RESEARCH ARTICLE

Anatomical and Phytochemical Characterization of *Theriophonum minutum* (Willd.) Baill. – An Ethnomedicinal Plant

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ABSTRACT

Use of plants by ethnic communities always play an important role in the life of common man as it can be another source of information for betterment in health and longevity. The study of plants used by tribals always encourages new generation to undertake new aspect of study. *Theriophonum minutum* (Willd.) Baill. is a (Family- Araceae) unique ethnomedicinal plant used by the Korku tribe of Melghat Dist. Amravati (Maharashtra) to cure intestinal and duodenal ulcers. There is no mention well known pathies like Ayurveda, Siddha, Unani, Homeopathy, etc. As this is a unique medicinal plant, no anatomical and phytochemical data is available for drug characterization. Drug characterization is important to understand purity of the drug. Here an attempt is made to study the macro and micromorphology of all plant organs in details.

Keywords: Ethnobotany, *Theriophonum minutum* (Willd.) Baill., Anatomy, Phytochemistry

INTRODUCTION

Theriophonum minutum (Willd.). Baill. Belongs to the family Araceae, commonly known as aroids, are the plants known to everyone but unfortunately scientifically little studied. The word “arum” is derived directly from ancient Greek “aron”. This family is very diverse in its appearance, where the leaves are most appreciated feature due to its variegated appearance. (Mayo et al, 1997). Though most of the Aroids widely used as ornamental indoor plants, some species of *Alocasia*, *Amorphophallus*, *Colocasia* and *Xanthosoma* are rich source of carbohydrate. Many of them possesses medicinal properties, Viz. *Agalonema treubii* is a valuable source for glycosidase inhibitors that are antidiabetic, antimetastatic, antiviral, and immunomodulatory agents. An indole alkaloid, Decursivine, isolated from *Rhaphidophora decursiva*, exhibits antimalarial activity. The powder of *Homalomena aromatica* rhizomes is used as an anti-inflammatory agent, a tonic for treatment of skin disease in India (Chen et al, 2007). While reviewing the literature we noted that *Theriophonum minutum* is not exclusively studied for neither for its ethnomedicinal uses nor for its scientific studies. Very few records have been found for its uses and scientific studies where, only the embryological studies of *Theriophonum minutum* is carried out by Parameswaran (1959). As per Edison et al (2007) in his report, *Theriophonum divaricatum* tubers are used against diarrhea and *Theriophonum minutum* tubers are dried and eaten after steaming, also used in confectionary by locals. Leaves are used as wild vegetable (Patale et al, 2015).

MATERIALS AND METHODS

The ethnobotanical survey of the study area was conducted during 2017-18. During survey data on medicinal uses of the plants used by Korku people was documented. Informal discussions, interviews and forest walks with informants, medicine men (Bhumkas, Vaidus) were held to gather information of different species of ethnomedicinal plants available around the villages and in forest (Devarkar, 2001). A schedule was used to collect information on personal data, traditional knowledge about each species used by the local informants. Identification of the collected specimens was made with the help of Flora of Melghat (Patel, 1968) and other Standard Floras (Hooker, 1872-1897; Dhore & Joshi, 1998; Bhogaonkar & Devarkar, 1999). Plant material was collected in the month of August, from Melghat region of Dist. Amravati (Maharashtra). External morphology and anatomy of root, stem and leaf was studied in laboratory. Freshly hand-cut sections were observed under microscope and Camera Lucida sketches were made and presented in Plate: II & Plate: III (Kokate et al. 1998).

OBSERVATIONS & RESULTS

Theriophonum minutum (Willd.). Baill. Hist. Pl. 13:457.1895; Sharma, Karthikeyan & Singh, Fl. Mah. State - Monocot. 222.1996; Bhogaonkar & Devarkar, Add. Fl. Melghat. 67.1999; *T. crenatum* (Willd.)Bl. Hook f. Fl. Brit. India 6: 512.1893. (Kor.- Tangya, Doda)

Macromorphology

Plants cormose; corm spherical, old corms are discarded. Leaves simple, petiolate, entire, obtuse, younger leaves sagittate, narrow, middle part of lamina, 17 x 1 cm; lateral lobes 8 x 5 cm; petiole 7 cm long. Inflorescence stalked. Spathe leafy, yellow green, darker at the base and fades towards apex, 11-12 x 4.5 cm; margin dentate; dark brown to purplish. Inflorescence axis 6.5 x 5.7 cm. with creamish appendage. Male and female flowers distant, the male with small subulate neuters above and long, narrow neuters below. The females at the base of spadix, 3-6 in number, in single series; ovaries conical, slightly notched at base, sessile, single celled; ovules pendulous and basal; stigma pulvinate, discoid, with reddish brown spots. Berries not seen (Plate: I, Figures A-D).

Occurrence: Rare. Only at Kolkaz, along moist slopes, shady localities. **Flowers:** August - September.

Micromorphology

Root (Plate: II, Fig.1) - Tetrarch; pith absent, center only with single metaxylem element present. Epiblema single layered, gets soon replaced by underlying thick walled hypodermal layer. Rhizodermis followed by 2-3 layers of somewhat thick-walled compactly placed cells. Cells of middle cortex consisting of contractile parenchyma inner cortex 5-6 layered, parenchymatous, tangentially stretched, becoming gradually smaller towards the stele; concentrically arranged. Endodermis thick-walled; pericycle thin-walled.

Leaf (Plate: II, Figures 2-10) - Petiole cylindrical with numerous, small, ridges & furrows. Epidermis thinly cuticularized. Below the ridges, following the epidermis are large sclerenchymatous patches. In furrows, hypodermis parenchymatous with numerous chloroplasts. Peripheral vascular bundles opposite the sclerenchymatous patches forming a ring. Few Vascular bundles scattered in ground tissue. Each vascular bundle consist of xylem with one or two tracheary elements, a water canal and a patch of phloem. Water canal is produced by disintegration of vessel elements. Ground tissue parenchymatous, enclosing few large air canals. Bundles of raphides present. **Lamina** amphistomatous; cells angular. Stomata though not

distinctly, roughly paracytic, more frequent in lower epidermis. In v. s. horns of guard cells form a distinct cavity leading to sub stomatal chamber. Mesophyll differentiated in single layered palisade and 3-4 layered spongy parenchyma. Raphides present in spongy as well as palisade cells. **Midrib** with few sclerenchymatous hypodermal patches on the lower side. Vascular bundles of abaxial side abutting the sclerenchymatous patches. Few vascular bundles scattered in parenchymatous ground tissue.

Scape (Figs 11-13) - Cylindrical with ridges and furrows. Ground tissue parenchymatous with sclerenchymatous hypodermal patches below the ridges. Peripheral vascular bundles abutting the sclerenchyma. Numerous small vascular bundles scattered in ground tissue.

Chemistry - Total seven amino acids present. They are Glutamic acid, Serine, DL-Alanine, Lysine mono-hydrochloride, DL-Methionine and Isoleucine and unp2 Alkaloids, Flavonoids, Phenolics (Catechol) and Steroids present. Ash contains Calcium, Sulfur, Magnesium, Iron Chlorine and Phosphorus.

Korku uses - Tuber powder with honey given for small intestinal ulcers and stomach aches.

DISCUSSION

All the members of Araceae studied here are belong to subfamily Aroideae. All are rhizomatous members with single large aerial leaf with long petiole. Contractile roots having contractile parenchyma present in all species. Wound cambium producing cork is produced in most of the species. This feature has been earlier noted by Reyneke and Schijff (1974) in roots of *Eucomis* of Liliaceae. Hypodermal sclerenchymatous patches noted in petioles of genera studied are not noted either by French and Tomlinson (1983) or Mayo et. al. (1997). Though association of laticifers with vascular bundles is reported previously; in the present members the associated canals appear to be of two types; at least morphologically. Canals associated with phloem are different from those associated with xylem. Thus here both the laticifers and water canals may be present. Solereder and Meyer (1928) described the palisade as consisting of short, wide and armed cells. On the contrary palisade of the members studied consists of narrow, elongated, and compactly placed, unarmed cells. It appears that Araceae show varied anatomy. Araceae is known to have oxalate crystals, saponins, phenolics, cyanogenic glycosides and polyhydroxy alkaloids. All the members test positively for alkaloids, steroids and phenolics. Medicinal use of members is restricted to the tribals of Melghat only; thus forming a unique feature of Korku medicine.

CONCLUSION

Korku tribe are very shy and conservative. The uses of plants are found unique in many ways (Devarkar, 2001). In the southern part of the India *Theriophonum minutum* tubers are mostly used as a source of starch and food. In eastern part of Maharashtra, leaves are used as vegetable but only the Korku using this plant as medicine against intestinal or duodenal ulcers. The primary phytochemical screening shows the presence of Total seven amino acids present along with positive tests were observed for Alkaloids, Flavonoids, Phenolics (Catechol) and Steroids present. Ash contains Calcium, Sulfur, Magnesium, Iron Chlorine and Phosphorus. Study of detailed chemical profile of the plant can reveal many more novel chemicals. The present study shows that along with many wild plants species *Theriophonum minutum* is used for curing their health issues. These medicinal plants never directly harvested from fields by Korku. There are rituals and procedures to collect the plants. Such important treasure of the wild medicines are with these tribes, which can be used for betterment of humans. To achieve this, detailed studies of the every wild plant should be carried out by young researchers.

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Theriophonum minutum (Willd.) Baill.

PLATE I: Macromorphological Characteristics

Fig. A - Complete plant body; Fig. B - Spadix cut open; Fig. C- Male Flower; Fig. D - Female Flower

PLATE II: Micromorphological Characteristics

Fig. 1 – Transverse Section of Root (Sector Magnified); Fig. 2 – Transverse Section of Petiole (Diagrammatic);
 Fig. 3– Transverse Section of Petiole (Sector magnified); Fig. 4 – T. S. Petiole (Single Vascular Bundle)
 Fig. 5 – Upper Epidermis showing stomata; Fig. 6 – Lower Epidermis showing stomata

PLATE III: Micromorphological Characteristics

Fig. 7 – Transverse Section of Leaf (Single Stomata magnified); Fig. 8 – Transverse Section of Leaf (Sector magnified);
 Fig. 9 - Transverse Section of Leaf midrib (Diagrammatic); Fig. 10 – Transverse Section of Leaf midrib (Sector magnified);
 Fig. 11 – Transverse Section of Petiole (Diagrammatic); Fig. 12 – Transverse Section of Petiole (Sector magnified);
 Fig. 13 – Transverse Section of Petiole (Single Vascular Bundle)