

Morphological and Anatomical Study to The *Colchicum szovitsii* from *Colchicaceae* Family in Iraq

Sura H. Jbarah^{1*}, Areej A. Farman Al-Rawi²

¹ Department of Biology, College of Education for Pure Science (Ibn Al-Haitham) college, University of Baghdad, Iraq

* Correspondence: surahusseiniwael@gmail.com

ABSTRACT

Received: 17/07/2023

Accepted: 01/10/2023

Online: 15/04/2024

2024. This is an open access article under the CC by licenses

<http://creativecommons.org/licenses/by/4.0>



Background: *Colchicum szovitsii* it is a wild perennial herbaceous plant grows in Iraq, it is medical and poisonous herb contain colchicine (alkaloid have cytotoxic effects) especially in corm and seeds. All parts are highly toxic if eaten. Handling of corms may cause skin allergy. **Methods:** This investigation present morphological and anatomical features of this plant for the first time in Iraq. (3) **Results:** The corm shape oblong to oblong-ovoid, the shape of the leaf is linear to oblong-lanceolate, undifferentiated perianth with 6 white oblanceolate tepals, the 6 stamens epiphyllous. The anatomical study observed isolateral leaf, uniseriate epidermis and anomocytic stomata, and the mesophyll consisting many layers of irregular spongy paranchyma (chloranchyma), the type of vascular bundle is collateral. **Conclusions:** In this study we found that *C. szovitsii* distributed in Iraq have different morphological and anatomical features from the same species in Turkey and Iran like the dimension of corms, leaves, stamens, filament, anthers and capsule.

Keywords: Colchicum, Colchicine, Epiphyllous.

DOI: <https://doi.org/10.24126/jobrc.2024.18.1.731>

1-INTRODUCTION

The family colchicaceae have 19 genera distributed in Asia, Africa, Australia, and North America Eurasia (1). This family within Liliales, it is described by De Candolle for the first time in 1805 included 6 genera (2). The genus *Colchicum* L. is represented by about 65 species in Europe, North Africa and Asia (3). In Central and North Albania there are 8 species six of them are autumn flowering species, whereas tow species are spring flowering (4). Some taxonomic treatment of several genera within colchicaceae divided colchicum L. nearly 100 species (5). In Iraq there are 6 species (*C. crocifolium*, *C. kurdicum*, *C. haussknechtii*, *C. kotschyi*, *C. szovitsii*, *C. deserti-syriaci*)

Most of them grow in the north region of Iraq and the borderline between Iraq and Iran; others grow in west and middle region. According to the soil depth there are varies in height of plant especially in flowering time (4).

Colchicum szovitsii grows in the mountains on scree and boulder beds recently uncovered from snow, grassy mountain slopes and meadows 1000-1800 m, found in the mountain south of Haji Umran, the middle forest zone and the lower margin of the thorncushion zone, Sawara Tuka and in Shaqlawa (Figure 1). It is medical and poisonous plant because it contains the toxic alkaloid colchicine (C₂₂H₂₅O₆N) which is especially concentrated in their corms and seeds (Figure 2.), that used in pharmaceuticals for rheumatism and gout (6) in general it has anti-inflammatory features, antimitotic, antitumor but it well known for its cytotoxic effect that causes diarrhea, vomiting and miscarriage in vertebrates (7). Also it has Anti- Diabetic effects if injections of colchicine in human cause to control insulin secretion from pancreas cell that caused rising glucose (8). The flowers and fruits appear in January-April, then 2-3 synanthous leaves erect from short neck of the corm, the favorite time to planted in August or in early September in deep rich soil, bulbs should be put 5-7.5 cm below the soil (3).



Figure 1. *C.szovitsii*

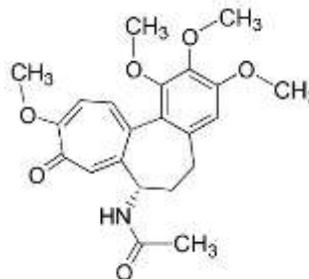


Figure 2. Chemical composition of colchicine

The purpose of this study is to clarification the morphological and anatomical features of *C.szovitsii* to distinguish from another species of the genus that is useful for taxonomic studies and the knowledge of their advantages or riskiness of this species.

2- MATERIAL AND METHODS

C. szovitsii was collected from the mountains in the north of Iraq 1000-1800 m, only found in four locations between the middle forest zone and the lower margin of the thorncushion zone, Sawara Tuka, Shaqlawa, mountain south of Haji Umran on January-March. *C.szovitsii* were kept in (FAA) formalin acetic acid-alcohol that contain of (90cc ethyl alcohol (70%), 5cc formalin, 5cc glacial acetic acid), for 20-24 hours then washed and kept in 70% alcohol until the sectioning were prepared (9), for preparing the transverse sections of leaves used the paraffin wax methods, sectioned at 15µm thickness by (rotary microtome), staining with safranin and fast green stain, mounted with (DPX) distyrene plasticizer xylene (10). The slides were examined using compound microscope type (MEIJI TECHNO) (MT-4300L) and photographed by digital camera (canon), also used dissecting microscope type kaisi (KS- 37040 A) for morphological studies.

3- RESULT

1.1. Morphological properties of *C. szovitsii*

1.1.1. Roots

C.szovitsii is perennial, terrestrial, monocots plant so it has fibrous root with adventitious or diffused roots that comes from the base of the corm that used to absorption of water and mineral from the soil (Figure 3.)



Figure 3. Root and corm

1.1.2. *Corm*

The corm is subterranean stem that grows underground remaining alive during harsh conditions of cold or drought which is known as rootstocks function as storage and protective organs, the shape of the corm is oblong to oblong-ovoid, it's covered by reddish-brown to dark brown tunics elongated into a short neck, the broad is between (10-30) mm, the long is between (15-45) mm (Figure 3.).

1.1.3. *Leaves*

The leaves are (2-3) synanthous or hysteranthous enclosed together with the flower by tubular cataphyll usually not overtopping flower, the color is pale to mid green, the shape is linear to oblong-lanceolate, the broad is between (7-12) mm, the long is between (100-140) mm (Figure 4.)



Figure 4. Leaf

1.1.4. *Flowers*

There are (1-5) bisexual flower (hermaphroditic) have radical symmetry (actinomorphic), regular whorls, each flower have entire perianth with 6 white oblanceolate tepals in tow whorls that formed white long perianth tube (1.5-1) mm (Figure 5.)

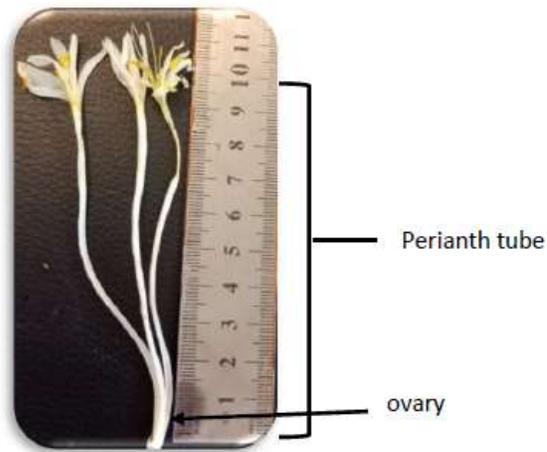


Figure 5. Perianth tube

The gynoecium found inside the perianth tube, originates from three syncarpous to formed superior ovary that have three locule (pleurilocular) with axile placentation, the ovary carried three free overtopping cylindrical styles, in the apex of each style have filiform stigma (Figure 6.)

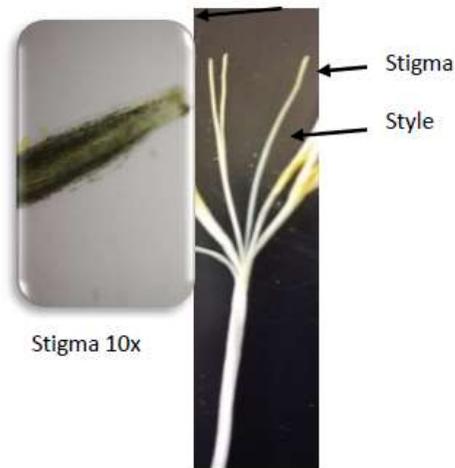


Figure 6. The gynoecium

androecium consist of 6 free filamentous stamens that based on the tepals (epiphyllous) in biseriate arrangement the long of outer stamens (0.05-0.16) mm and the inner stamens (0.07-0.15) mm, each stamen have whitish-yellow stout filament swollen base yellow to green (7-11) mm, it was carried the anthers from its apex, anthers was pale yellow color without brown spots the long is (1.5-5) mm (Figure 7.).

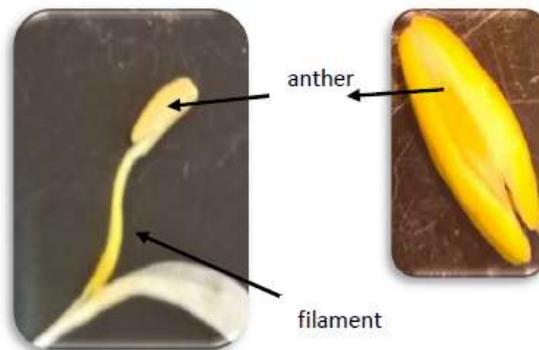


Figure 7. The androecium

1.1.5. *Fruits*

It is simple fruit originated from mature ovarian its dry fruit capsular type that have dry and strong exocarp, the capsule at ground level or their pedicels elongated up to 5cm above ground, its oblong to ellipsoid shape, the dimension is (0.15 -0.25) ×(0.1-0.25) mm, keeps members of seeds inside it until opening by longitudinal dehiscence (Figure 8.).



Figure 8. The fruit

1.1.6. *Seeds*

The color is reddish-brown, raphe region swollen at least towards micropyle to distinct, roundish, white appendage (Figure 9). All terms from (11).



Figure 9. The seed

1.2. *Anatomical properties of the leaves in C. szovitsii*

The leaf is of the isolateral type, the first layer epidermis covered by cuticle its thicker in upper epidermis more than that in lower epidermis. Both upper and lower epidermis are made up of uniseriate, rectangular or isodiametric cell, the upper and lower epidermis cells are similar size, the cells in lower epidermis are more abundant and located slightly higher than the upper epidermis. All terms from (12). The length of stomata in upper surface are (30-35) μm and (29-36) μm in width while the length of stomata in lower surface are (31-37) μm and (22-26) μm in width (Figure 10.)

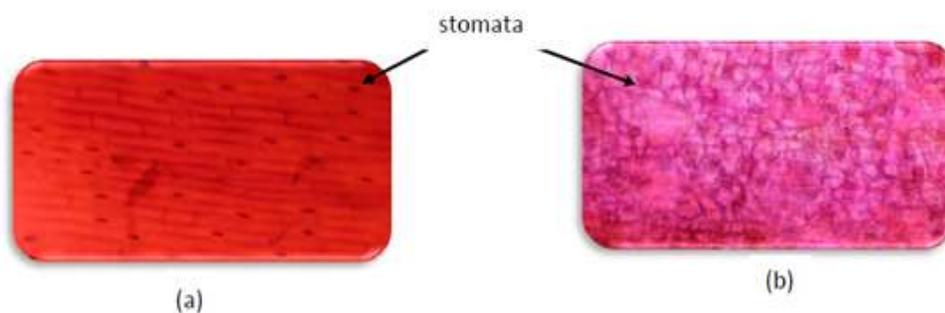


Figure 10. The stomata
(a) in upper epidermis
(b) in lower epidermis

The mesophyll is consisting of spongy layers of irregular parenchyma (chloranchyma) cells. In the middle found a collateral type of vascular bundle equal in sizes, the xylem is towards the upper surface and the phloem towards the lower surface. The midrib is not the prominent part (Figure 11.)

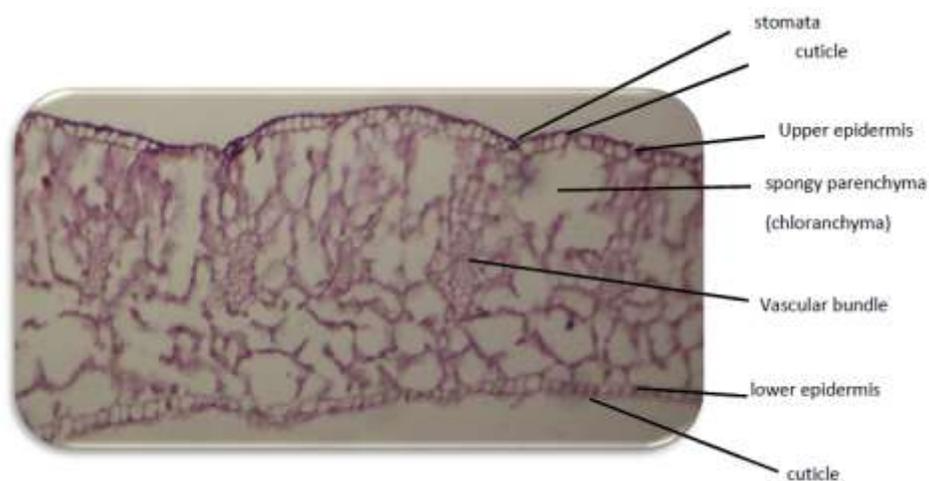


Figure 11. Cross-section of leaf of *C. szovitsii*

4. DISCUSSION

In this investigation the morphological features of *C. szovitsii* were observed. We compared the findings of these studies with the Flora of Iraq, Flora of Turkey and Flora of Iran. There is similarity in leaves and flowers numbers, but the different in measurement of other parts of the plant. These are given in Table (1).

Table (1): The comparison Of morphological features of *C. szovitsii* between our study and Flora of Iraq, Flora of Turkey and Flora of Iran

Morphological features (mm)	The finding Of this study(mm)	Flora of Iraq (mm)	Flora of Turkey (mm)	Flora of Iran (mm)
Corm length	(15-45)	Not recorded	(0.15-0.4)	(0.15-0.45)
width	(10-30)	(0.1-0.15)	(0.1-0.23)	(0.1-0.3)
Leaves numbers	2-3	2-3	2-3	2-3
Leaves length	(100-140)	(up to 27)	(1.2-2.5)	(0.1-0.13)
width	(7-12)	(4-18)	(0.12-0.35)	(0.04-0.3)
Flowers number	1-5	1-7	1-7	1-7
Stamens length				
Outer	(0-05-0.16)	Not recorded	Not recorded	(5-6)
Inner	(0.07-0.15)	Not recorded	Not recorded	(7-17)
Filament length	(7-11)	(7-10)	(7-11)	Not recorded
Anthers length	(0.5-5)	(2-4)	(2-5)*1	(1.5-5)
Capsule length	(0.15-0.25)	(15-25)	(0.35-0.4)	(0.15-0.5)
width	(0.1-0.25)	Not recorded	(0.15-0.22)	(0.1-0.25)

In anatomical studies the leaves of *C. szovitsii* are isolateral type covered by thin cuticle, anomocytic stomata type, there are many of spongy parenchyma (chloranchyma) and the type of vascular bundle are collateral. We found some different from those of the species that studied in investigation by (13). The data recorded in Table (2).

Table (2). The comparison Of anatomical features of *C. szovitsii* between our study and investigation by (31)

Anatomical features	The finding Of this study	The investigation by Akan and Satil
Cuticle	Thin layer	Thin layer
Type of stomata	Anomocytic	Anomocytic
Type of leaves	Isolateral	Isolateral
Layers of palisade parenchyma	No palisade layers	1-2 layers
Layers of spongy parenchyma	All are spongy layers	2-3 layers
Type of vascular bundle	Collateral	Collateral

5. CONCLUSIONS

In this study we found that *C. szovitsii* distributed in Iraq have different morphological and anatomical features from the same species in Turkey and Iran like the dimension of corms, leaves, stamens, filament, anthers and capsule. Also in the numbers of flowers as well as in the section of leaves. So we can recognition from this taxonomical features the species in Iraq from the related that distributed in Turkey and Iran, we can use this features to differentiate *C. szovitsii* from other species like *C. wendelboi*, *C. varians*, *C. kotschyi*, *C. haussknechtii*, *C.*

REFERANCES

1. Vinnersten A, Reeves G. Phylogenetic relationships within Colchicaceae. American Journal of Botany, (2003); 90(10):1455-1462.
2. Düşen O, Sümbül H. Pollen morphology of some *Colchicum L.* taxa (colchicaceae) from Mediterranean region in Turkey. Int. J. Agric. Stat. Sci., (2013); 3(2):169-177.
3. Chakravarty HL. Plant wealth of Iraq, vol.1, (1976); 11.
4. Malo S, Shuka L. Distribution of *Colchicum doerfleri halacsy*, *Colchicum triphyllum kunze* and *Colchicum bivonae guss.*, in Albania. Int. J. Agric. Stat. Sci., (2013); 3(2): 273-278.
5. Dusen OD, Sumbul H. A Morphological Investigation of *Colchicum L.* (Liliaceae) Species in the Mediterranean Region in Turkey. Turk J Bot., (2007); 31: 373-419.
6. Gupta R.K. Medicinal and Aromatic Plants. CBS Publishers & Distributors. New Delhi. India, (2010); 622 pp.
7. Ali M. Pharmacognosy and Phytochemistry. CBS- Publisher. Vol. 1, (2008); 802 pp.
8. Adami R.; Naderi G. Anti-Diabetic mechanism of *Colchicum speciosum* hydro alcoholic extract *in vitro*. Int. J. Agric. Stat. Sci., (2015); 6(5):152-157.
9. Al- Rawi A.A.F. Taxonomical Study of the Genus *Pisum L.* (Papilionaceae) in Iraq. M.Sc. thesis. College of Education- Ibn Al-Haytham. University of Baghdad, 2010; 106 pp.
10. Al-Mashhadani AN. Taxonomical Study of the Genus *Onsoma L.* (Boraginaceae) in Iraq. Ph.D. thesis. College of Science. University of Baghdad. (1992); 256 pp.
11. Al-Musawi AHE. Plant Taxonomy. University of Baghdad. (1987); 379 pp
12. Alani BA, Salih QN. Essentials of Anatomy. Vol 3. University of Baghdad., (1988); 228 pp
13. Akan H, Satil F. Morphological and anatomical investigations on some species of *Colchicum L.* occurring in South East Anatolia, Turkey. Journal of Biological Science, (2005); 5(4):402-410.

من العائلة اللحلاحية في *Colchicum szovitsii* دراسة مظهرية وتشريحية لنبات اللحلاح العراق

سرى حسين جباره أريج عبد الستار فرمان الراوي

قسم علوم الحياة ، كلية التربية للعلوم الصرفة ، ابن الهيثم ، جامعة بغداد ، بغداد ، العراق

الخلاصة

خلفية البحث: نبات اللحلاح هو نبات عشبي بري معمر ينمو في العراق، وهو نبات طبي وسام يحتوي على مادة الكولشيسين (مادة قلووية ذات تأثير سمي)، خاصة في الكورمة والبذور. وتعتبر كل اجزاءه عالية السمية إذا تم اكلها بشكل مباشر. كما ان مسك الكورمة باليدين قد يسبب الإصابة بحساسية الجلد. **طريقة العمل:** تقدم هذه الدراسة الصفات المظهرية والتشريحية لهذا النبات لأول مرة في العراق. **النتائج:** شكل الكورمة متطاوّل الى بيضوي متطاوّل، وشكل الورقة خطي الى رمحي متطاوّل، الغلاف الزهري غير متمايز مكون من ست بتلات بيضاء ذات شكل رمحي مقلوب، ولها ست اسدية مركزة على القاعدة. توضح الدراسة التشريحية بان الأوراق متساوية الابعاد، وبشرتها مكونة من صف واحد من الخلايا، والثغور من الطراز الشاذ، والطبقة الوسطى مكونة من عدة طبقات من النسيج البرنكيمي الاسفنجي الغير منتظم (كلورنكيمي)، والحزم الوعائية من النوع المتوازي. **الاستنتاج:** في هذه الدراسة وجدنا ان هذا النوع من اللحلاح الموزع في العراق له صفات مظهرية وتشريحية مختلفة عن الأنواع المشابهة له في تركيا وايران مثل ابعاد الكورمة، الأوراق، الاسدية، الخويط، المتك والمحفظة.

الكلمات المفتاحية: نبات اللحلاح، مادة كولشيسين، مركزة فوق الاوراق.