



## Botanical studies of the leaves of *Tacazzea apiculata* Oliv

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### Abstract

*Tacazzea apiculata* is a medicinal plant widely used in Hausa traditional medical practices for the treatment of numerous ailments such as pile, skin diseases and as tonic. Microscopical examination and preliminary phytochemical screening of the leaves were carried out with the aid of camera lucida and standard detecting reagents respectively. Elemental analysis was also carried out using Energy Dispersion X-Ray Fluorescence (EDXRF) machine. The leaf was found to be dorsiventral, with anomocytic stomata  $25-25.9-26 \times 12.5-13-14$  and covering Trichomes  $120-130-160 \times 11-12-13$  on the lower surface. Quantitative microscopy gave a stomatal index of  $18 - 25 \pm 4.2 - 40$  vein islet and vein islet termination of  $10-13 \pm 0.89 - 15$  and  $6-11 \pm 1.3 - 14$  respectively. Physical constants of the leaves include moisture content (10%), total ash value (6%) and acid insoluble ash (2%) The results of the studies could serve as useful tools for detection of adulteration in the drug.

Keyword: *Tacazzea*, Periplocaceae, leaves, microscopy, EDXRF, Elemental analysis

### Introduction

*Tacazzea apiculata* is a woody, climber widely found in tropical West Africa. (1) It is an important medicinal plant used for the treatment of various ailments in Hausa land including relief of pains in pile (2). The twig is taken in milk as tonic (3). The leaves are said to be effective in the treatment of craw-craw (4) and the flowers are considered edible (5). Compounds of the leaf have not yet been reported. This work is aimed at carrying out microscopical examinations and to determine some physical constants and trace elements in the leaves of *cipiculata* with the view to provide pharmacognostic standards of identification which could be useful in monograph preparation and possible inclusion in Pharmacopoeia

### Materials and methods

#### *Identification, Collection and Preparation of Plant Materials*

The Plant Material was collected during its flowering stage (June 1999) from Sakaru village along Zaria-Jos Road. The plant was first identified by herbarium keepers of the Department of Biological Sciences, Ahmadu Bello University Zaria. (Herbarium No 6975) The identity of the plant was further confirmed by Dr (Mrs.). O.A. Ugbogu and Mr. Gabriel Ibhenuseblor of the taxonomy section Forestry Research Institute of Nigeria (FRIN) Ibadan Nigeria. Fresh leaves were obtained for quantitative microscopy while powdered material was obtained by air drying under room temperature and powdered using pestle and mortar.

#### *Qualitative microscopical Studies*

The qualitative microscopy carried out involved the use of fresh and powdered leaves.

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The methods outlined in Gokhale (200) and Kokate (1994) were adopted. Two surfaces of the leaf and the transverse sections were examined under the microscope (x400), with the view to determine the presence or absence of characteristic features that could be diagnostic in the identification *Tacazze apiculata* either in fresh or in powdered form.

#### *Quantitative Microscopy (Determination of Leaf Constants)*

Five quantitative microscopical constants were determined, they include; stomatal number, stomata index, palisade ratio, vein-islet number, and veinlet termination number. The method involved the use of camera lucida and ocular micrometer for microscopical measurement as described in Kokate, (1994) and Evans, (1996).

#### *Chemo-Microscopical Studies*

The methods of Brain and Turner (1975), Cutler (1978) and Kokale (1994) were adopted in the studies. Cleared sections/powdered leaves were stained with appropriate reagents in order to detect the presence or absence of some ergastic substances in the tissues.

#### *Elemental Analysis of the Powdered Leaves of T. apiculata.*

The analysis was carried out using Energy Dispersion X-Ray Fluorescence (EDXRF) transmission emission technique at the Center for Energy Research and Training (CERT), Ahmadu Bello University, Zaria.

The methods outlined by Schwedt (1997) and Idris (1999) were adopted. Samples of the fine powdered drug were prepared and introduced into the system. The EDXRF system consists of a 925 MBq <sup>109</sup>Cd annular isotopic source with a Combera Si (Li) detector having a resolution of 170 eV at 59 KeV. The X-ray spectra were acquired with a computer based MCA and (Trump 8K). The set up provides for dead-time correction and pile up rejection. Sensitivity calibration of the system was performed using thick foils of pure metals (Ti, Fe, Co, Ni, Cu, Zn, Zr, Nb, Mo, Sn Ta Pb) and of stable chemical compounds (K<sub>2</sub>CO<sub>3</sub>, CaCO<sub>3</sub>, Ce<sub>2</sub>O<sub>3</sub>, WQ<sub>3</sub>, ThO<sub>2</sub>, U<sub>3</sub>O<sub>8</sub>).

#### *Determination of some Physical Constants of the Leaves*

Five physical constants were determined and these include: moisture content, ash values, acid-insoluble ash values, alcohol-soluble extractive and water-soluble extractive values. These determinations were carried out on powdered drug using the modified methods described in Brain and Turner (1975); A.P (1986) and Kokate (1994). Three different determinations were carried out in each case and the average was taken.

## **Results and discussion**

#### *Microscopical characters of the powdered leaves of T. Apiculata*

The microscopy of the powdered leaves revealed the presence of anomocytic stomata, singly and cluster crystals of calcium oxalate and numerous laticiferous canals. The detailed result is reported in Table 3.1. These features are peculiar to the family Periplocaceae a segregate of asclepiadaj:cae. Metacalfe and Chalk (1950) Hall, (1976)

#### *Histological characters of the leaves*

The transverse section through the midrib revealed that the xylem is crescent shape and

surrounded by the phloem. The parenchymatous cells appear to be polygonal. The midrib has numerous laticifers spine of which appeared yellowish in colour, this yellow substance could be latex (Cronquist, 1981). Trichomes were characteristically seen on both the upper and the lower part of the midrib. The transverse section through the lamina revealed that the leaf is dorsiventral. Radial section of the upper epidermis shows that the epidermal cells have polygonal shape and the surface is completely devoid of stomata and trichomes. The lower surface revealed the presence of numerous stomata and few unicellular, uniseriate non-glandular trichomes.

#### *Quantitative microscopical leaf constants*

The leaf constants for five determinations were expressed as mean  $\pm$  S.H.M (Table 3.3). Only palisade ratio was determined for the upper surface as the surface is devoid of stomata. The stomatal index and veinlet termination number are diagnostic and useful in the detection of adulterations.

#### *Trace Elements in the Leaves of T. apiculata*

The results of the elemental analysis using EDXRF technique are described in Table 3.4. The results revealed the presence and concentration of Titanium, Manganese, and Iron, which are known to be among the beneficial trace elements in herbal drugs.

Recently, plant species have been identified that contain nutrients displaying new, beneficial medicinal or therapeutic properties (Chen Chien-Yi and ChangLai Sheng -Pin, j 2001; Underwood, 1975). However, any element can have adverse health effects if the concentrations are high enough

#### *Physical constants of the leaves of T. apiculata*

Physical constants (Table 3.5) were also determined for the leaves of *T. apiculata*. The moisture content of 10% is not too high and this might minimize or prevent decomposition of the crude drug due to chemical change or microbial contamination. The total ash value is the residue remaining after incineration of the drug. It simply, represents inorganic salts, naturally occurring in drug or adhering to it or deliberately added to it as a form of adulteration. Total ash usually consists of carbonates, phosphates, silicates and silica. The total ash value for *T. apiculata* ( $6\% \pm 0.15$ ) is moderate and it is an indication that the leaf contains moderate amount of inorganic salts. The acid-insoluble ash of  $2\% \pm 0.06$  is an indication that the leaf has low adhering dirt and sand. Ash values are good criteria to judge the purity of drugs (Kokate, 1994). The alcohol extractive value ( $25.7\% \pm 0.15$ ) and water extractive value ( $30\% \pm 0.27$ ) are indicative of a good measure of chemical substance that can be extracted by these solvent from the leaves of *T. apiculata*.

**Table 3.1 Microscopical Characters of the Leaves of *T. apiculata***

Diagnostic Characters	Type	Size ( $\mu$ m) (LxB)/diameter	Freq.
Stomata	Anomocytic	25-25.9-26 x 12.5-13-14	Numerous
Trichomes	Unicellular	120-130-160 x 11-12-13	Few
Fibres	Apex tapering	150-165-175 x 10-10.5-12	Numerous
Laticifers	Unbranched	-	Numerous
Starch grains	Oval, simple	7.5-8.5 x 1.5-2-2.5	Few
CaOx crystals	Prismatic	1.5-18.3-25 x 10-12.6-15	Few

L=length B=Breath (width) Freq.=frequency

**Table 3.2 Chemo-microscopical Characters of the Leaves of *T. apiculata*.**

Constituent	Result	Tissue/cells
Starch	+	Parenchyma cells
Cellulose	+	Epidermal cells
Lignin	+	Xylem vessels
Mucilage	-	-
Calcium oxalate	-	Idioblasts
Calcium carbonate	-	-
Tannins	+	Parenchyma cells

Key: (+) Present (-) absent.

**Table 3.3 Leaf constants of *T. apiculata***

Determinations	* Values Upper Epidermis
Palisade ratio	4-11.214.6-16
<b>Lower Epidermis</b>	
Stomatal number	102 - 112 ± 5.4 - 130
Stomatal index	18-2514.2-40
Vein islet number	10-1310.89-15
Vein let termination	<b>6-11 11.3- 14</b>

\* **Bold** - Mean 1 S.E.M lor five determinations

**Table 3.4: The concentrations (ppm) of Trace elements in the Leaves of *T. apiculata* as determined by EDXRF analysis.**

Element	Concentration (ppm)
Ti	-
V	115-LOD-
Cr	30.9 -LOD-
Mn	-
Fe	-
Co	7.11-LOD-
Ni	2.89-LOD-
Cu	1.42 -LOD-
Zn	1.53-LOD-
As	1.52-LOD-
Se	0.889 -LOD-
Pb	0.643 -LOD-
Sr	0.587 -LOD-
Y	0.54-LOD-
Zr	0.19-LOD-
IMb	0.672 -LOD-

-LOD- Limit of Determination

**Table 3.5 Physical Constants of the Leaves of *T. apiculata*.**

Evaluative Parameter	*Mean Value (% w/w)
Moisture content	10.0 ± 0.21
Ash value ,	6.0 + 0.15
Acid - insoluble ash value	2.0 ± 0.06
Alcohol extractive value	26.7 ± 0.15
Water extractive value	30.0 ± 0.27

\* Mean value of three determinations

## Conclusion

The Botanical studies on the leaves of *Tacazzea apiculata* have been reported for the first time. The plant has long history of use in traditional medicine for treatment of scabies and onchocerciasis. *Tacazzea apiculata* could have insecticidal and / or anthelmintic properties.

against the causative parasites and being natural, the plant may be a drug with fewer side effects. Correct identification of the plant is very essential and this study has provided relevant scientific information that could serve as a diagnostic tool for the identification of *Tacazzea apiculata* an important medicinal plant in Hausa folklore

## Acknowledgement

The authors wish to thank Malam Urpar Gallah and Malam Musa Mohammed of the herbarium section Ahmadu Bello University Zaria for collecting the plant. We also thank Dr (Mrs.). O.A. Ugbogu and Mr. Ciabriel Ibhensebor of the Taxonomy section Forestry Research Institute of Nigeria (JFRIN) Ibadan for identifying the plant.

## References

- Hutchinson, J. and Dalziel, J. M. (1963): Flora of West Tropical Africa, Vol. 2. Crown Agents for Oversea Government, and Administration. Mill Bank London, S. W. 1, p 83. 17(3)293-297.
- Kallamu, M. (1999): (Personal Communications) Loc'fl/ Uses of Yadiyar Kada (*T. apiculata*) Herbalist. Malali Village, Kaduna.
- Watt, J.M. and Breyer-Brandvijk, M. G. (1962) The Medicinal and Poisonous Plants of South and Eastern Africa, E and S Livingstone, Edinburg, p 137.
- Dalziel, J.M. (1956) Useful Plants of West Tropical Africa. Crown Agents for Overseas Govt, London, p 340.
- Peters, C. R.; O' Drien, E. M.; and Drummon, R. B (1992) Edible Wild Plants of Sub-Saharan Africa. Royal Botanic Gardens, Kew, P 67.
- Brain, K.R and Turner.T.D. (1975) The Practical Evaluation of Phytopharmaceutical, Wright Scientific Bristol pp 81-88.
- Calixto J B Beirith A. Ferreira J. Santos A.R. Cechinel F V Yunes R. A. (2000) Naturally Occurring antinociceptive substances from plant. *Phytother. Res.* 37: 319-321
- Chen Chien-Yi and Chang Lai Sheng -Pin (2001) Determination of Several Trace Elements in Chinese Herbs with Epithermal Neutron Activation Analysis. *Analytical Science* vol. 17 supplement. The Japan Society for Analytical chemistry. P1649
- Ciulei, I. (1997): Methodology for the Analysis of Vegetable Publication of UNIDO, Romani, pp 64-67.
- Irvine, F.R. (1961): Woody Plants of Ghana. Oxford University Press London, p 654.
- Cronquist, A. (1981) An Integrated System of Classification for Flowering Plants. Columbia Uni. Press, New York, Pp 879 - 882.
- Cutler, D. F. (1978) Applied Plant Anatomy, Longman, London pp 31 -46.
- Evans, W. C. (1996): Trease and Evans Pharmacognosy 14<sup>th</sup> edn, W. B. Saunders Co. Ltd., London. Pp 542 - 578.
- Gokhale, S. B; Kokate, C. K. (2001) Practical Pharmacognosy, Nirali Prakashan, India pp 1-25.
- Hall, M. A (1976): Plants Structure, Growth and Adaptation. The Macmillan Press Ltd Hong
- Idris, I. F. (1999): Application of Transmission Emission Method in EDXRF for the Determination of Trace Elements in Geological and Biological Material. *J. Trace and Microprobe Techniques.* 17 (3) 293 - 97.
- Kokate, C.K. (1994) Practical Pharmacognosy, 4<sup>th</sup> edn, Vallabh Prakashan, pp 17 - 27.
- Metcalfe, C. R. and Chalk, L. (1950) Anatomy of the Dicots-Leaves, Stem and Wood in Relation to Taxonomy with notes on Economic uses Vol 2 Oxford, P 919.
- Schwedt, G. (1997): The Essential Guide to Analytical Chemistry - Translated by Haderline, John Wiley and Sons, Chichester, Pp 98 - 100.
- Silva, G. L. Lee, I. and Kinghorn A. D. (1998) Special Problems with the Extraction of Plants In: Cannel R.J.P (ed) Methods in Biotechnology. Natural Products Isolation. Humana Press, New Jersey, pp 343 - 363.
- Underwood, E.J. (1971) Trace elements in Human and Animal Nutrition, 3rd edn... Academic Press: New York