

Comparative Anatomical Study of Two Species of the Genus *Cornulaca* Delile. (Chenopodiaceae) in middle of Iraq

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ABSTRACT

Keywords:

Chenopodiaceae family ,
Cornulaca genus ,
Anatomy study .

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Received: 26/12/2018

Accepted: 11/3/2018

The research study comparative anatomical characteristics for (2) species to genus *Cornulaca* Delile of the Chenopodiaceae family these species. *Cornulaca aucheri* Moq. and *Cornulaca monacantha* Del.

The anatomical characteristics of the stems and leaves(blads) were studied Non petiolated thin leaves , wingless leaf blade with undifferentiated midrib region in cross-section , hairs non-glandular and more dense on stems than on leaves Other classical characters for (Kranz anatomy and undifferentiated mesophyll)

دراسة تشريحية مقارنة لنوعين من جنس *Cornulaca* Delile (Chenopodiaceae) في وسط العراق

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الخلاصة

تناول البحث دراسة الصفات التشريحية لنوعين تعود لجنس *Cornulaca* Delile. تنتمي

للعائلة الرمرامية Chenopodiaceae والنوعين هما *Cornulaca aucheri* Moq و *Cornulaca monacantha* Del. وشمل البحث دراسة الصفات التشريحية للسيقان والأوراق (النصل) بالإضافة الى الكساء السطحي والبلورات .

أظهرت نتائج الدراسة الحالية فقدان عنق الورقة ، وقلة سمكها واتخاذ النصل الشكل غير المجنح في المقاطع المستعرضة والكساء السطحي غير الغدي الأكثر كثافة على الساق مما على الأوراق. وتضمن البحث كذلك مناقشة النتائج التشريحية .

الكلمات المفتاحية:

دراسة تشريحية، العائلة الرمرامية،
جنس السليح.
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الاستلام: 26 / 12 / 2017

القبول: 11 / 3 / 2018

Introduction:

Chenopodiaceae is a family of about 102 genera and more than 1400 species of world wide in distribution , but commonly in xerophytic and saline habitats , (Shmida , 1985), and distributed in temperate and subtropical area, (Heywood ,1978) commonly known as Goose foot family, AL-katib (2000) , In Iraq it is represented by 25 genera and 88 wild species (AL-Musawi , 1987). Plants of Chenopodiaceae are mostly succulent, halophyte or xerophytes, (Ghadi, *et.al.*, 2006) the family Chenopodiaceae represented in flora of Egypt by 3 species, (Tackholme , 1974) described 2 species in Kuwait, (Daoud and Al-Rawi , 1984) described 4 species in Saudi Arabia, (Migahid and Hammouda , 1978)) .,The genus *Cornulaca* Delile. 4 species in the East , (Boissier , 1879) . The family Chenopodiaceae represented in flora of Iran by 41 genera and about 175 species , (Assadi , 2001) the genus in flora of the Iraq , (Rechinger, 1964) includes 4 species : *Cornulaca aucheri* Moq , *Cornulaca leucacantha* Charif et Aelena , *Cornulaca monacantha* Del. and *Cornulaca setifera* (Dc.) Moq. : The family Chenopodiaceae is divided into 4 sub families (1) Chenopodioideae with 6 tribes : Atripliceae, Beteae, Camphorosmeae, Chenopodieae, Corispermaceae, Sclerolaeneae (2) Polycnemoideae: with a single tribe Polycnemeae, (3) Salicornioideae: with 2 tribes: Halopeplideae, Salicorneieae (4) Salsoloideae: with 2 tribes

Salsoleae and Suaedeae . (Kuhn, 1993) .The special anatomy is a good example of the relationship between the structure and function in plants and at the same time the evolutionary synthetic character of the ancestors of the C3 ,(Cousins , 2010 ; Muhaidat *et.al.*,2007) . Based on the above and the scarcity of studies on C3 and c4 plants in Iraq and the Arab region, the current research focused on the anatomical characteristics of plant parts Record new qualities added to the adjectives A trophy for C3 and C4 species.

Material and Methods :

plant specimens were collected to *Cornulaca* genus during a field trips in the summer 2016 from (Baghdad ,Tikrit , Diyala and Kirkuk) of the mid Iraq . And were identified as *Cornulaca* species, according to several botanical literatures (Migahid and Hammouda ,1978; Assadi ,2001; Rechinger,1964 ; AL- Rawi, 1964).

Geographical distributions of the studied species are indicated as on mapes Iraq. (alkhesraji *et.al.*, 2016)

Anatomical Characters of fresh aerial parts of *Cornulaca aucheri* Moq. and *Cornulaca monacantha* Del. (stem and leaf (blade) were studied. Plant specimens were examined by dissecting and light microscope and free hand sectioning . sections are stained by safranin and iodine in potassium iodide(IKI) . The anatomical results were similar according to the (Esau, 1965; Radford *et al.*, 1974 ; Fahn, 1982) .

Results and Dissection:

Cornulaca aucheri Moq., Chenopod. Monogr. 163. (1840); Rech . Fl. lowland Iraq 211(1964) Boulos in Fl. Arab .penins. Socotra 1: 260 (1996); Hedge, in Fl. Iranica 172: 353(1997) ; Assad in Fl. Iran 38: 398 (2001); Freitag *et al.* in Fl. Pak. 204: 200 (2001) ; Tackh. stud. Fl. Egypt.ed.2,130 (1974); Fl. Saudi Arabia ed.2,1:259,264,265(1978); Batan. Fl. Qatar 75(1980) ; Ghazanfar, Fl.Oman1:45 (2003). (Ghazanfar & Edmondson , 2016)

Cornulaca monacantha Del. Fl. d' Egypte:206t.22(1813);Handel. Mazzetti in Ann. Naturh. Mus . Wien 26:144(1912); Rech . Fl. lowland Iraq 211(1964); Hedge, in Fl. Iranica 172: 353(1997) ; Assad in Fl. Iran 38:394(2001); Freitag *et al.* in Fl.Pak.204: 200 (2001); Ghazanfar, Fl.Oman1:45 (2003). (Ghazanfar & Edmondson , 2016)

Types : In Assyriae desertis, Aucher-Eloy 2801 (G).

Distribution: Saudi Arabia, Iraq, Iran, Oman, Kuwait, Bahrain, Qatar and Pakistan

Common names: Hadh , thalj .

Flowering : April- May.

A. Transverse Section of Stem

The results showed that *C. aucheri* was characterized by circular stem while *C. monacantha* was characterized by undulate circular (solid) in both species in the cross section . (fig.1) The results also showed a difference in the cuticle thickness and Epidermis thickness , the lowest rate of the cuticle thick 2.5 μ m in *C. aucheri* and 5 μ m in *C. monacantha* and non-glandular hairs , unicellular ,papillae in both types studied with different lengths, reaching a high rate of 32 μ m in species *C. aucheri* and 25 μ m in *C. monacantha* and the difference in thick of the cuticle may be due to environmental changes, while the Epidermis , uniseriate, and ranged in thick between 10-15 μ m in species *C. monacantha* and *C. aucheri* , the difference in the thick of the Epidermis and its dimensions to genetic control . As well as influenced by environmental factors. (Table1.Fig.2)The results showed a variation in the distribution of the tissues and thick of the cortex. The collenchyma tissue emerged in a continuous loop, followed by several rows of the normal parenchyma in *C. aucheri* .



fig.1: General view A- *C. aucheri* Moq , B- *C. monacantha* Del. 3mm ———

The Chlorenchyma tissue appeared in an intermittent ring, separated by the angle of separated by the angle of *C. monacantha* and *C. aucheri* The thick of the cortex is 500 μm , the results showed that vascular bundles are open collateral bundles , a circular ring around the pith in *C. aucheri* has a number of 8 bundles, which show the small bundle in the first ring near the cortex , while the large bundle are located in the second ring near pith in *C. monacantha* and the thick of the phloem in both species was 50 μm and the highest rate of xylem thick 150 μm in type *C. monacantha* , the crystals of the druses type in the cortex and pith and between vascular bundles in both species.

Table 1. quantitative characteristics of stem two species of *Cornulaca*.

Characters species	Cuticle thick μm	Epidermis thick μm	cortex thick μm	Vascular numbers	Xylem thick μm	Pith thick μm
<i>Cornulaca aucheri</i> Moq	2.5	15	500	8	145	600
<i>Cornulaca monacantha</i> Del	5	10	380	34	150	400

B. Transverse Section of leaf:

The results showed a difference in the leaves thick between 580 - 920 μm in species *C. aucheri* and *C. monacantha*. The upper and lower epidermis uniseriate and covered with a layer of cuticle except Stomata a high rate thick of 5 μm in *C. monacantha* , The upper epidermis thick is 10 μm in both studied species. The thick of the lower epidermis ranges from 20-30 μm in *C. aucheri* and *C. monacantha* . It was found that the Isobilateral Leaf characterized the Mesophyll to Palisade parenchyma below the upper and lower forms of ring and spongy parenchyma in the middle of the leaf .

The important characteristics by the leaf blades were the presence of Kranz anatomy, Which appeared square shape and the formation of a ring surrounds several layers of spongy cells . fig. 3. Table .2 , There was a marked difference in the rate of mesophyll thickness between 160-190 μm in *C. aucheri* and *C. monacantha* while the thickness of the Palisade layer between 20-30 μm in both species , table 2. Results of the study with the results of the study of (Al-Abide ,2012 ; Voznesenskaya *et.al.*,2001) The characteristics of the Cornulaca species similar to the results of the previous study in terms of the fact that the leaves sitting and not distinguished Mesophyll and the region of the midrib , it was noted that there are three Vascular bundle of one large central and two small side in *C. aucheri* and a large central Vascular bundle only in *C. monacantha* The length of the Vascular bundle between 400-500 μm in the two studied species

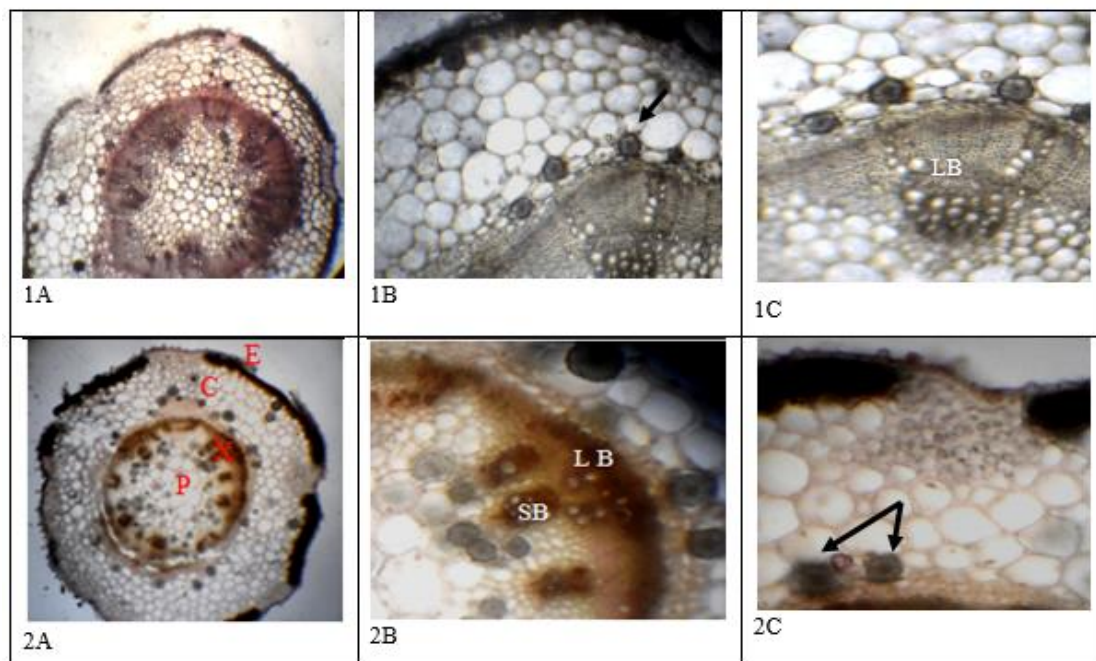


Fig.2 anatomical characteristics of the stem of Cornulaca . 300 μm _____

E : Epidermis , C : Cortex , X : Xylem , P : Pith , LB: large vascular bundle ; SB: Small vascular bundle, : druses crystals , (B,C largest fig A) , 1- *C. aucheri* 2- *C. monacantha*.

Table 2. quantitative characteristics of Leaves two species of Cornulaca.

Characters species	Leaf Thick (μm)	cuticle thick (μm)	Upper epidermis Thick (μm)	Mesoph yll Thick (μm)	Palisade layer thick (μm)	Spongy layer thick (μm)	Length Vascular bundle (μm)
<i>Cornulaca aucheri</i> Moq	580	2.5	10	180	30	120	500
<i>Cornulaca monacantha</i> Del	920	5	10	190	20	150	400

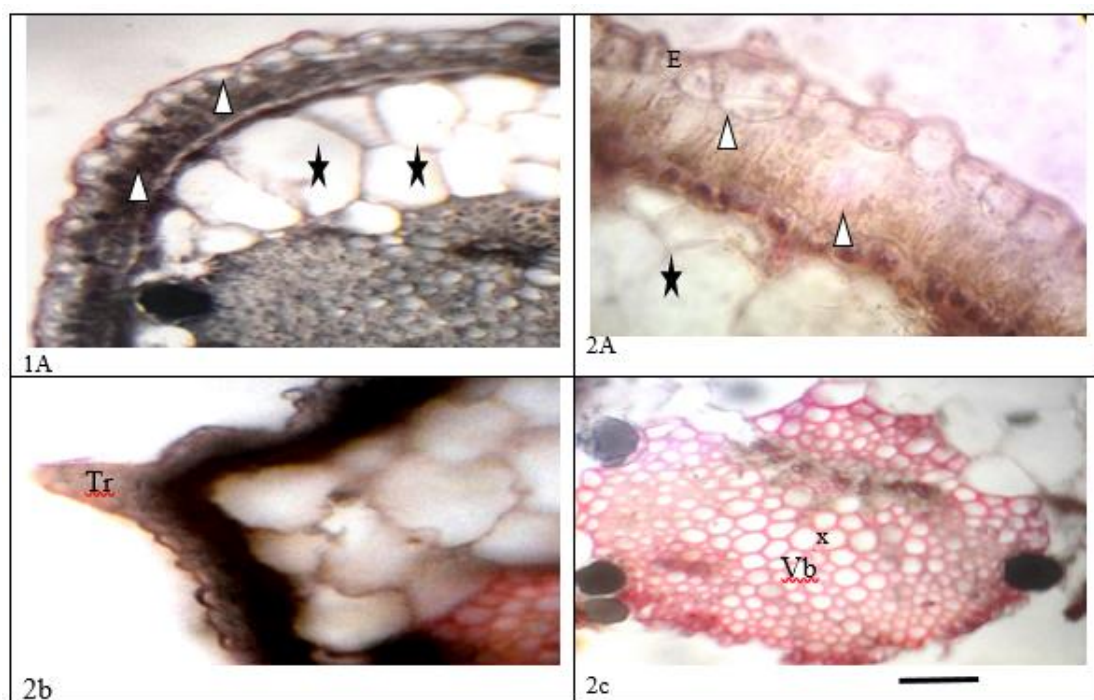


Fig.3 anatomical characteristics of the Leaves of *Cornulaca* . 400 μm —
A: blade , b-tr: trichomes c -Vb:Vascular bundle ,E : Epidermis ,(▲) Palisade layer,(★): Spongy layer , x: xylem *C. aucheri* 2- *C. monacantha* . 1- *C. aucheri* 2- *C. monacantha*.

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