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ANATOMICAL AND PHYTOCHEMICAL STUDIES OF ENDEMIC MEDICINAL SPECIES *MARTICARIA PUBSCENES* (ASTERACEAE) FROM SOUTH ALGERIA

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ABSTRACT: *Matricaria pubscens* (Asteraceae), with wide distribution area in southern Algeria, is a drug traditionally used in the treatment of certain diseases such as dehydration, cough and sore. The aim of this study was to determine the anatomical features of the root stem and leaves of medicinal species of *M. pubscens* sections. As a result of the study, it was discovered that in the root the vessels arranged in short multiple radial; the fibers are thin-walled thick, Vascular bundles are separated by large unilignifid rays. Most vessels in the central part are plugged with dark-staining substances. The anatomical structure of the leaves is isobilateral mesophyll and palisade parenchyma nearly two epidermises and spongy parenchyma in the middle, the leaf was bifaceous. The surface of the epidermis is covered with glandular hairs, the stomata were diastatic. The extract of aerial part of *M. pubscens* has significant amounts of Phenols, Flavonoids and Steroids, however tannins are present an average amount; the Alkaloids are present in lowest amount.

INTRODUCTION: Algeria has a rich culture of herbs and spices, which includes about 2,000 species and has a large geographic area with high potential abilities. More than 80% of the world's inhabitants relies on traditional medicine for their primary health care needs and has found a place in the life daily¹. Macroscopic and microscopic clarification of medicinal plants is the leading step towards crafting the identity and cleanliness of these resources and must be done before testing. The acquaintance of the histological structure of the different organs of the plant that contains the active substance is also very important².

The anatomical feature are an aid in the recognition of morphological characteristics many plants. Wherefore, it is essential that the anatomical details of the authentic material of the drug should be prepared in the form of diagnostic characters in the identification and the differentiation between closely related species to avoid any vagueness².

Asteraceae is a vast plant family that comprises roughly 1500 genera and 25,000 species in different habitats³. This family consists of vegetation quite distinct, which ranges from herbs, subshrubs, and shrubs to trees⁴. This vegetation is found into diverse habitats once it has a great environmental adaptation⁵.

Matricaria with about seven taxa, Are dominant in Europe, Central Asia, North America and North Africa⁶⁻⁸. *Matricaria pubscens* (Deaf.) Is an

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endemic species well known “called guertoufa” and particularly found in the northern and central Sahara^{9, 10}. Is a small annual plant, 7-15 cm in height up to 40 cm in plant cultivates, with many prostrate stems, which erect. Flowering takes place in springtime in the northern Algerian Sahara, at any time after the rain in the central Algerian Sahara. *Matricaria pubescens* is a popular herb used in traditional medicine in Algeria against several diseases, it has antiseptic properties and has been used for instance rheumatism, digestive diseases, diarrhoea and aching joint; it was prepared as an infusion or powder and used internally¹¹. Stems and pounded leaves are used as a filter for butter goats, providing a delicious smell of butter and aid in maintaining has also been added to the traditional soup and donate the foodstuffs a very agreeable aroma.

It is not reported as toxic by nomads; the whole plant is collected fresh in spring, and sold in the market in several oases in the south¹²⁻¹³. It is not signalize as intoxicant; whole plant is collected fresh in the spring and vended on the market place in various oases in the south.

The objective of this work was to establish a relation enter anatomical organizations comprising natural produce in various tissues of the plant; In addition to the phytochemical screening methods have been applied to detect the main groups of these classes of chemical compounds.

MATERIAL AND METHODS:

Plant Materials Collection: Plant material was collected from region of south East Algeria, Eloued city [34.017571, 6.454652]. The whole plants was collected after that the species was identified using Ozonda's Flore (1983) and the taxonomic was done. All parts of plants collected were dried at 25°C in the dark to avoid the photooxidation of phenolic compounds, and in a well ventilated and stored for the extraction part .

Anatomical study: Fresh plants were collected softly since normal Sahara areas; for the anatomical explanation of the fragment has been segmented by hand, in transverse section. The sections were prolonged in (sodium hypochlorite at 12 °C.) for 20 minutes to bleach the cells, then rinsed with distilled water and then with 1% acetic acid for 1

min. The sections were stained by double staining with methyl green and Congo red accordance with the usual techniques of plant anatomy¹⁴.

Screening of crude extract: The phytochemical screening tests for the extracts were affected for the diverse constituents of the plant. The crude extracts were detected for the presence or absence of metabolic compounds such as alkaloids, steroidal compounds, phenolic compounds, flavonoids and tannins using standard procedures¹⁵⁻¹⁶. Color intensity or precipitate formation was used as analytical responses to these tests.

RESULTS:

Phytochemical screening: The extract of aerial part of *M.pubscens* has significant amounts of Phenols, Flavonoids and Steroids, however tannins are present an average amount. The alkaloids are present in lowest amount **Table 1**.

TABLE 1: PHYTOCHEMICAL SCREENING

Natural Products	Phenols	Flavonoides	Alcaloids	Steroids	Tannins
quantity	+++	+++	+	+++	++

+++ : important quantity presence, ++ : average quantity presence and + : feeble quantity presence

Macroscopic features: *Matricaria pubescens* (Deaf.) is an endemic species well known and particularly found in the northern and central Sahara **Fig. 1**. Annual plant with dark green tuft lying then straightened rods. Is a small annual plant, 7-15 cm in height up to 40 cm in plant cultivates, with many prostrate stems, which erect, rower. Leaves Hairy dissected and green darkens, The leaves alternate, sessile, thick, fleshy, are divided into strips; Involucres of bracts straw yellow with a broad membranous margin, the deeply dissected leaves, with each of the lobes ending with a white tip are slightly fleshy and are between 1 and 3 cm long. Flowers in all tubes, surmounted string in a peeling longer membranous, rejected on one side, the flowers are yellow tubular, their heads are about 5 to 8 mm in diameter and are set at the ends of the stems and grouped in hemispherical discoid heads, Flowering generally occurs in spring season and at all times after it rains in the Algerian central Sahara. The fruits are achenes very small, yellowish-white with a short pappus membranous to aid the dispersion (Ozenda., 1983).



FIG. 1: MATRICARIA PUBSCENS (DESF.), ASTERACEAE. (A) ENTIRE PLANT GROWN IN THE SAHARA IN SOIL SAND. (B) A FLOWER. (C) AACHEN

Microscopic features:

The leaf: Cross-section showed that, the leaf has an axial and adaxial epidermis isobilateral covered with cuticle **Fig. 2**, whereas the cuticle is omitted in stomatal area. Stomata's are present on both sides of the leaf, which is in view of kidney-shaped surface. The glandular and no glandular trichomes of *M. pubescens* are capitate on the Surface of epidermis **Fig 3**. The internal cells of palisadic parenchyma layers are dense with chloroplasts, and the spongy parenchyma in the middle. Palisadic

parenchyma is more regularly arranged in tow layer than the central cells of the mesophyll **Fig. 2**. Three vascular bounds a central and two laterals are distributed; each collateral bundle consists of xylem and phloem. The midvein has large bundle consists of nearly more than twelve rows of tracheary elements. Each row has two or three xylem elements. The phloem occupies the lower side of leaf. It consists of sieve elements with companion cell, phloem parenchyma and phloem fibers.

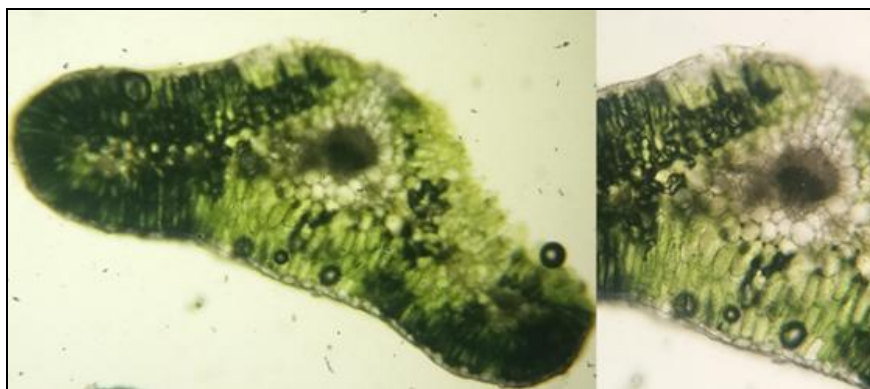
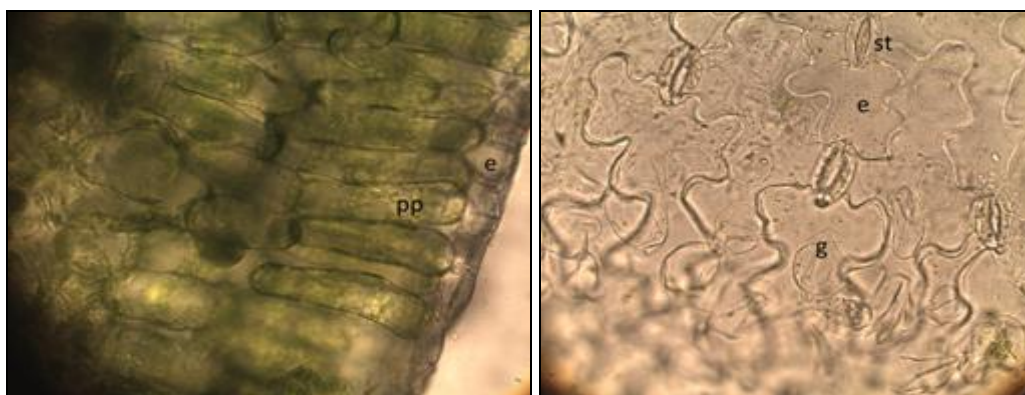


FIG. 2: CROSS SECTIONS OF LEAF OF M. PUBSCENS



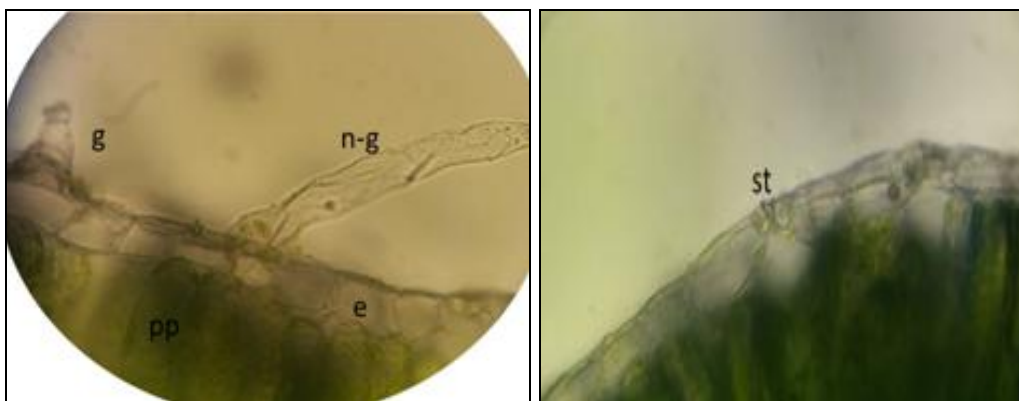


FIG. 3: THE SURFACE AND LEAF SECTIONS OF LEAF OF *M. PUBSCENS*, ADAXIAL SURFACE OF LEAF (e) Epidermis cell (st) stoma cell. (pp) palisade parenchyma, (g) glandular hair, (n-g) no-glandular hair

The root: A cross-section of the root appears as a complete circle **Fig. (4A)**. The old root of *M. pubscens* is composed of three common zones: the periderm, the pricyclic derivatives and the vascular tissues. The phelloderm layers comprised of more than fifteen thick layers of elongated and compacted cells; the outer zone is the covered bark of Suberine. The cortex parenchyma occupied large area and is composed of large elongated cells. The major part of the roots is reserved by xylem

elements **Fig. (4 and b)**. There are thin walled ray parenchyma cells between these xylem elements. The xylem consists protoxylem vessels outwardly metaxylem vessels inside connected by connective tissue with the phloem. From the cross section one notices vessels arranged in multiple radial short, the fibers are thin to thick walled; the vessels are thick-walled and are separated by large unquoted rays **Fig. (4B)**. Most vessels in the central part are plugged with dark-staining substances **Fig.(4B)**.

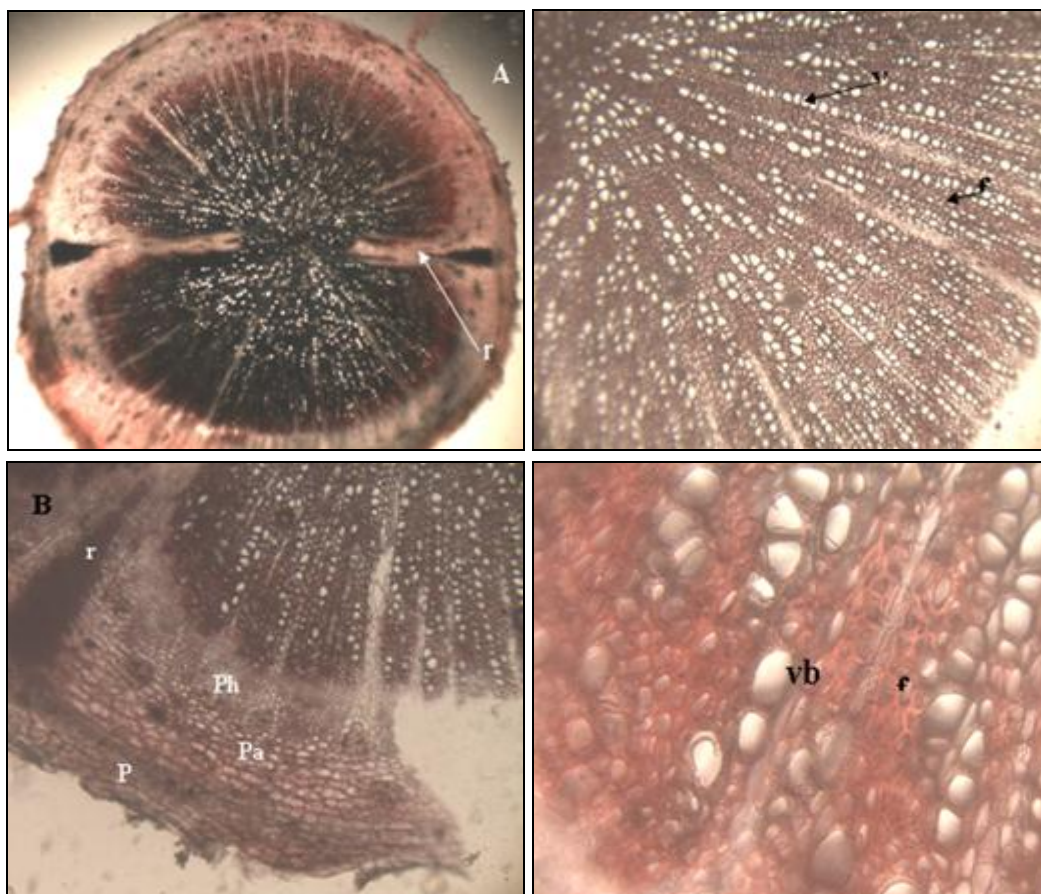


FIG. 4: *M. PUBSCENS*. A CROSS-SECTION OF ROOT: r, ray. VB: vascular bundle; ph; phloem; xl sylem; Sc, sclerenchyma, p: periderm, pa: parenchyma cell

The stem: A transverse section of the stem reveals, the epidermis made up of a single layer of compactly radially arranged cells, protected with a thick cuticle **Fig 5**. The epidermis contains glandular trichomes. The cortical region is formed by one to two layers of angular collenchyma and for about four layers of parenchymatic cells. Cortex is distinguished to collenchymatous cells 5 – 8 layers thick. The vascular system is collateral, consisting of several continuous bundles,

distributed in a single ring. Isolated sclerenchyma fibers are located externally to the phloem, forming caps. Vascular cylinder is eustele, and composed of 10–12 bundles each with well defined patches of phloem and well defined xylem vessels. The sclerenchymatous interfascicular region is located between the vascular bundles. Pith is broad and homogeneous, consists of round, thin-walled polygonal parenchymal cells **Fig. 5**.

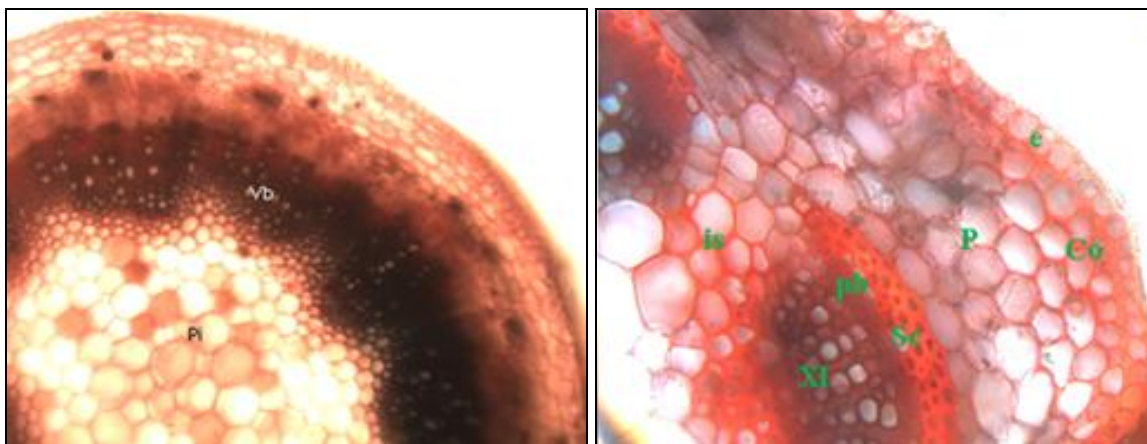


FIG. 5: STEM TRANSVERSE SECTIONS OF *M. PUBSCENS*, ca: cambium; Co: collenchyma, xl xylem; E: epidermis; P: parenchyma; pi: pith; VB: vascular bundle. Sc, sclerenchyma, is: interfascicular cell

DISCUSSION: The anatomical study of plant organs based on morphological and anatomical variations, such as venation models, types of stomata, the type of trichomes, secretion system and mesophyll with differentiated structures¹⁷. A few anatomical studies on the *M. pubscens* species have been found in the literature. This study provides suitable information on the morphology and structure composition of *M. pubscens*. From the cross section one notices vessels arranged in multiple radial short, the fibers are thin to thick walled; the vessels are thick-walled and are separated by large unquoted rays. Most vessels in the central part are plugged with dark-staining substances. The anatomical characteristics of the medicinal taxon *M. pubscens*, the anatomical information of the root, stem and leaf of the Asteraceae family, were reported¹⁸.

Some morphological properties are used as taxonomic characters such as leaf feature, shape and length of stem and capitule properties¹⁹. Although, results that some differences are represented, can generally be consistent with the description of the flora of Algeria¹³. The stem

anatomy of *M. pubscens* is composed of epidermis, cortex, corticular vascular bundles with distinguishable cambium formation and parenchymatic pith. The results are constant with the other research²⁰. The anatomical structure includes the Asteraceae family studied by Metcalfe and Chalk (1979) as characteristics of this species. The structural organization of the leaves is similar to most species of the Asteraceae family, is composed of two epidermis, the lower and the upper, including the stomata, the parenchymatous mesophyll and the vascular bundle^{20, 21}.

The upper epidermis cells are covered with cuticle²², the glandular and nonglandular trichomes of *M. pubscens* are capitate. Similar glandular trichomes were found in most specie's of Asteraceae family²³. The essential oil present in *M. pubscens* can be found in glandular trichomes and secretory ducts²⁴⁻²⁵. The mesophyll tissue of leaves of any species varies according to the number of cell layers that make up the palisade parenchyma and the spongy parenchyma²⁶. In the case of *M. pubscens*, the mesophyll is isobilateral; two layers of palisade parenchyma close to the epidermis and the spongy

parenchyma in the middle, also other result reported in other spaces such as *Vernonia psilophylla*¹⁷⁻²⁶.

CONCLUSION: This work has contributed to expand the information about *Martucaria pubscens*, utilizing usual techniques of microscopic analysis of plants. It was shown that the root, stem and leaf blade of *M. pubscens* present the characters of, morphology and anatomy for the *M. pubscens*, Which are valuable in the identification the other species which are also important factors for the control of the quality of plant resources. In South Algeria adverse environments, plant species grown in sand area, have many anatomical traits in different plant organs to withstand drought. The anatomical characteristics of the stems such as the presence of thick cuticles, the epidermis with thick walls and the presence of subepidermal under layments, as well as stains of sclerenchymatic fibers as supporting and protective source, parenchyma cortex shrunk as response to drought resistance. Anatomical traits in *Z. album* leaf are the presence of highly organized palisade mesophyll lead to isobilateral anatomical structure and the occurrence of water storage tissues.

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REFERENCES:

1. Bodeker G, Burford G.: Conservation of medicinal plant biodiversity In: Bodeker G, Burford G. Traditional, Complementary & Alternative Medicine: Policy and Public Health Perspectives, Imperial College Press, London. 2007.
2. Gao, GY, Feng, YX.: Comparison of morphological and microscopical diagnostic characters of Hawthorn fruits Yao Xue Xue Bao. 1995; 30(10):781-795.
3. Souza, VC, Lorenzi H: Botânica sistemática: guia ilustrado para identificação, todas famílias de fanerógamas nativas e exóticas no Brasil, baseado em APG III. 3ª ed. Instituto Plantarum, Nova Odessa, São Paulo, 2012; 768p.
4. Joly, A.B.: Botânica: introdução à taxonomia vegetal, 13th ed. Companhia Editora, São Paulo.2002.
5. Venable DL, Levin DA.: Morphological dispersal structures in relation to growth habit in the Compositae. Plant. Syst. Evol. 19983; 143, 1–16.
6. Oberprieler C, Vogt R, Watson, LE: Tribe Anthemidea Cass. In: Kadereit JW, Jeffrey C, Kubitzki K (eds) Flowering plants

- Eudicots. The families and genera of vascular plants 1819, vol 8. Springer, Berlin, 2007; 1: 342–374.
7. Himmelreich S, Kallersjo M, Eldenas P, Oberprieler C: Phylogeny of southern hemisphere Compositae-Anthemideae based on nrDNA ITS and cpDNA ndhF sequence information. Plant Syst Evol 2008; 272:131–153.
8. Talip C, Nur Mu`never P, Huseyin I, Sema H, Ahmet E, Y.: The comparative pollen morphology of genera *Matricaria* L. and *Tripleurospermum* Sch. Bip. (Asteraceae) in Turkey Plant Syst Evol. 2013; 299: 959–977.
9. Boukef M.K: les plantes dans la médecine traditionnelle tunisienne, médecine traditionnelle et pharmacopée- agence de coopération culturelle et technique.1986; 350.
10. Benchelal A.C., Bouziane H., Maka M., Ouahes C., 2000. Fleurs du Sahara, Ibis Press, Paris.
11. Hammiche V. Maiza, K.: Journal of Ethnopharmacology 2006; 105: 358–367.
12. Bounaga N, Barc, RA: Recherche en zone aride et pluridisciplinarité rêve ou réalité Rev. Res. Amilieu Aride 1990; 1.3-9.
13. Ozenda, P: Flore du Sahara. Centre National de la Recherche Scientifique. Paris.1983;
14. Langeron, M: Précis de microscopie. Microscope, accessoires, méthodes, amibes, métazoaires, botanique. Édition masson. 1949; 1430.
15. Dohou, N., Yamni, K., Tahrouch, S., Idrissi Hassani, L. M., Badoc, A. & Gmira, N: Screening Phytochimique d'une Endémique Ibéro-Marocaine, *Thymelaea Lythroides*. Bull. Soc. Pharm. Bordeaux. 2003; 142, 61-78.
16. Harborne, J, B.: Phytochemical Methods, A guide to Modern Techniques of Plant analysis. Chapman and Hall, London .second ed. 1998; 54–84.
17. Patricia M, Adriana H, Beatriz A: Comparative leaf morphology and anatomy of three Asteraceae species, Brazilian Archives of Biology and Technology 2006; 49(1): 135-144.
18. Fritz H, Annett B: Atlas of Stem Anatomy in Herbs, Shrubs and Trees, 2013; 2:1-415.
19. Huseyin I, Melahat. O., Leaf anatomy as an additional taxonomy tool for 18 taxa of *Matricaria* L. and *Tripleurospermum* Sch. Bip. (Anthemideae-Asteraceae) in Turkey Plant Syst Evol 2011; 296: 205–215.
20. Metcalfe. CR., Chalk, L., Anatomy of dicotyledons, vol 2, 1st ed. Clarendon, Oxford. 1979.
21. Napp-Zinn. K., Eble. M.: Beitrage zur systematischen Anatomie der Anthemideae: die Spaltöffnungsapparate. Plant Syst Evol 1978; 130:167–190.
22. Cilliers, S, S., Kruger, H.: Leaf anatomy of the southern African species of *Brachylaena* (Asteraceae). Bot. Bull. Acad. Sin., 1993; 34, 335-346.
23. Vanessa, CG, Rosi Z., Roberto P., Jane MB., Francinete, RC.: Morpho-anatomical characteristics of *Baccharis glaziovii* in support of its pharmacobotany. Rev Bras Farmacogn 2014; 24: 609-616.
24. Budel, J.M., Farago, P.V., Duarte, M.R. 2013. Pharmacobotanical study of *Baccharis cognata* DC. (Asteraceae: Astereae). Lat. Am. J. Pharm. 32, 550-554.
25. Tadrent, W., Kabouche, A., Touzani, R., Kabouche, Z., Chemotypes investigation of essential oils of "Guertoufa" herbs, J. Mater. Environ. Sci. 2014; 5(4):1200-1205.
26. Sajo, MG., Menezes, NL., Considerações sobre a anatomia foliar de espécies de *Vernonia* Scrib. (Compositae) da Serra do Cipó, MG. *Naturalia*, 1994; 19: 161-172.

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