REVIEW OF RESEARCH
IMPACT FACTOR : 5.7631(UIF) UGC APPROVED JOURNAL NO. 48514 ISSN: 2249-894X
VOLUME - 7 | ISSUE - 12 | SEPTEMBER - 2018

PHYTOCHEMICAL AND PHARMACOGNOSTICAL EVALUATION OF MONOCOT GRASS *KYLLINGA TRICEPS* ROTTB

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ABSTRACT

Kyllinga triceps rottb. A monocot perennial herb found in various parts of India, is traditionally used in vitiated conditions pitta and vata, hyperdipsia, fever, liver disorders, verminosis, cough, splenopathy, diabetes and dermatitis [1].The aim of the present study was to evaluate the phytochemical and pharmacognostical study of ignored ayurvedic medicinal herb kyllinga triceps rottb. The plant is monocot grass belongs to the family cyperaceae, commonly used in various ayurvedic preparation's and called musta [2], In various ayurvedic texts it is also known as nirvishi [3]. Many species of family cyperaceae resembles the original drug thus the present study will help in identification and collection of original plant.The study includes morphological and microscopical characters along with an estimation of its physicochemical parameters such as loss on drying, ash values, extractability in Petroleum ether and ethanol, preliminary phytochemical screening [4]. The generated information of the present study will provide data which are helpful in the correct identification and authentication of medicinal plant kyllinga triceps rottb. and may help in preventing its adulteration. The result of phytochemical screening revealed that the plant contains saponin, carbohydrates, phenolic compounds, flavonoids, and triterpenoids. Foaming index was found to be 14, organoleptic evaluation was also performed. Stomatal number was found to be 14 and stomatal index was found 19.44, presence of anomocytic stomata is the characteristic feature of the leaves of the plant kyllinga triceps rottb. Thus, the result of the present study may be useful in the identification and collection of crude drug and may be helpful in future research .

KEY WORD: *kyllinga triceps rottb., phytochemical, pharmacognostical, stomatal index, anomocytic.*

INTRODUCTION

Herbal medicines are the use of plants and plant extracts as medicines. India is blessed with enormous varieties of medicinal and the aromatic plants, which may be attributed to the Indian climatic conditions. These plants are used as a potential source of many drugs in traditional Indian system of medicine [5]. The plant is distributed throughout India, Ceylon hot and warm temperate regions of the Old World countries. Plant is a major weed of improved pastures, but also occurs in crops, gardens, plantations and roadsides [6] . It grows best in moist fertile soil that is seldom cultivated and in full sunshine. It is present in areas up to 7000 ft. elevation. The plant is naturalized primarily in gardens and lawns [7]. The rhizomes of plant *Kyllinga triceps* rottb are fragrant, aromatic, sweet, astringent, bitter, refrigerant, febrifuge, antidiarrhoeal, diuretic, stomachic, anthelmintic, expectorant, demulcent and tonic [8]. They are useful in vitiated conditions of pitta and vata, fever, cough, bronchitis, hepatopathy, splenopathy, diabetes, dermatitis, fistula and tumours. The plant is used as an

antidote in many parts of India [9]. The root is a good refrigerant much used in fevers [10].Drug is also used in skin diseases and eye diseases Chinese call Kyllinga "shui wu gong" and use it for common colds, bronchitis, malaria, arthritis and injuries [11]. Kyllinga is used for diarrhea in Malaysia and dysentery in china. Kyllinga is used in various places in Polynesia for joint pain and Rheumatic problems [12]. The spikes are applied as poultices from gathered nails Adecoction of the rhizome in used as diuretic, demulcent and tonic [13]. It is given to relieve thirst in fevers and diabetes [14]. Therefore, the objective of the present work is to evaluate various pharmacognostic and phytochemical properties of the plant.

MATERIALS AND METHODS

COLLECTION OF SPECIMEN

The species for the proposed study that is *Kyllinga triceps* rottb were collected from Bhoora Khon area of Shivpuri District of Gwalior Division (M.P.) with the help of Mr. N.K. Pandey (R.O.) National Research institute for ayurvedic-siddha (CCRAS) Amkho, Gwalior.

TAXONOMICAL IDENTIFICATION

The species for the proposed study was identified as *Kyllinga triceps* by Dr. (Smt.) M.D. Gupta (Asst Director) and Mr. N.K. Pandey (R.O.) National Reseach Institute for Ayurveda and siddha (C.C.R.A.S.) under Ministry for Health and Family Welfare, Govt. of India, Amkho Gwalior (M.P.)

TREATMENT

First of all the rhizomes were washed with water and dried for one hour and then it was dried in shade. By the help of grinder the dried rhizome was powdered and was passed through the sieve no. 60 for powder analysis and coarse powder was used for phytochemical work [15].

PREPARATION OF PLANT EXTRACTS

Preparation of the extract of *Kyllinga triceps* rottb, powdered rhizome is done by using ethanol and petroleum ether solvents. For both extracts cold percolation method was used. for preparation of extracts of dried *kyllinga triceps* rottb, rhozmes powder, rhizome powder were extracted with 80% ethanol and petroleum ether separately for 24 hrs, which was filtered with 80 mesh nylon cloth. Raw material and solvent ratio was 1:8, total extraction procedure was repeated for five times, clean and sterile conditions were maintained through out the extraction process so that their should be no chance of contamination [16]. All the filterates obtained after extraction were combined and again subjected for filtration with 250 mesh nylon cloth, finally extract was obtained was concentrated with reduced pressure[17].

PHYSICO CHEMICAL CONSTANTS

ASH VALUES

Ash values are helpful in determining the quality and purity of crude drug, especially in the powdered form [18].The ash content of a crude drug is generally taken to be the residue remaining after incineration. It usually represents the inorganic salts naturally occurring in the drug and adhering to it, but it may also include inorganic matter added for the purpose of adulteration. Hence, an ash determination furnishes a basis for judging the identity and cleanliness of a drug and gives information relative to its adulteration with inorganic matter.The Total Ash of a crude drug reflects the care taken in its preparation [19]. The Acid Insoluble Ash is a part of the total ash which is insoluble in dilute Hydrochloric acid. A higher limit of acid-insoluble ash is imposed, especially in cases where silica may be present or when the calcium oxalate content of the drug is very high [20]. Some analysts favour mixing of sulphuric acid with the powdered crude drug before washing and this Sulphated Ash value is normally less fusible than ordinary ash.Procedure given in Indian Pharmacopoeia were used to determine the different ash values such as total ash and acid insoluble ash [21].

DETERMINATION OF TOTAL ASH VALUE

Accurately weighed about 3 gms of air dried powdered drug was taken in a tared silica crucible and incinerated by gradually increasing the temperature to make it dull red hot until free from carbon. Cooled and weighed, repeated for constant value. Then .the percentage of total ash was calculated with reference to the air dried drug[22].

DETERMINATION OF ACID INSOLUBLE ASH VALUE

The ash obtained as directed under total ash was boiled with 25 ml of 2 N HC1 for 5 minutes. The insoluble matter was collected on an ash less filter paper, washed with hot water, ignited and weighed, then calculated the percentage of acid insoluble ash with reference to the air dried drug [23].

DETERMINATION OF WATER SOLUBLE ASH VALUE

The total ash obtained was boiled with 25 ml. of water for 5 minutes. The insoluble matter was collected on an ash less filter paper, washed with hot water and ignited for 15 minutes at a temperature not exceeding 450°C. The weight of insoluble matter was subtracted from the weight of total ash. The difference in weight represents the water soluble ash. The percentage of water soluble ash was calculated with reference to the air dried drug[24].

EXTRACTIVE -VALUES

Extractive values of crude drugs are useful for their evaluation, especially when the constituents of a drug cannot be readily estimated by any other means. Further, these values indicate the nature of the constituents present in a crude drug [25].

DETERMINATION OF ALCOHOL SOLUBLE EXTRACTIVE VALUE

5gms of the air-dried coarse powder of the rhizome of Kyllinga triceps rottb, was macerated was macerated with 100 ml of 90% ethanol in a closed flask for,24 hours, shaking frequently-during the first 6 hours.and allowing to stand for 18 hours. Thereafter, it was filtered rapidly taking precautions against loss of the solvent. Out of that filtrate, 25 ml of the filtrate was evaporated to dryness in a tared flat bottomed shallow dish, dried at 105°C and weighed. The percentage of ethanol soluble extractive value was calculated with reference to the air-dried drug [26].

DETERMINATION OF ETHER SOLUBLE EXTRACTIVE VALUE

5gms of the air-dried coarse powder of the rhizome of Kyllinga triceps rottb, was macerated was macerated with 100 ml of ether in a closed flask for,24 hours, shaking frequently-during the first 6 hours.and allowing to stand for 18 hours. Thereafter, it was filtered rapidly taking precautions against loss of the solvent. Out of that filtrate, 25 ml of the filtrate was evaporated to dryness in a tared flat bottomed shallow dish, dried at 105°C and weighed. The percentage of ethanol soluble extractive value was calculated with reference to the air-dried drug [27].

LOSS ON DRYING

Loss on drying is the loss in weight in % w/w determined by means of the procedure given below. It determines the amount of volatile matter of any kind (including water) that can be driven off under the condition specified (Desiccator or hot air oven). If the sample in the form of large crystals, then reduce the size by quickly crushing to a powder [28].

PROCEDURE

About 1.5 gm. of powdered drug was weighed accurately in a tarred porcelain dish which was previously dried at 105°C in hot air oven to constant weight and then weighed. From the difference in weight, the percentage loss of drying with reference to the air dried substance was calculated.

FOAMING INDEX

Many medicinal plant materials contain saponins that can cause a persistent foam when Plant extract decoction is shaken. In order measure the foaming ability of decoction of plant material and their extracts, a foaming index is established.

PROCEDURE

Weigh accurately about 1 gm of coarsely powdered drug and transferred to 500 ml conical flask containing 100 ml of boiling water. Maintained at moderate boiling at 80-90°c for about 30 minutes. Cooled and filtered into a volumetric flask and added sufficient water through the filter to make up the volume to 100 ml (V_1).Cleaned 10 stoppered test tube of uniform dimensions were taken and marked from 1 to 10. Measured and transferred the successive portions of 1,2,3 ml upto 10 ml and adjusted the volume of the liquid in each tube with water to 10m1. Stoppered the tubes and shaken them in a lengthwise motion for 15 seconds uniformly and allowed to stand for 15 minutes and measure the height. If the height of the foam in every tube is less than 1 cm, the foaming index is less than 100 (not significant) [29].

QUALITATIVE PHYTOCHEMICAL ANALYSIS

Both ethanolic and Petroleum Ether extracts obtained from the powdered Rhizome of Kyllinga trices rottb; were subjected to various qualitative tests for the identification of various plant constituents present in this species [30].

RESULT & DISCUSSION

MACROSCOPICAL CHARACTERS

Habit: Perennials with short, creeping rhizomes, culms leafy at base Leaves from culm half length to equaling stem, flat or canaliculated, sheaths closed, 15 x 0.4cm, with strong reddish nerves, mouth margin, almost straight, flaccid, green or greyish green, flat or slightly keeled, margins smooth or scabrous, apex short, flat or trigonous. Flowers: Triple head, Spikes triple headed 4 x 8mm, globose, white, rachis named or pitted, and Rhachilla wingless, floral brats 3, very long and narrow, overtopping to 11 cm similar to the leaves. Spikelet's 4mm. long, ovate or elliptic, sub erect or spreading, 3 flowered, glumes 4(5), lower ones narrow linear, to 2mm, Hyaline, keeled, 3rd bisexual, uppermost bisexual, boat shaped, to 2.5 mm mucronulate stramineous keel strong, wing serrate or smooth, sometimes obscurely developed, stamens 3, Anthers small, linear, to 0.5mm. Nut ovoid or oblong, biconvex, to 1.5 mm, dorsally compressed, rather more than half as long as the glume, yellowish brown, style rather more than 0.8mm. Long, ovary superior, stigmas 2, filiform, as long as the style. Culm: 5 to 40cm high, usually solitary, erect. 1 to 1.5 mm wide, sharply triquetrous, smooth, leafy at base Fruits: Achene's laterally flattened, lenticular, ovoid to oblong or Ellipsoidal Seed: Oval shaped, highly viable, flat in cross section, free inside the fruit, embryo minute in floury endosperm. Rhizome: Short, creeping sheathed by brownish leaf sheath.Rhizome is circular and even in outline it is 2mm in diameter. Root: The root is thin and fibrous. The rhizomes are horizontal, fleshy underground stem, with nodes, inter nodes, scale leaves and axillary buds, which are meant for storage and vegetative propagation. Surface: Rough, Dry, Sheathed by brownish leaf sheath Size and Shape: Short, 2mm in diameter, circular, even in outline, upto 6 in. length. Colour: Yellowish brown to dark brown Taste: Astringent Odour: Aromatic

MICROSCOPICAL STUDIES

MICROSCOPY OF LEAF (FIG.1 & 2)

The leaf is folded ad axially in the form of "V", the two margins being expanded laterally. The surface of the leaf is smooth and glabrous. The abaxial side is even while the adaxial side is somewhat uneven due to the presences of dilated bulliform cells. The midrib is semicircular on the lower side and on the upper side it has wide short bulged hump formed by the bulliform cells. The midrib present in 250 μm in vertical plane and 220μm in horizontal plane there is a single prominent circular Vascular bundle in the midrib. The

bundle has two wide circular metaxylem elements and a crushed circular protoxylem lacuna. Phloem occurs in a circular patch in between the metaxylem elements. The bundle is surrounded by a single layer of sheath of parenchyma cells. On either side of the midrib bundle, there is a thick mass of fibers close to the epidermal layer. Lamina is 150 μm thick it has wide dilated epidermal layer on the adaxial side; the cells are radially oblong and thin walled. At certain places, the adaxial epidermis become highly dilated and vertically elongated forming bulliform cells or motor cells. These cells will shrink during dry weather and make the lamina to fold ad axially. During moist weather, these cells dilate and make the lamina to unfold. The abaxial epidermis is thin made up of circular or barrel shaped cells. In the adaxial epidermis there are eight or more small nests of fibers located on the surface of the epidermis. The- lamina has several lateral vascular bundles- located in horizontal row with in the mesophyll tissue. The lateral vascular bundles are similar to the midrib bundles and have two metaxylem elements, protoxylem lacuna, phloem mass and bundle sheath parenchyma. The- lamina has several lateral -vascular bundles- located in horizontal ,ow with in the mesophyll tissue. The lateral vascular bundles are similar to the midrib bundles and have two metaxylem elements, protoxylem lacuna, phloem mass and bundle sheath parenchyma. Due presence of bundle sheath it in is confirmed as c4 fig.1.plant. The mesophyll tissue is not differentiated into palisade and spongy parenchyma. It consists of compact spherical parenchyma cells with dense chloroplast anomocytic presence of anomocytic stomata is the characteris Feature of T.S. of *Kyllinga triceps* rottb. Stamatal No. is 14 and index in 19.44.The aerial stem or the culm is triangular in cross sectional view with three prominent wings the wings are semicircular The epidermis of the culm has fairly thick epidermal layer made up of rectangular or squarish cells. With thick cuticle the pith is wide, homogeneous and parenchymatous. The cells are thin walled and compact. Thick masses of fibers (Sclerenchyma) are seen on either side of the wings. The vascular system of the culm consists of outer vascular bundles and inner vascular strands. The outer vascular strands are smaller circular and collateral. They have two meta xylem elements, proto xylem lacuna and small cluster of phloem. Each bundle is surrounded by parenchymatous bundle sheath and chlorenchyma cells. The inner vascular bundles occur with inner zone of the stem, next to the outer vascular bundles. The inner bundles are less in numbers, but large in size, elliptical in shape. They also have typical monocot type of meta xylem-proto xylem element, phloem in between the meta xylem element.

MICROSCOPY OF CULM (STEM)
(Fig 3 & 5)

The aerial stem or the culm is triangular in cross sectional view with three prominent wings the wings are semicircular The epidermis of the culm has fairly thick epidermal layer made up of rectangular or squarish cells. With thick cuticle the pith is wide, homogeneous and parenchymatous. The cells are thin walled and compact. Thick masses of fibers (Sclerenchyma) are seen on either side of the wings.The vascular system of the culm consists of outer vascular bundles and inner vascular strands. The outer vascular strands are smaller circular and collateral. They have two metaxylem elements, protoxylem lacuna and small cluster of phloem. Each bundle is surrounded by parenchymatous bundle sheath and chlorenchyma cells.The inner vascular bundles occur with inner zone of the stem, next to the outer vascular bundles. The inner bundles are less in numbers, but large in size, elliptical in shape. They also have typical monocot type of metaxylem-protoxylem element, phloem in between the metaxylem element.

Microscopy of Root (Fig- 4)

The root in thin and fibrous it has crushed epidermal layer. The cortex has outer zone of three or four layers of shrinking parenchyma cells and inner zone of much wider air chambers. The endodermis and peri cycle are thick walled and sclerenchyma cells are present. The vascular cylinder has a wide circular central meta xylem and several radial rows of proto xylem elements. Phloem occurs in between the metaxylem elements.

MICROSCOPY OF RHIZOME ,Fig- 6

The rhizome is the underground stem which is short, creeping, sheathed by brownish leaf sheath. The leaf sheath has two layers of epidermis with large air-chambers in between . The outer and inner epidermal layers are single layered with rectangular cells. The margins of the leaf sheath are two or three layered and there are large, circular vascular bundles placed in the air-chambers in a single row. There are smaller vascular bundles situated along the outer epidermis. In the region where the vascular bundles occur, the epidermis becomes three layered.The rhizome is circular and even in outline. It is 2mm in diameter. It has single layered epidermis. The epidermal cells are rectangular, narrow and thin walled. There is wide cortex comprising of homogenous parenchyma tissue. The cortical cells are small, angular thin walled and compact. The cortex is 700 μm wide.The stele is central, circular and 240µm in diameter. It has a thick endodermis which consists of radially oblong cells with thick inner and radial walls. The, peri cycle is single layered with, spindle shaped parenchymatous cells. Inner to the endodermis is a thick sheath of thick walled sclerenchyma cells. Within the sclerenchyma sheath are seen small nest of phloem and one or two solitary xylem elements the sclerenchyma cells are lignified. In the central part of stele are several diffusely distributed vascular bundles. The outer bundles are smaller and central ones are large. The vascular bundles are amphivasal type, they have central core of phloem and surrounded by one or two layer of xylem. The xylem elements are angular, thick walled and lignified. The pith cells are parenchymatous, thin walled and compact. Some of the pith cells have dense mass of tannin. The inflorescence is a condensed spike conical in shape and terminal in position, it is white, the peduncle is reduced. In sectional view, the inflorescence axis has many ridges and furrows. The florets are attached to the axis in the furrows with a short stalk. The floret have thin, membranous perianth members. The inflorescence axis has central pith and peripheral zone of one or two rows of vascular strands each floret has a single ovary with single ovule. The ovary is broad at the apex and conical at the base. The ovary develops into small nutlet with single seed. The anthers are two lobed and four chambered. The anther wall is thin with spiny outer surface. The pollen grains are minute, triangular with smooth exine.

MICROSCOPY OF INFLORESCENCE (Fig-7A,7B,7C)

The inflorescence is a condensed spike conical in shape and terminal in position, it is white, the peduncle is reduced. In sectional view, the inflorescence axis has many ridges and furrows. The florets are altached to the axis in the furrows with a short stalk. The floret have thin, membranous perianth members. The inflorescence axis has central pith and peripheral zone of one or two rows of vascular strands each floret has a single ovary with single ovule. The ovary is broad at the apex and conical at the base. The ovary develops into small nutlet with single seed. The anthers are two lobed and four chambered. The anther wall is thin with spiny outer surface. The pollen grains are minute, triangular with smooth exine.

POWDER MICROSCOPY (FIG .8, 9)

Powder of the rhizome, aerial stem and leaf was studied under the microscope and the following elements were observed. Vessel elements: The vessel elements are long, narrow and cylindrical. They are 90 μm and 20 μm wide. They have simple, circular, horizontal perforation plate. The lateral wall pits are elliptical and dense. Xylem fibers: They have long narrow pointed ends. The walls are thick and lignified. Pits are absent they are 400-550 µm long. Vessel element and fiber of the aerial stem are much longer and narrower. The vessel element is 550 μm long. The fibers are also thin and long upto 600 µm The epidermal cells are vertically oblong andparallel to each other. The anticlinal walls are thick and straight. They are densely pitted. The cells are 50-110 µm long and 20 µm wide. The stomata are anomocytic and occur in vertical rows.Parenchyma cell of different shape and size are seen in the powder. Presence of long narrow xylem fibers with pointed ends, presence of densely pitted anticlinal walls and presence of anomocytic stomata in vertical rows are the characteristic features of powder microscopy.

Table-1: Foaming Index Of The Powdered Rhizome Of *Kyllinga Triceps* Rottb.

S. No.	Test Volumetric Flask (10 ml)	Height of Foam (cm)
1.	1	0.3
2.	2	0.6
3.	3	0.9
4.	**4**	**1.4**
5.	5	1.5
6.	6	1.7
7.	7	1.8
8.	8	1.8
9.	9	1.8
10.	10	1.8

Table-2: TLC Of Ethanolic Extract And Petroleum Ether Extract Of Powdered Rhizome Of *Kyllinga Triceps* Rottb.

S.No	Extract	Solvent System	No of Spots	Colour of Spots	RF Value
1	Petroleum ether extract	Ethyl Acetate: Hexane (30:70)	3	Dark Blue Greenish Blue Black	0.60 0.48 0.40
2	Ethanolic Extract	Chloroform Ethyl Acetate (60:40)	3	Dark Blue Greenish Blue Black	0.52 0.45 0.50

Table 3 : Data for Preliminary Phytochemical Analysis Of Extracts Of *Kyllinga Triceps* Rottb.

Phytoconstituents	Ethanolic extract	Petroleum Ether Extract
Alkaloids	-	-
Saponin	-	-
Glycosides	-	-
Carbohydrates	+	-
Tannins, Phenolic compounds	+	-
Flavonoids	+	+
Steroids	+	+
Proteins and Amino acids	-	-
Tri terpenoid's	+	+
Fixed Oils and Fats	-	+
Gums and Mucilage	-	-
Lignin's	-	-
Volatile oil	+	+

Table 4 : Data For Ash Values Of Rhizome Powder Of Kyllinga Triceps Rottb

Sr. No.	Analytical Parameter	Ash Values % w/w
1	Total	7.66
2	Acid Insoluble Ash	1.77
3	Water soluble ash	7.82

Table-5 : Data For Extractive Value For Rhizome Powder Of *Kyllinga Triceps* Rottb

Sr. No.	Analytical Parameter	Ash Values % w/w
1	Alcohol soluble extract	1.7
2	Petroleum Ether	1.6

Loss on Drying

Loss on drying at 105° C = 5.33%W/W.

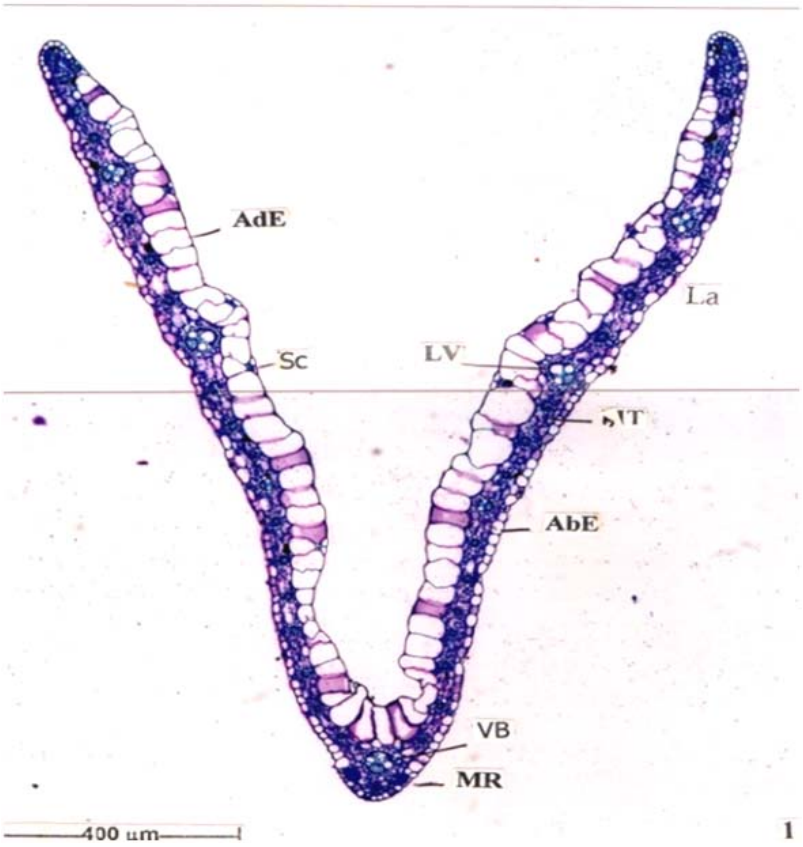

Fig-1: TS Of Leaf Showing Folded Adaxially In The From Of "V", The Two Margins Being Expanded Laterally AbE- Abaxial Epidermis: AdE-Adaxial Epidermis: La- Lamina: Lv- Lateral Vien: Mr- midrib:mt- Mesophyll Tissue Sc-Sclerenchyma: Vb- Vascular Bundle.

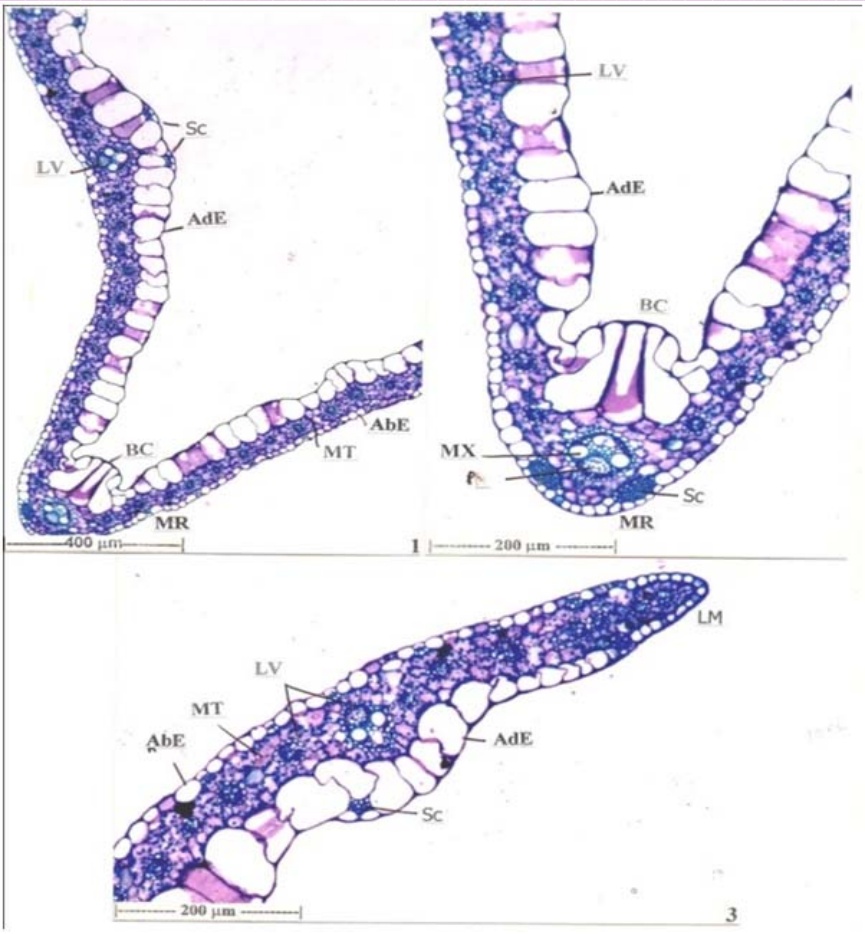

Fig-2: Anatomy of the leaf:-
1. T.S. of the leaf through midrib with lamina, 2. Midrib and lamina enlarged. , 3. T.S. of the leaf margin.
AbE=- Abaxial epidermis: AdE- Adaxial epidermis: Bc- Bulliform cells
LM-leaf margin: LV-lateral Vein: MR-Midrib: MT- Mesophyll tissue: MX-meta xylem: Ph-Phloem: Sc-Sclerenchyma.

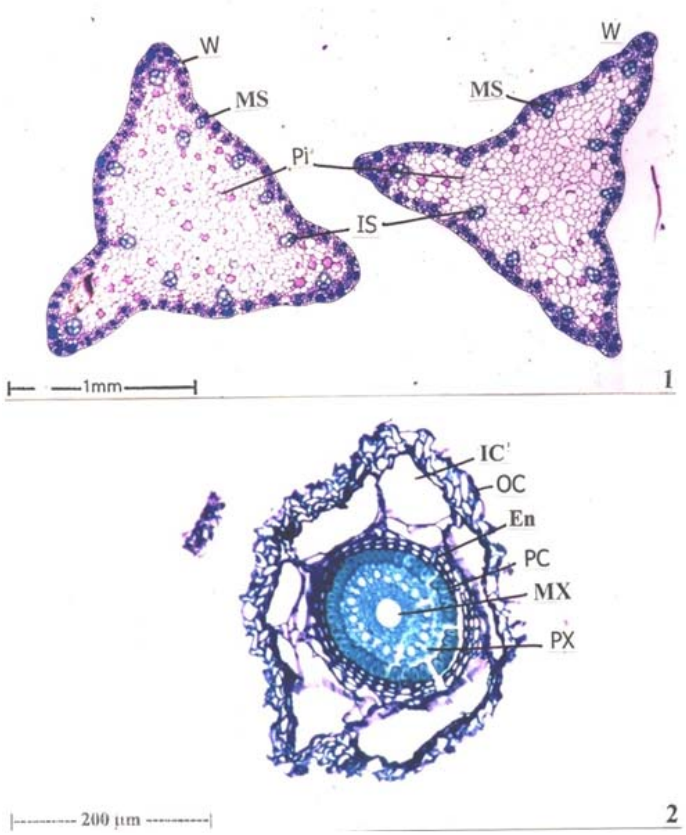

Fig-3 & 4: Anatomy of the stem (culm) and Root:
1. T.S. of culm entire view, 2. T.S. of root ground plane
En- Endodermis: IC-Inner Cortex: Is- inner vascular strand: MS- Marginal Strand: MX-metaxylem: OC-Outer cortex: Pi-pith:Pc-Pericycle: PX- Protoxylem: W-Wing.

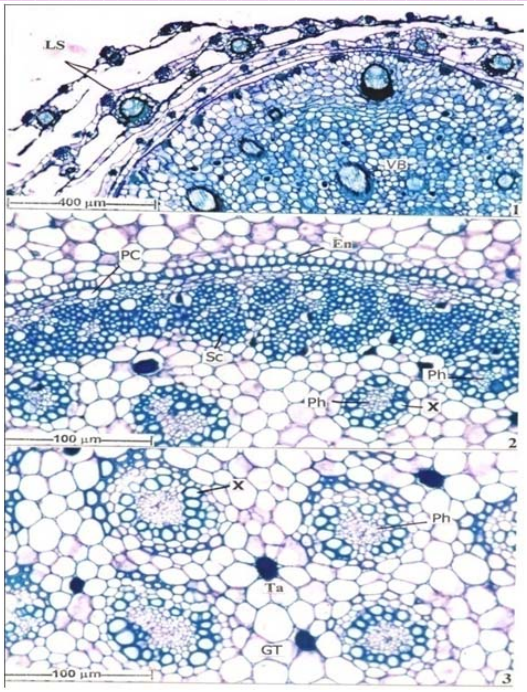

Fig. 5 Structure of the (culm) Stem

1. T.S. stem half portion enlarged.

T.S. stem a wing portion enlarged. Ep- Epidermis: Is – Inner vascular strand: MB-marginal Bundle: Mx-Metaxylem: Ph-phloem: Pi- Pith Protoxylem: Sc- sclerenchyma.

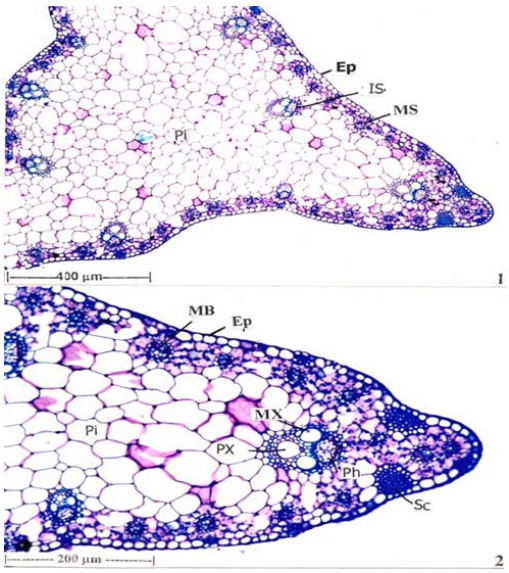

Fig-6: Structure of the Rhizome vascular bundles:

1. Leaf sheath and outer vascular bundles.

2. Inner and central vascular bundle enlarged.

3. "Amphivasal"-type of vascular bundles enlarged.

En-Endodermis: GT ground tissue: LS- Leaf sheath: Pc- pericycle: Ph- Phloem: Sc- sclernchyma: Ta- Tanniniferous idioblast: VB- vascular bundle: X- xylem.

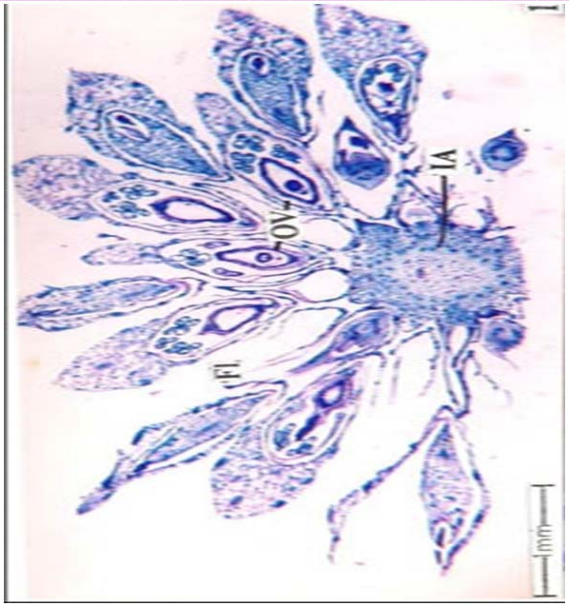

Fig.7A
Anatomy of the Inflorescence
1. T.S. Inflorescence half portion-enlarged
2. Inflorescence axis and vascular strand enlarged.
3. Structure of the perianth, Pollen, Anther and Ovary.
An- Anther, Fi-Florets: IA-inflorescence axis: Ov-Ovary: Pe-perianth
Po-Pollen: VS- Vascular Strand.

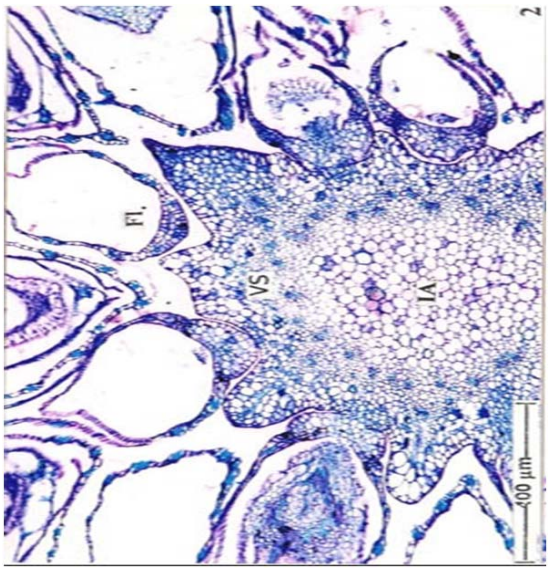

Fig.7B
Anatomy of the Inflorescence
4. T.S. Inflorescence half portion-enlarged
5. Inflorescence axis and vascular strand enlarged.
6. Structure of the perianth, Pollen, Anther and Ovary.
An- Anther, Fi-Florets: IA-inflorescence axis: Ov-Ovary: Pe-perianth
Po-Pollen: VS- Vascular Strand.

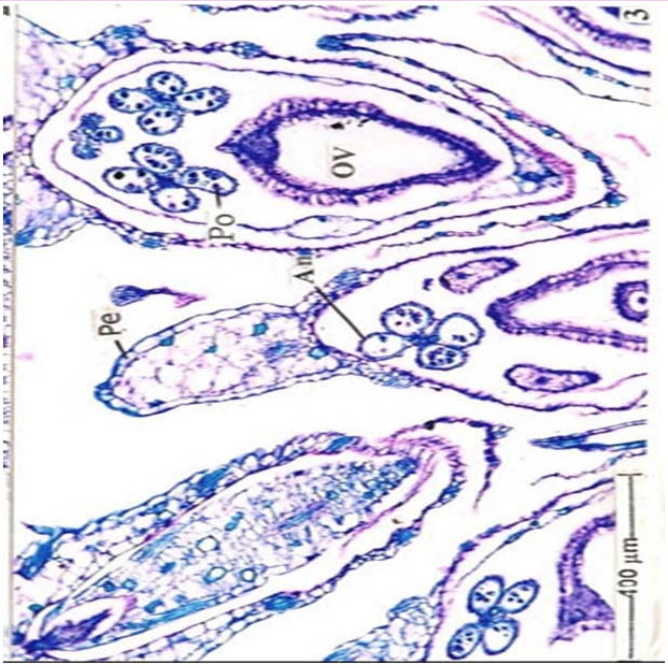

Fig.7C
Anatomy of the Inflorescence
7. T.S. Inflorescence half portion-enlarged
8. Inflorescence axis and vascular strand enlarged.
9. Structure of the perianth, Pollen, Anther and Ovary.
An- Anther, Fi-Florets: IA-inflorescence axis: Ov-Ovary: Pe-perianth
Po-Pollen: VS- Vascular Strand.

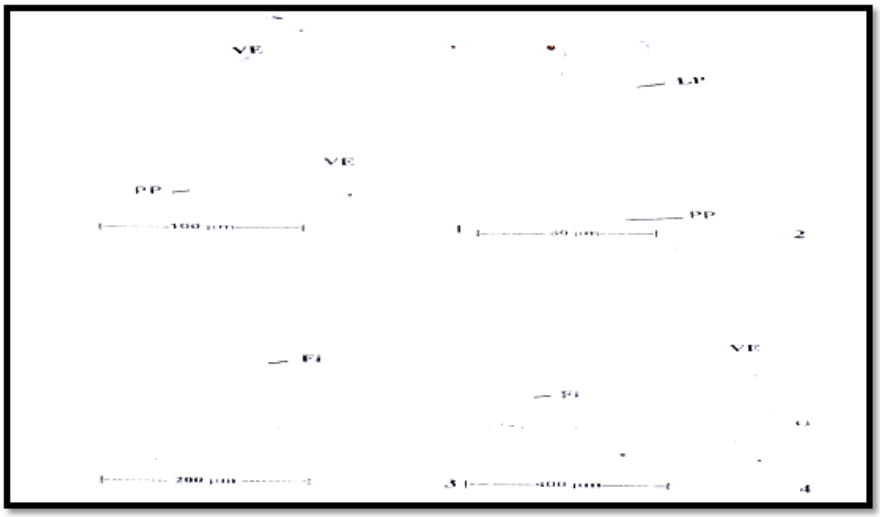

Fig-8: Powder Microscopy of the Rhizome
1.2: Vessel elements
3.4: Vessel element and fibers.
Fi- Fibres: LP-Lateral Pits PP- Perforation Plate: VE-Vessel element

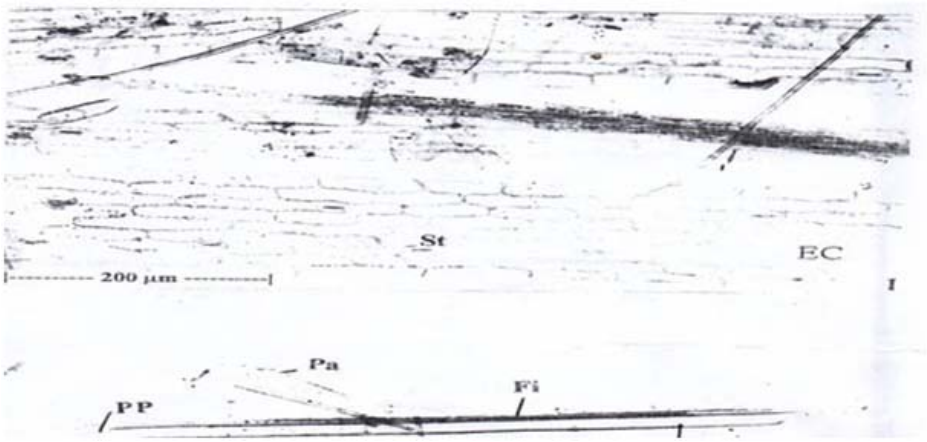

Fig-9: Powder Microscopy of the leaf and Culm:
1.Abaxial epidermis and stomata
2. Fibre, Parenchyma cell and vessel element of (stem) culm.
C-Epidermal cell; Fi- Fiber; Pa-Parenchyma cells. PP-Perforation plate; St-Stomata; VE-Vessel element

CONCLUSION

Morphological and micro morphological examination and characterization of medicinal plants have always been accorded due credentials in the pharmacognostical studies. Botanical identity of the plants is an essential prerequisite for undertaking the analysis of medicinal properties of any plant. A researcher may succeed in getting a new compound or may find many useful pharmacological active properties in the plant. If the botanical identity of the plant happens to be dubious or erratic, the entire work on the plant becomes invalid. Thus it is needless to stress the botanical identity of the crude drug is the threshold in the processes of pharmacological investigations. The researchers should be equipped with all possible diagnostic parameters of the plant on which the researchers plan to work. Present study may help in identification and future research on the plant kyllinga triceps rottb.

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