linn.

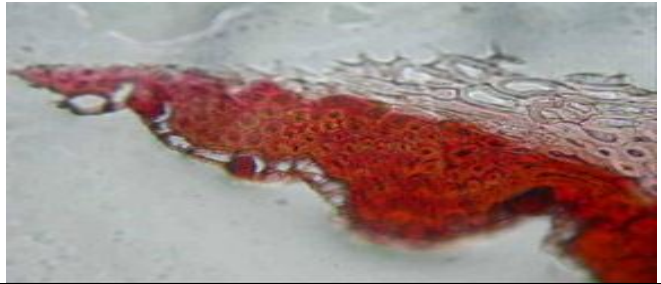


Figure 5. Ground tissue and Endodermis of *Cyperus rotundus* Linn.

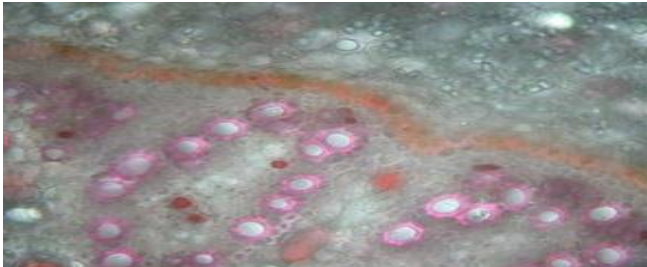


Figure 6. Starch grains in Ground tissue of *Cyperus rotundus* Linn.

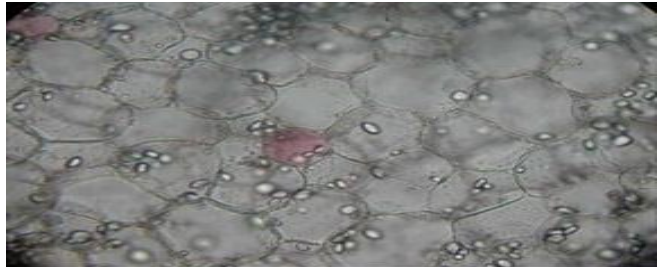


Figure 7. Endodermis and pericycle of *Cyperus rotundus* Linn.

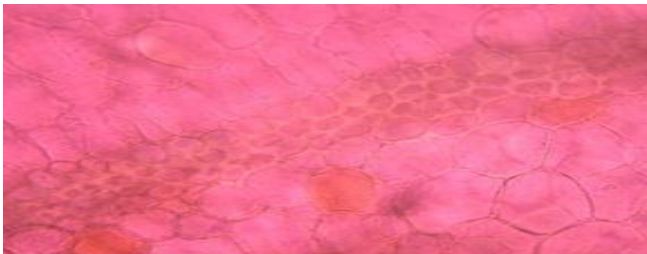


Figure 8. Vascular Bundle of *Cyperus rotundus* Linn.

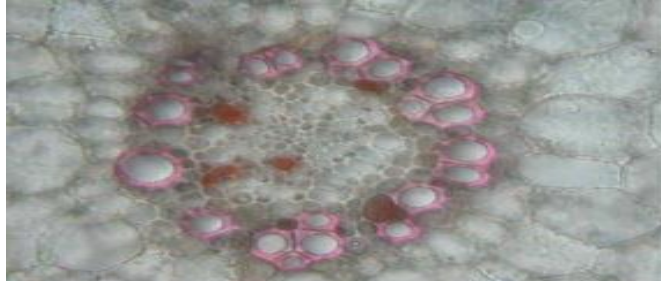


Figure 9. T. S of Rhizome (Ground plan) of *Kyllinga triceps* P. Beauv.



Figure 10. Epidermis of *Kyllinga triceps* P. Beauv.



Figure 11. Ground tissue and Endodermis of *Kyllinga triceps* P. Beauv.



Figure 12. Starch grains and Tannin in Ground tissue of *Kyllinga triceps* P. Beauv.

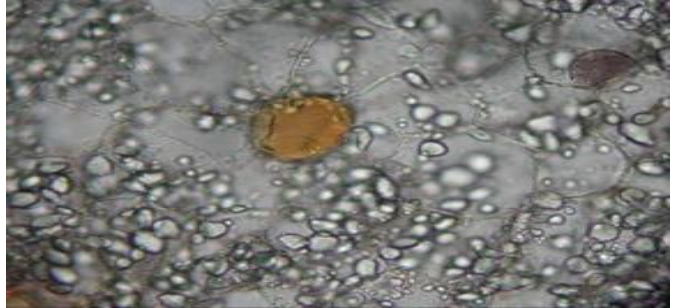


Figure 13. Endodermis and pericycle of *Kyllinga triceps* P. Beauv.

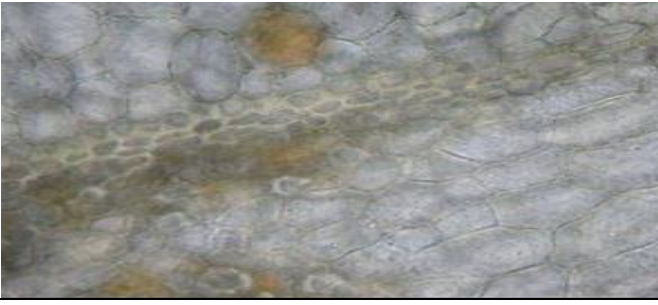


Figure 14. Vascular Bundle of *Kyllinga triceps* P. Beauv.



Figure 15. Parenchyma cells, abundant xylem vessels and trachids of *Cyperus rotundus* Linn.



Figure 16. Parenchyma cells and fibers of *Cyperus rotundus* Linn.

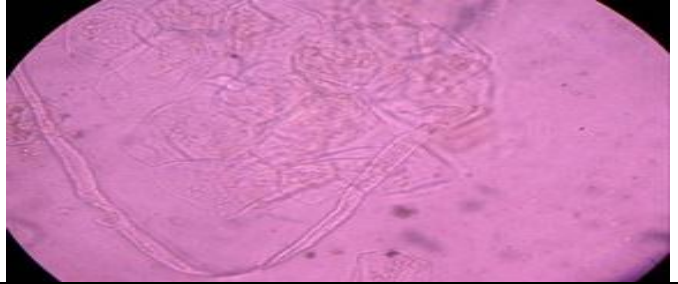


Figure 17. Xylem vessel with helicle thickening of *Cyperus rotundus* Linn.



Figure 18. Trachids of *Cyperus rotundus* Linn.



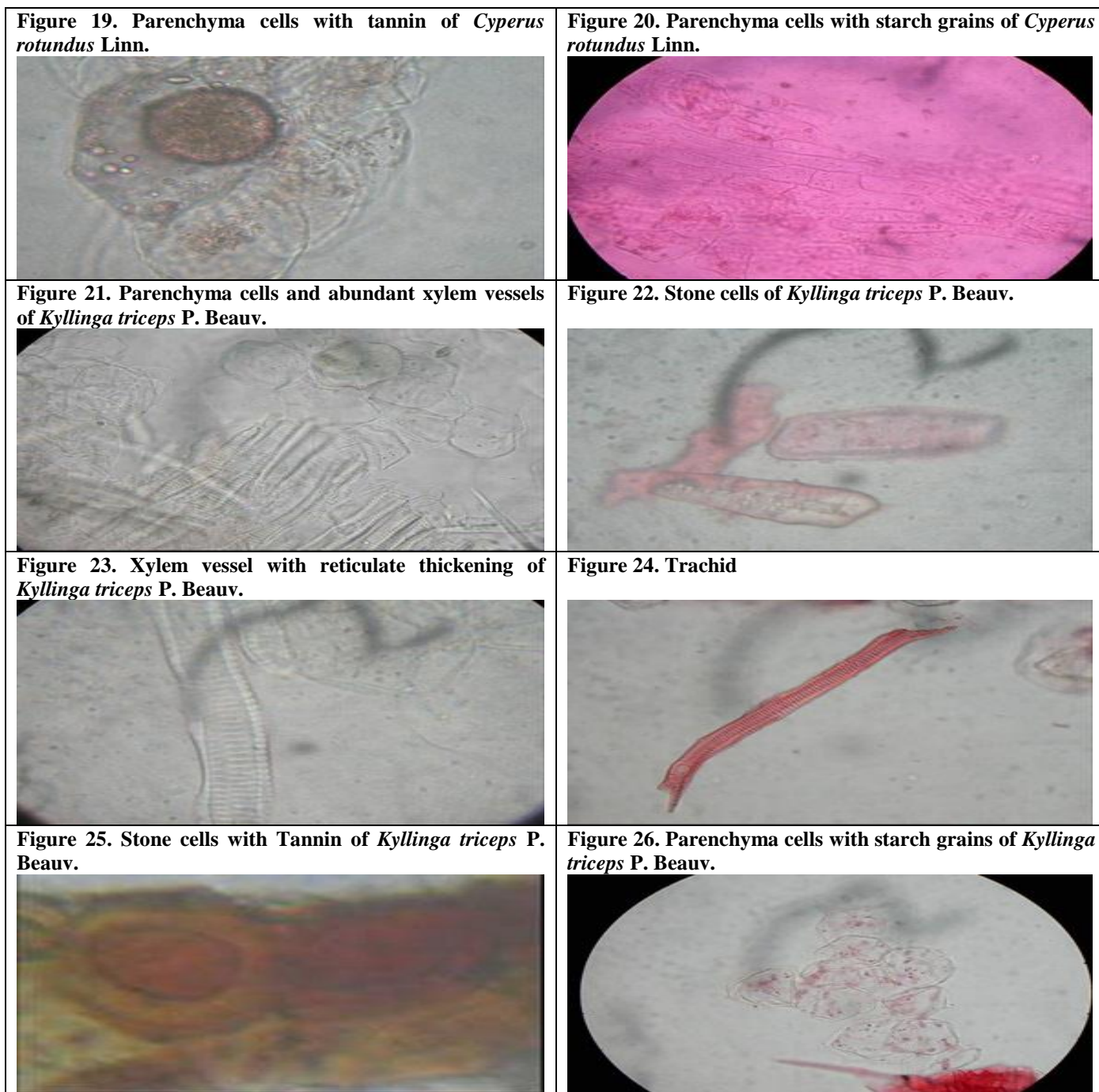


Table 1. Morphological differences *Kyllinga bulbosa* P. Beauv. and *Cyperus rotundus* Linn.

| | <i>Kyllinga bulbosa</i> P. Beauv. | <i>Cyperus rotundus</i> Linn. |
|---------------|--|--|
| Habit | A glabrous short-stemmed tufted perennial herb up to 20 cm height, having short creeping rhizome | A perennial glabrous herb more than 40 cm height, having tubers, stoloniferous rhizome and root. |
| Rhizome | Tubers small, black ovoid and fragrant | Tubers large, ovate, elongated, hard and aromatic. |
| Leaves | Leaves nearly crowded at the base as long as the stem | Leaves radical, long more than half as long as the stem or longer. |
| Inflorescence | Spikes 1-3, sessile, capitate. | Spikes in umbellate compound heads. |
| | Spikelet 1-2 flower. | Spikelet with many flowers. |
| | Rachilla is deciduous as a whole | Rachilla is persistent |
| | Stigma 2 in number. | Stigma 3 in number. |

Table 2. Anatomical characteristics of *Kyllinga bulbosa* P. Beauv. and *Cyperus rotundus* Linn.

| | <i>Kyllinga bulbosa</i> P. Beauv. | <i>Cyperus rotundus</i> Linn. |
|------------------------|--|--|
| Epidermis | Single layered rectangular cells | Single layered rectangular cells |
| Hypodermis (Sclereids) | 6-8 layered with stone cells rounded, elongated, irregular with broad and narrow lumen, pits not well developed. | 10 –12 layered with stone cells rounded to polygonal with broad and narrow lumen, pits well developed. |
| Ground tissue | Many layered, thin walled, compactly arranged rounded to polygonal parenchymatous cells filled with abundant rounded to oval starch grains and tannin content. | Many layered, thin walled, compactly arranged hexagonal parenchymatous cells filled with rounded to oval starch grains and tannin content. |
| Endodermis | Single layered with prominent casparian thickening. | Single layered without prominent casparian thickening |
| Pericycle | 1-2 layered | 2-3 layered |
| Vascular bundles | 18-20 in numbers with scattered amphivasal vascular bundles. | 28-30 in numbers with scattered amphivasal vascular bundles. |

Table 3. Measurements of cells in different tissues (μm)

| Tissues | <i>Kyllinga bulbosa</i> P. Beauv. | <i>Cyperus rotundus</i> Linn. |
|---------------|-----------------------------------|-------------------------------|
| Epidermis | 30-45-60×15-30-45 | 30-45-60×15-30-45 |
| Hypodermis | 60-90-120X 45-60-75 | 75-120-135X 60-75-90 |
| Cortex | 135-160-195 X 75-90-135 | 150-195-240× 105-135-150 |
| Endodermis | 30-45-60 X 15-30-45 | 30-45-60 X 15-30-45 |
| Pericycle | 15-30 X 7.5-15 | 15-30 - 45 X 15-30 |
| Xylem | 45-75- 135 X 30-45-60 | 75- 135-150 X 30-45-60 |
| Phloem | 15-30 X 7.5-15 | 15-45 X 15 X30 |
| Starch grains | 15-45-60 (in diameter) | 30-45-60 (in diameter) |

CONCLUSION

The present study of Comparative morphology and Pharmacognosy helps in the identification of *Cyperus rotundus* and *Kyllinga bulbosa*. Morphological characters such as type, size of rhizome, height of the plant, inflorescence, number of flowers on spikelet and number of stigma in flower are key characters to differentiate the two species (Figure. No. 1 - 2).

Anatomical characters such as number and layer of cells, development of pits in hypodermis, structure of parenchyma cells, number of amphivasal vascular bundles in ground tissue and presence of tannin content in different tissues are important in differentiating the species. Hypodermis made up of 10 – 12 layers of polygonal stone cells with well-developed pits in *Cyperus rotundus*. Where as in *Kyllinga bulbosa* 6 - 8 layers rounded and elongated with simple pits. Similarly, the presence of number of amphivasal vascular bundles varies from 28 - 30 in *Cyperus rotundus* and 18 - 20 in *Kyllinga bulbosa* respectively. In *Kyllinga bulbosa* tannin content is present in both ground tissue and stelar region (Figure. No. 3 - 14).

Macerate of both *Kyllinga bulbosa* and *Cyperus rotundus* also showed differences in the thickenings of xylem vessels, in case of *Cyperus rotundus* xylem vessels are spiral and helical but in *Kyllinga bulbosa* xylem vessels

are helical with reticulate thickenings, Same way in *Cyperus rotundus* parenchyma cells are hexagonal in *Kyllinga bulbosa* parenchyma cells are oval. In case of *Cyperus rotundus* cell size of hypodermis, cortex, pericycle and phloem are big in size when compared to *Kyllinga bulbosa* (Figure. No. 15 - 26).

The comparative pharmacognostic study will help in distinguishing the genuine crude drug *Cyperus rotundus* from the substitute of *Kyllinga bulbosa* through its morphological and anatomical studies and also other species of *Cyperus* and *Kyllinga* which in turn helps in the quality preparation of several Ayurveda drug formulations. Further studies are necessary to carry out research in Pharmacological and phytochemical standardization for authentication of crude drugs in Ayurveda and Siddha system of Medicine.

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