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MORPHOLOGICAL AND ANATOMICAL STUDY OF *ASPHODELUS MICROCARPUS*

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ABSTRACT

The genera and species of Liliaceae show a considerable structural diversity of leaves and especially stems. This paper presents a morphological and anatomical study of the leaves and stems of *Asphodelus microcarpus*. The results showed that the investigated species had typical morphological characters. and also that it could be distinguished from another plant not only by its morphological but anatomical characters as well.

INTRODUCTION

Asphodelus is a genus of mainly perennial plants native to Iraq and some other countries. Asphodels are popular garden plants, which grow in well-drained soils with abundant natural light. Now placed in the family Xanthorrhoeaceae, subfamily Asphodeloideae, like many lilioid monocots, the genus was formerly placed in the lily family (Liliaceae). Liliaceae includes mostly perennial herbs with starchy rhizomes, corms, or bulbs comprising about 250 genera and 3500 species (Satıl & Akan, 2006). They are naturally distributed in the tropical and temperate regions. The plants are hardy herbaceous perennials with narrow tufted radical leaves and an elongated stem bearing a handsome spike of white or yellow flowers (Shuka *et al*., 2010). *Asphodelus albus* and *Asphodelus fistulosus* have white flowers and grow from 1½ to 2 ft. high; *Asphodelus ramosus* is a larger plant, the large white flowers of which have a reddish-brown line in the middle of each segment. The leaves are used to wrap burrata, an Italian cheese. The leaves and the cheese last about the same time, three or four days, and thus fresh leaves are a sign of a fresh cheese, while dried out leaves indicate that the cheese is past its prime (Lifante, 2000). *Asphodelus microcarpus* is a perennial herb,1 m high , its hab. On hill slopes , wadi sides , floodplains of mountain streams, usually on alluvial soil . Distrib. Occasional, locally dominant in the lower forest and upper moist-steppe zones of Iraq and Mediterranean Europe to Greece , Cyprus, Turkey, Syria, Lebanon, Palestine, Jorden , Sinai, Egypt, N. Africa . There are few morphological and anatomical studies on the different species of the genus *Asphodelus* (Rizk *et al*., 1992). Anatomical studies have been used successfully to clarify taxonomic status and help in the identification of different species. In the past anatomical studies incorporation with morphological studies for the resolution of taxonomic problems of monocots have been used (Ocak *et al.*, 2004). Although *Asphodelus microcarpus* is of economic and ecological importance, little attention has been given to the structural and cytological aspects of the male and female gametophyte (Kosenko, 2000). The objective aims to investigate the morphological and anatomical properties of *Asphodelus microcarpus* collected from north of Iraq.

MATERIAL AND METHODS

The collection of the botanical material and the field observations of *Asphodelus microcarpus* were carried out in north of Iraq in April . The taxonomic description of the

species followed Townsend (1985). Some plants were prepared as herbarium materials, and voucher specimens were deposited in the Iraq Natural History Research Center & Museum / University of Baghdad, Others were fixed in 70 % ethyl alcohol for anatomical studies. Fresh and herbarium specimens were used to determine the morphological characteristics of the species and the biometric measures of bulbs, stems, leaves, and floral organs. For anatomical studies, the material was stored in 70 % alcohol. The transverse sections of stem, and leaf. Cell wall lignification tests were performed by phloroglucinol-HCl reaction. Sections were placed on slide in a drop of 0.1 g phloroglucinol in 10 ml of 95 % alcohol and covered with a coverslip. Some of the solution was evaporated and then 25 % HCl was diffused at the edge of the coverslip. The stained and unstained sectionswere mounted in glycerin-gelatin to make permanent preparations (Jensen, 1962). The slides were investigated with an Olympus BH2 microscope, and the selected images were photographed with a Progress C12 (Jenoptik) digital camera.

RESULTS

Morphological features

Perennial herb, c. 1m. high. Leaves ensiform, acuminate , triquetrous, up to 50 cm. long and 3cm. Broad, glabrous, margin smooth. Scape terete, glabrous, solid. Inflorescence racemose-paniculate. Bracts ovate-caudate, scarious with a dark central nerve, somewhat longer than the 4-6 mm. long flowering pedicals. Perianth tubular-campanulate , segments 12-16 mm. long, pinkish or white with a violet to dirty greenish center nerve. Anthers orange, included. Style shortly exserted. Capsule 8-9 mm. long, obovate, truncate-hexagonous, with transverse ribs. Seed blackish, c.7 mm. long.

Anatomical features

Stem

The transverse sections of the stem of *Asphodelus microcarpus* showed epidermis with a thick cuticle (9.5 µm) composed of single-layered ovoid, or spheroid cells. Cortex was multilayered. It comprised a monolayer collenchyma close to the epidermis and spherical parenchymatous cells with intercellular spaces. The stem contained 44–49 vascular bundles of various size in the vascular cylinder. They were embedded in a disorderly manner in the parenchyma of the stem. Vascular bundles comprising the xylem and phloem were collateral in type. The pith consisted of parenchymatous cells. The stem had sparse single-celled, nonglandular hairs .

Leaf

There was single-layered epidermis on both sides of the leaf. The upper epidermis had a thicker cuticle than the lower one. Epidermal cells were orbicular in cross section. The mesophyll was unifacial, about 1024 µm thick. It comprised 10–12 layers of round-shaped parenchyma cells. Vascular bundles had different size and were arranged in one row. The xylem faced the upper surface, while the phloem faced the lower epidermis. Sclerenchyma fibers were absent in the vascular tissue. The leaf was amphistomatic. The stoma type was anomocytic, and the stoma cells were located on the same level as the other epidermal cells. The stomata index was 30 for the upper epidermis and 35 for the lower epidermis.

Discussion

The family Liliaceae was formerly a paraphyletic group that included a great number of genera now contained in other families, including Asphodelaceae. The present paper aims a better characterising of the endemic *Asphodelus microcarpus* species which is an important plant of economic and medicinal value (fig.1.) In the past taxonomic information of this

genus was based largely on morphological markers, which leads to certain taxonomic confusion. Anatomical studies could be an important tool to resolve taxonomic problems of this genus, as anatomical studies showed variation in this study deals with the morphological and the anatomical features of the plant , The morphological characters of the studied plant species were examined externally by the naked eye and their characters were outlined. According to the results in this study, The morphological features of *Asphodelus microcarpus* in this study are similar to those given by (Townsend, 1985). The result indicated that a small number of specific morphological traits are enough to detect variation and adequately define plant morphology in many aspects and these traits could be distinguished this spesies from another plant not only by their morphological but anatomical characters as well (Adinolfi *et al.* 2002). Since morphological traits are very plastic, any recorded variation should not necessarily be interpreted as genetic variation. However, some anatomical characteristics of the stem were studied. In the early works on plant anatomy, the entire epidermal layer was conceived as the plant cuticle (Pantis, 2005). *Asphodelus microcarpus* is similar anatomically to *Asphodelus aestivus*. The stem cortex of the first has a monolayer collenchyma under the epidermis (Sawidis, 2005). Anatomical features of the leaf of *Asphodelus microcarpus* were similar to the examined *Asphodelus aestivus* (Pantis , 2011)(fig. 2. a,b). The mesophyll is not differentiated into a palisade and a spongy parenchyma (Fattah, 2002). It is composed of isodiametric parenchymatic cells. Some differences related to anatomical properties have been found.

Fig. 1: The morphology of *Asphodelus microcarpus*

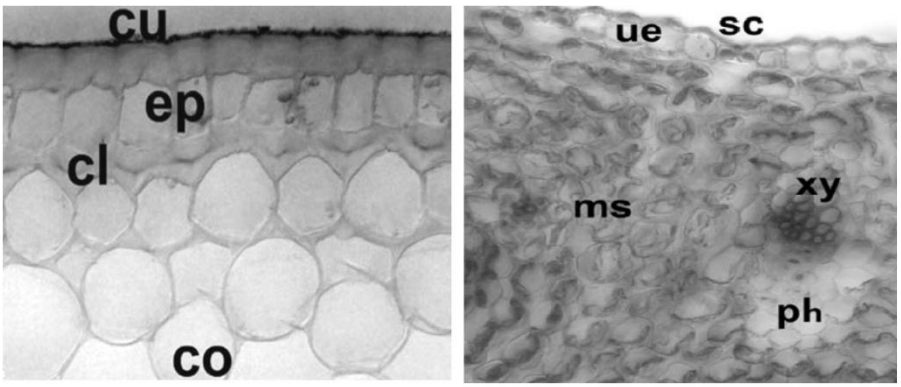

Fig. 2:
A. Stem anatomy of *Asphodelus microcarpus* : cu –cuticle; ep – epidermis; cl – collenchyma; co – cortex
B. leaf anatomy of *Asphodelus microcarpus*: sc- stoma cell; ue- upper epidermis; xy- xylem; ms- mesophyll; ph- phloem

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دراسة مظهرية وتشريحية للـ *Asphodelus microcarpus*

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الخلاصة

الأجناس والأنواع للعائلة الزنبقية أظهرت تنوع في تركيب الأوراق والساق. هذه الدراسة أظهرت دراسة مظهرية وتشريحية لساق وأوراق هذا النوع. أظهرت النتائج إن الأنواع المتحقق منها تملك صفات مظهرية نموذجية. والتي أيضا أن تميز النبات عن غيره من النباتات ليس فقط مظهريا وإنما في الصفات التشريحية أيضا.