

TAXONOMICAL ,PHYTOCHEMICAL AND PHARMACOGNOSTIC STUDIES IN AN ENDEMIC AROID

ANITHA C.T , INDUKRISHNA K. K AND ASWATHY SURENDRAN K.
Post graduate and Research Department of Botany
Sree Narayana College ,Nattika Thrissur,Kerala, India
Affiliated to UNIVERSITY OF CALICUT

INTRODUCTION

Earth is the home for all plants and animals and mother nature is blessed with biodiversity; Plants were the only medicines used before 500 B. C. During this time it was believed that plants had both ritual magic powers and medicinal qualities. Even today, the World Health Organization estimates that up to 80 percent of people still rely mainly on traditional remedies such as herbs for their medicines. Plants form the source of many modern medicines. Medicinal value of the plants lies on certain chemically active substances which induce a definite physiological action on the human body.

The present study is intended with an aim to unveil the medicinal property of a member of Araceae. The Araceae is a family of herbaceous monocots with 125 genera and about 3750 species .Members of the family are highly diverse in life forms, leaf morphology, and inflorescence characteristics. The experimental endemic plant, *Theriophonum* is a genus of flowering plants in the family Araceae. It is found only in India and Sri Lanka.

Pharmacognosy is the branch of medicine. It deals with the study of chemical, biological, physical, biochemical properties of drug. It helps to discover a new medicine from natural sources such as plants. Pharmacognosy is basically divided into conventional and modern pharmacognosy. Conventional pharmacognostical study is based on macroscopic, microscopic and quantitative microscopy. Macroscopic characters include shape, size, colour and texture of the drug in crude or powdered form while microscopic characters include the anatomical details of drug producing plant, maceration study and the size measurement of various type of cells. The quantitative microscopy includes the vein islet number, palisade ratio, stomatal number and stomatal indices and so restricted to leaf drug only.

Intention of the selected work is to study the pharmacognostic properties relating there possible implication in herbal medicine. To add more characters to the profile of an endemic aroid; *Theriophonum infaustum* N.E Br. is yet another focus .

MATERIALS AND METHODS

The present study is selected due to close similarity of genera and species in the family and the data relating the pharmacognostic nature of the plant is yet to be explained.

Collection and authentication of the plant :Whole plants were collected from the campus of Sree Narayana College, Nattika Thrissur ,Kerala in flowering stage during the month of may –june and in vegetative stage in march- april identified and authenticated with the flora .Herbarium deposited in the Department of botany of the college.

parameters for study-

ORGANOLEPTIC EVALUATIONS-Organoleptic evaluations were performed according the color, size, odor and taste parameters.

MACROSCOPIC EVALUATIONS-Different macroscopic parameters of stem, root, fruit and leaves were noted. Leaves evaluation include presence of petioles and characters of lamina *i.e.* shape , base, texture, venations, apex and nature of root was studied .

MICROSCOPIC EVALUATIONS

Qualitative microscopy -For qualitative microscopic analysis transverse section of leaf, and petiole were made Staining was performed as per standard procedure. Various identifying characters were studied with staining. All evaluations were recorded as microphotographs.

Maceration studies-Plant materials such as petiole and leaves were treated with macerating mixture and observations were recorded .

Palynology -Anthers were squashed and pollen grain were prepared using 70% alcohol and mounted in glycerine to observe under light microscope results were noted and photographed .

Stomatal study-Leaf peels were taken from the upper and lower surface of leaf and prepared to observe stomata and the results were noted .

Determination of alkaloids (Harborne, 1973)

A total of 200 mL of 20% acetic acid was added to 5 g of dried powder taken in a separate 250 mL beaker and covered to stand for 4 h. This mixture containing solution was filtered and the volume was reduced to one quarter using water bath. To this sample, concentrated ammonium hydroxide was added drop-wise until the precipitate was complete. The whole solution was allowed to settle and the precipitate was collected by filtration and weighed. The percentage of total alkaloid content was calculated as:

Percentage of total alkaloids (%)=Weight of residue×100/Weight of sample taken

RESULTS

MACROSCOPIC CHARACTERS

Habit	-	Herb by seasonally dormant tuberous perennials
Rhizome	-	4-5 cm length
Leaf Type	-	simple ,several,clustered
Leaf Arrangement	-	Alternate
Leaf Margin	-	Smooth
Leaf Shape	-	Cordate
Leaf Blade Length	-	4 -5cm
Leaf Blade Width	-	3.5-5 cm
Length of Petiole	-	7 -9cm
Leaf Colour	-	Green
Flower	-	unisexual
Inflorescence	-	Spadix
Length of inflorescence	-	5 -8cm
Flower colour	-	Greenish Yellow
Spathe	-	7-8cm

Tuber ('Corm') size 0.5-2.0 x 1-2 cm 1.5-2.0 x 1.0 cm

TAXONOMY

Herbs ,flowers unisexual, short pedicellate, spadix enclosed in a spathe,neuters present, perianth absent.....Araceae

Leaves few ,cordate,sagitate three lobed,petiole long spathe tubular,spadixincluded and slender ,male and female flowers separated stamens aggregated in a narrow,cylindricmass longer than female flowers,ovules basal neuters are seened above the male flowers and also above female flowers near female flowers the neuters are filiform,berries ovoid.....*Theriophonum*

Petiole slender and notched longer than leaf blade spathe lanceolate and acute and creamish white purple at the base.....*infaustum* N.E.Br

ORGANOLEPTIC EVALUATION

dried plant powder (whole) shows

colour -white

taste -acid

colour- white

smell - aromatic

texture -rough

MICROSCOPIC STUDIES

Transverse section of petiole shows an epidermis characterised by columnar cells interrupted by stomatal opening .The section of petiole shows 10-11notches below the region of the notches is collenchymatous patches followed parenchymatous cortical region of 8-10 layers. Within which is the characteristic monocot scattered vascular bundles. Vascular elements are less developed.Dark coloured deposition were found in the intercellular spaces of cortical cells is a notable character of the group. No epidermal outgrowth is recorded(plate-1a,b).

Microscopical studies of leaves are studied by transverse section ,the material shows an epidermal region with the columnar cells ,stomata is noted which found to be more in upper epidermis. Mesophyll cell are seen with upper palisade and spongy parenchyma cells with chlorophyll. The section of leaves showed three notches,near the notches is collenchymas and vascular cells are less developed and are present in the middle region .The leaf section showed the dark bodies comparatively greater than the petiole. Epidermal outgrowth are not reported.

Stomatal studies -showed a paracytic type of stomata which shows the character of hypostomatic nature and are also amphistomatic (plate-1d)

Maceration studies-Cell contents were studied by the maceration procedures showed that the plant contains sclerides, vascular elements with spiral thickening, idioblast, oil globules, fibers, cortical cells and a dark coloured spherical bodies seen in clusters are also noted .These dark coloured bodies were found more in leaves than in the macerated petiole(plate-1f)

Palynological studies showed spherical pollen grain ; medium sized with spinulose exine were noted are shown in (plate-1e)

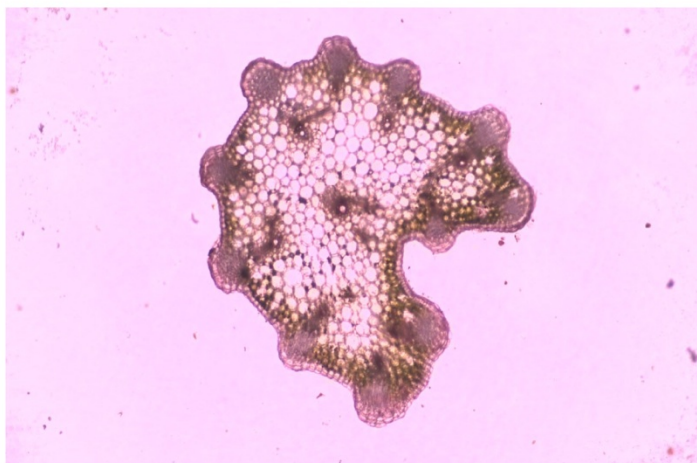
Preliminary phytochemical studies were done with the whole plant . An aqueous extract of the plant showed the presence of alkaloid, saponins, carbohydrates, phenols, glycosides, proteins, amino acids, tannins and flavanoids(table-1)

Determination of alkaloids

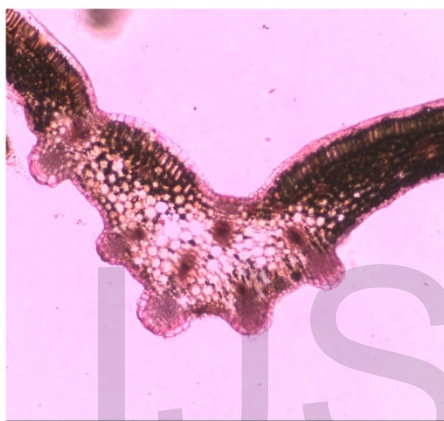
The alkaloid estimation of the whole plant material showed that it contains 12.7 %



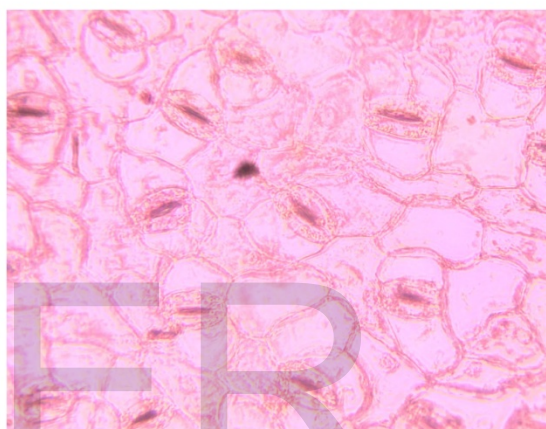
a)



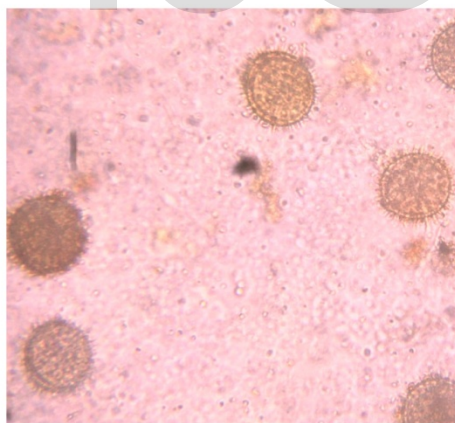
b)



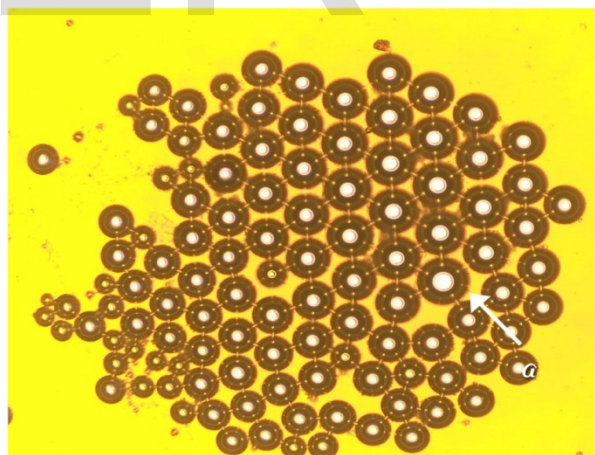
c)



d)



e)



f)

- a) Habit
- b) Anatomy- Petiole
- c) Anatomy Leaf
- d) Stomata
- e) Palynology - pollen grain
- f) Maceration - Dark bodies

DISCUSSION AND CONCLUSION

One of the most important natural resources found in India is plant diversity and plants were the mainstay of medicine and credited with mystical and almost supernatural powers of healing. The potential application of plants may be immediately evident, only by phytochemical studies.

For many centuries botany and medicine were closely linked they provide the chief remedies other than surgery. Therefore, plants have been one of the important source of medicines ever since the dawn of human civilization. About 30,000 to 70,000 plants are used medicinally across the world and 80% of the world's rural people meet their needs of primary health care from such plants (Sarkar, 1996). In spite of tremendous developments in the field of allopathic medicine, during the 20th century plants still remains one of the major sources of drug in modern as well as traditional system of medicine throughout the world and over 60% of all pharmaceuticals are plant based (Evans, 1996).

The plant selected for the study is, *Theriophonum infaustum* N.E.Br. Critical taxonomic appraisal of the constituent species supports existence of only five species, viz. *T. dalzellii*, *T. fischeri*, *T. infaustum*, *T. minutum* and *T. sivaganam*, and all are with restricted distribution in India.

Critical examination of the morphological characters revealed that the tuber size, petiole length, lamina shape, spathe length and spadix length of the species, indicating the species fell within the range of variation of *T. infaustum*. The anatomy is also striking with 10-11 notches in petiole and 3-4 in leaves both showed dark coloured bodies which can be calcium depositons. From the previous works it has been showed that Aroids produce large amounts of oxalic acid, most of it being deposited as crystals of calcium oxalate agglomerations, needle-like crystals lying parallel to one another, are the typical crystal form of the family. These raphide bundles usually occur singly, embedded in mucilage within large idioblasts different types of calcium oxalate crystals are found in aroids, such as druses, In the present study there occurs a dark coloured circular bodies seen in layers or groups associated with idioblast. In addition to this sclerids, xylem elements fibers were also recorded. The vascular element are less in number in microscopical section studies and in maceration studies.

The distribution of stomata is interesting inspite of the fact that the leaf is dorsiventral it is mostly amphistomatic. The distribution of the stomata on the upper surface is fewer. The distribution has to be directly correlated with the trend in conservation of water. One may say that the aroid genera studied demonstrate a fundamental tendency towards attainment of hypostomaty which is apparently a derived condition. (Zade, 1986) The stomatal complex is sometimes employed as a parameter of taxonomic distinctiveness (Tomlinson, 1969). Within the study of present plant it is characteristic that it shows a paracytic stomata. As other aroids it also showed a hypostomatic nature. The leaf and petiole epidermal characters showed a significant pattern of columnar cells without any outgrowth.

The process of standardization can be achieved by stepwise pharmacognostic studies. These studies help in identification and authentication of the plant material. Such information can act as reference information for correct identification of particular plant and also will be useful in making a monograph of the plant.

The palynological characters are important for the suprageneric taxonomy. Ornamentation is recorded as spinulose, aperturate and globular in outline.. Spiny pollen grains are common in Araceae, and have been considered (Grayum 1984) as an adaptation for aiding attachment to insect vectors which have hairy bodies which can be an added character in identifying adulteration. Spinose pollen can be associated with fly pollination (Grayum 1984, 1985, 1990). Phenolic compounds occur in large amounts and are structurally and biosynthetically diverse and can widely contribute to the field of medicine.

The ethnobotany of the *Theriophonum* appears to be diverse and fascinating, no comprehensive modern review exists in this regard. The present study can form a window for exploring the plant.

REFERENCE

1. Evans W. C. 1996. Trease and Evans Pharmacognosy. (14th ed; 4th reprint 2001) WB Saunders Company Ltd.
2. Grayum, M. H. 1984. Palynology and phylogeny of the Araceae. Unpubl. Ph.D. Dissertation. University of Massachusetts, Amhers.
3. Grayum 1985. Evolutionary and ecological significance of starch storage in pollen of the Araceae. Amer. J. Bot. **72**: 1565–1577. [CrossRefGoogle Scholar](#)
4. Grayum M. 1992. Comparative external pollen ultrastructure of the Araceae and putatively related taxa. Monographs in Systematic Botany from the Missouri Botanical Garden **43**: 1–167
5. Harborne, J B: Phytochemical methods: a guide to modern techniques of plant analysis. 1973, London, Chapman and Hall, Ltd, 49-188. 2.
6. Michael H. Grayum. 1990. Evolution and Phylogeny of the Araceae. Annals of the Missouri Botanical Garden. **77**(4): pp. 628-697.

7. Sarkar, S. 1996. Medicinal plants and the law. Center for Environmental law, WWF – India.
8. Sivadasan, M., Jaleel, V. A., Alfarhan, A. H., & Lakshminarasimhan, P. (2014). Taxonomic identity of *Theriophonum danielii* and *T. manickamii* (Araceae). *Bangladesh Journal of Plant Taxonomy*, 21(1), 63-70.
9. Tomlinson, P. B. 1969. *Anatomy of the Monocotyledons- III CommelinalesZingiberales* (ed. C.R. Metcalfe), Clarendon Press, Oxford
10. Zade, N. S. 1986: *Morphological studies in the monocotyledons-IX* Ph.D. Thesis, Marathwada University, Aurangabad.

ACKNOWLEDGEMENT

We are thankful to the Principal and Head of the department of Sere Narayana college ,Nattka for permitting to avail the facilities of the institution

IJSER