



## Morphological, Anatomical and Environmental Characteristics and the Geographical Distribution of *Matricaria pubescens* (composées) from Algeria

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### ABSTRACT

This study included morphological and anatomical features, and the ecological and geographical distribution of *Matricaria pubescens* (Asteraceae) plants, which were found to be annual herbaceous plants, branched at the base and flattening on the ground. That is a spontaneous plant distributed in North Africa, particularly in Algeria in the Saharan and Sub-Saharan regions. In the current investigation, the relationships of *Matricaria pubescens* were examined using morphological, anatomical, and micro-morphological methods. The present study reported the detailed stem anatomy, epidermis micromorphology, environmental characteristics, and the geographical distribution. The anatomical structure of this species was studied using fresh materials.

**Keywords:** Anatomy Characteristics, Morphological Characteristics, *Matricaria Pubescens*, Medicinal Plant, Eloued Region.

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occurs in spring in the northern Algerian Sahara, at all times after it rains in the Algeria, the central Sahara (Benhouhou, S.S & Sadoul, N. 1986).

### 1. INTRODUCTION

Algeria has a rich culture of medicinal herbs and spices, which includes about more than 2000 species, and it has a vast geographical area with high potential abilities. Medicinal plants have remained as the important reservoir of new drugs. This family includes quite distinct vegetation, which ranges from herbs, subshrubs, shrubs, to trees (Joly, 2002). This vegetation has been found in various habitats because of having great environmental adaptation (Venable & Levin., 1983). Medicinal herbs have been considered as a source of stock essential for the discovery of new molecules necessary for the development of new drugs. The Asteraceae family has been widely used in traditional medicine to cure many diseases (Souza & Lorenzi, 2012). The genus *Matricaria* belongs to the Asteraceae (composées) family, which includes about 1500 genera and 25 000 species belonging to the order of astrales (campanales). *Matricaria pubescens* which is called Guertoufa or Ouazouza in arabic, is found in the northern and central Algeria Sahara Sahara (Boukef., 1986; Benchelal *et al.*, 2000). *M. pubescens* is a popular herb which is widely used in folk medicine in Algeria against various diseases, it includes antiseptic characteristics and has been used for several diseases such as rheumatism, digestive diseases, diarrhoea and aching joint; it has been prepared as an infusion or powder and is used internally (Hamliche & Maiza., 2006). The entire plant has a very agreeable scent, it is a small annual plant, it has green hairy dissected leaves that darken, the plant is alternate, sessile, thick, fleshy, and is divided into strips; the flowering generally

### 2. MATERIAL AND METHODS

The study was based on samples taken from different regions of south-eastern Algeria by field trip during the 2018-2019 growing seasons (*Ben Guecha* north east of ELOUED, *Négrine* South east of TEBESSA, north of Illizi, *Siar* southern of KHENCHELA and a variety cultivated in Eloued west). In terms of morphological study, the measurements and dimensions of vegetative and reproductive parts, fruits and seeds were recorded. The anatomical study was based only on fresh samples. The anatomical sections of the leaves were obtained by the waxing method, the roots and stems were studied using the manual cutting method, the sections were studied using a composite microscope, and the models were photographed using a digital camera. The important field observations were recorded during field trips while sample collection.

### 3. RESULTS AND DISCUSSION

#### 3.1. Morphological characteristics of *Matricaria pubescens*

*Matricaria pubescens* is a small annual plant, 7-15 cm tall (longer in the plant flattening on the ground), and reaching 40 cm in the case of cultivated plants, with many thin, branched, dark green stems. It is a plant with numerous stems in the form of tufts, lying down and then straightened. The leaves are slightly fleshy yellowish, between 1 and 3 cm long, deeply cut, with lobes. The flowers are tubular yellow grouped in

hemispherical discoid heads, the capitula is 4 to 8 mm in diameter, attached to the ends of the stems, topped chain of a scale, long, membranous, rejected on one side, having the appearance of a ligule (figure 1 and Figure 2). The studied species showed variations in their morphological features, such as stem length, number and position. In wild varieties of different areas studied, the plant stems are branched and prostrate, ending with a number of composed flowers (Benhouhou, S.S & Sadoul, N. 1986), in grown cultivars, the plant stems are branched and erect from the beginning,

finished with a large number of complex flowers. In the areas with very hard climatic conditions, particularly deserts and sandy soils, the stem length is very short, and the number of branches is very small (Ashraf M. & Idrees N. 1992 ; Mezni M., 1999). The lack of water causes the leaf surface to be short, and decreases the size of the plant, and shortens the plant life cycle (Figure3) (Aguirrezabal L A N, & Tardieu F, 1996; Adjab M, 2002). The results indicated that the length and the thickness of the leaves depended on the climatic conditions.



Figure 1: Plant samples of *M. pubescens*, variety cultivated (A), from Siar (B), negrine (C) and Ben Guecha (D).

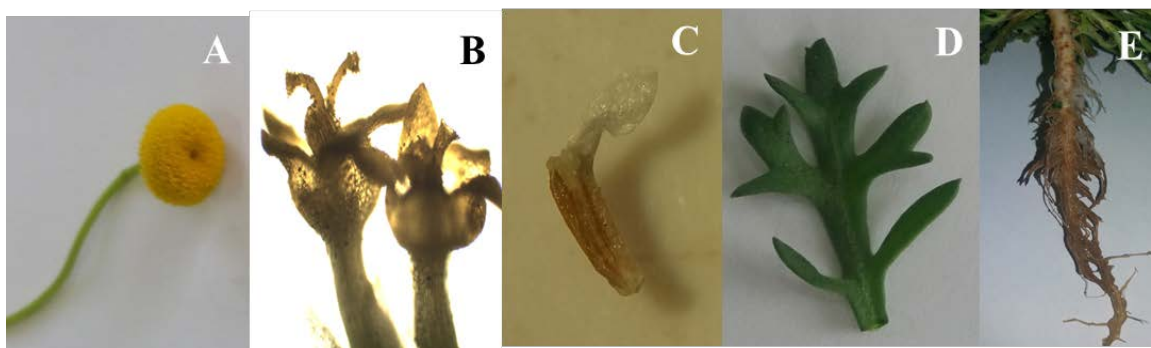


Figure2: Representation of the flowers (A and B), seed (C), leaves (D) and root(E)

**3.2. Geographical distribution**

The species *M. pubescens* is particularly common throughout the northern and central Sahara. This is an endemic species well known in North Africa, this plant is common throughout the northern Sahara including the regions of Biskra, El Oued, Touggourt, Bechar Ghardaia, Tebessa, suede of khenchela, Ouargla, Beni Abbes, and the central Sahara including the regions of Adrar, Tamanrasset, Djanet Illizi; the soils and bioclimatic characteristics have been represented in Table1.

*Matricaria pubscens* thrives in desert conditions with 50 mm average rainfall per year, often found in non-saline spaces in sanded floors and occasionally on stony floors. *M. pubscens* grows well in the desert conditions with an average rainfall of 50 mm per year, it is often found in unsalted spaces on sandblasted soil and sometimes on stony soil, and it has been sited in isolated and very remote places, known only to some villagers. It has been observed that plants that develop under very harsh environmental conditions are small in size compared to the other samples grown in more humid or cultivated environments. The small size and shape of the leaves and the stems of the plants help them to the resist drought.

**Table 1:** Bioclimatic and soil characteristics of the studied regions

regions	T annual average	T max annual average	T min annual average	Total annual precipitation	Bioclimatic floors	Soil type
<i>Ben Guecha</i> <i>ELOUED</i>	23.0	29.5	16.5	83.2	saharien	sandy soils
<i>Négrine</i> <i>TEBESSA</i>	16.5	22.9	9.7	391	arid superior	Loose alluvial
Illizi	26.3 33.6	18.0	6.12	31.26	saharien	sandy soils
<i>Siar</i> <i>KHENCHELA</i>	11.2	15.3	5.8	413	Semi-arid	windy accumulation



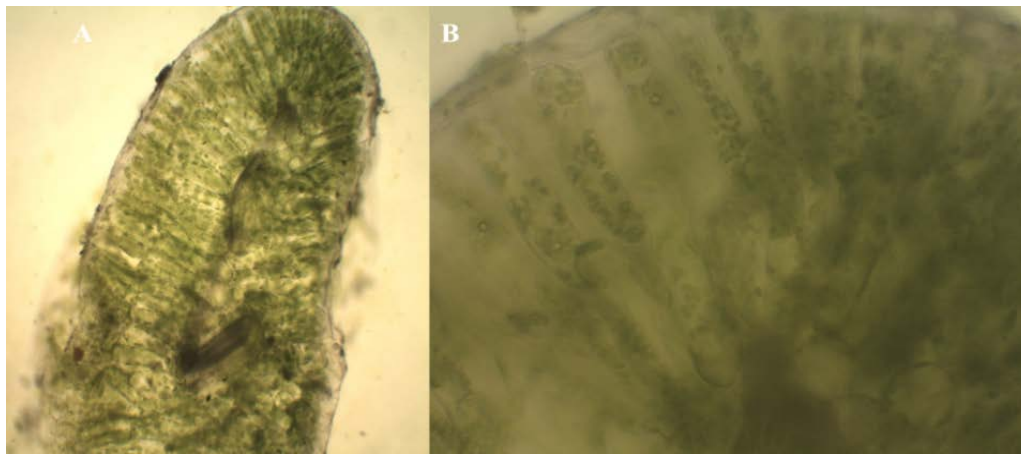
**Figure 3:** Stems length, position and ramification in different areas under different climatic conditions. From Siar region (A), from desert regions (B and C)

**3.3. Anatomical characteristics**

**Leaf**

The mesophyll has a palisade parenchyma close to the epidermis with the spongy parenchyma in the middle, the parenchyma palisade cells are dense in chloroplasts, and they are more regularly arranged in two layers than the central cells of the mesophyll. The mesophyll has a palisade parenchyma close to the epidermis with the spongy parenchyma in the middle, the parenchyma palisade cells are dense in chloroplasts and they are more regularly arranged in two layers than the central cells of the mesophyll. In the parallel vascular bundles, each collateral bundle consists of xylem and

phloem. The median vein has a large bundle consisting of almost more than twelve rows of tracheary elements, each row having two or three xylem elements. The phloem occupies the lower side of the leaf, it consists of sieve elements with accompanying cell, phloem parenchyma and liber fibres (Figure 4). Also, other studies reported *Vernonia psilophylla* in other spaces (Sajo & Menezes., 1994, Patricia et al., 2006). The anatomical structure of the leaves is similar in all taxa of the family of Asteraceae; the leaves are composed of lower and upper epidermis including anomocytic or anomocytic-anisocytic stomata, parenchymatic mesophyll, and vascular bundle (Napp-Zinn & Eble., 1978).

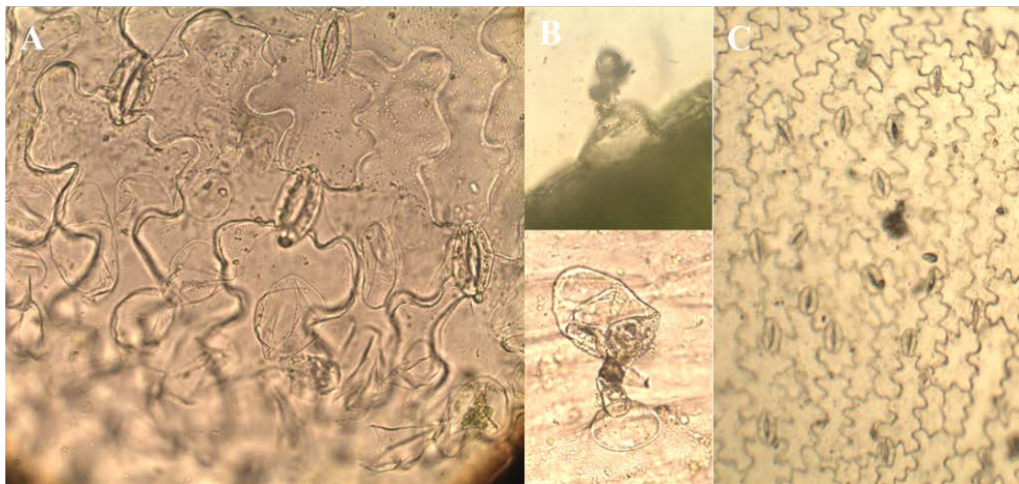


**Figure 4:** The surface sections of a leaf of *M.pubscens*

**Epidermis**

The abaxial and adaxial epidermis consists of a single layer on the upper and lower surface covered with a cuticle. The stomata are present on both surfaces of the leaf (amphistomatic) which have the shape of a queen in the view of surface, the remains are surrounded by a limited number of cells that closely resemble the remaining epidermal cells (anomocytic form). The glandular trichomes of *M.pubscens* are

capitate on the surface of the epidermis. The upper epidermis cells are covered with cuticle (Cilliers & Kruger., 1993), and the glandular trichomes of *M.pubscens* are capitates. Similar glandular trichomes have been found in most species of Asteraceae family (Vanessa et al., 2014) (Figure 5). The essential oil present in *M.pubscens* can be found in glandular trichomes and secretory ducts (Budel et al., 2013; Tadrent et al., 2014).

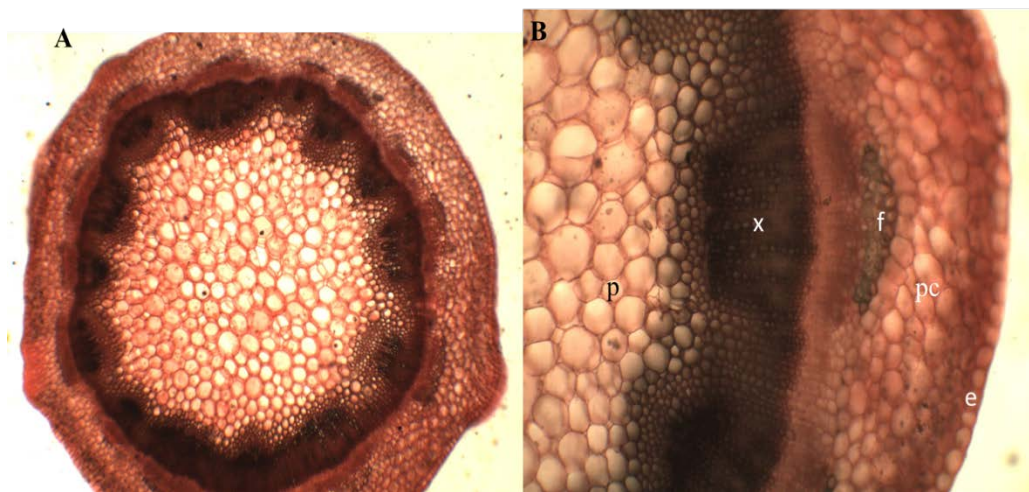


**Figure 5:** The epidermis cell (A zoom x400, C zoom x100), glandular trichomes (B)

**The stem**

A transverse section of the stem revealed that the epidermis consists of a single layer of cells arranged in a compact way; the cells are radially elongated and covered with a thick cuticle, and the epidermis contains glandular trichomes. The cortex is formed by about four layers of parenchymal cells, from 5 to 8 thick layers, and is distinguished from collenchyme cells. The Vascular Cylinder consists of 10 to 12 bundles, each

comprising defined areas of phloem and well-defined xylem vessels. The marrow is broad, uniform, and composed of round to polygonal parenchymal cells with thin walls, and isolated sclerenchyma fibres located outside the phloem, forming plugs (Figure 6). The anatomic features of the species are similar to the peculiarities of the family Asteraceae studied by Metcalfe & Chalk (1979).



**Figure 6:** Stem transverse sections of *M. pubscenes*, sylem(x), parenchyma (p), epidermis (e), sclerenchyma fibers (f), parenchyma cortical (pc)

**The root**

The cross sections of the roots seemed to have three common parts including peridermal, pricyclic derivatives, and vascular tissues. The suberin covers the outer zone; the phelloderm is composed of exceeding fifteen thick layers of elongated and compacted cells. The parenchyma of the cortex is composed of

large elongated cells, and occupies a large area. Most of the root is reserved for the xylem elements, the xylem consists of protoxylemal vessels on the outside, and metaxylem on the inside is connected by a connective tissue to the phloem, the vessels have thick walls; there is a thin wall of parenchymal ray cells between the xylem elements (Figure 7).

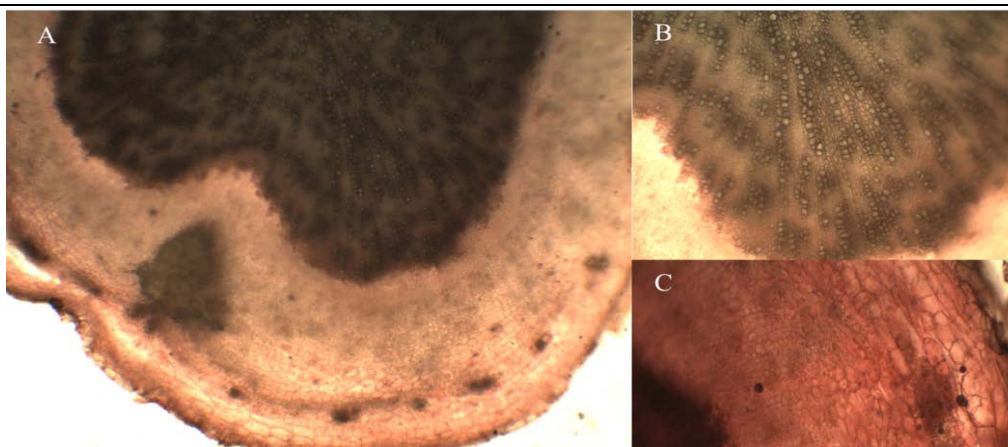


Figure 7: *M. pubescens*: a Cross-section in the root (x100: A) , xylem (B) and cortex (C)

#### 4. CONCLUSION

This work has contributed to expand the information about *M. pubescens*, including the morphological and anatomical features, and the ecological and geographical distribution. The characters of morphology and anatomy of the *M. pubescens* have been useful in the identification and differentiation from other species of this genus and have also been essential parameters for the quality control of the vegetable's raw material. In South Algeria, due to the adverse environments, plant species grown in sand areas and in very hard climatic conditions, have many morphological and physiological behaviours; their stem length is very short, the number of branches is very small, the leaf surface is shorthand, the size of the plant is decreased, and in addition, the plant's life cycle is short.

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