

FOLIAR AND STEM ANATOMY STRUCTURES IN SELECTED TAXA OF THE GENUS *ONONIS* L. (FABACEAE) IN KURDISTAN REGION – IRAQ

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ABSTRACT

This work revealed the anatomical characteristics of the leaf and stem (herbarium specimen) for one species and two subspecies of perennial *ononis* genus (*ononis sicula*), subspecies (*ononis spinose leiosperma*), and (*ononis viscosa breviflora*) were first time investigated for the evaluation in term systematic of resemblance and variation in these taxa.

The trunk and foliar were prepared for anatomical description by paraffin method. Which shows some differences were the outline and structure of stem and leaf in cross section. Prismatic crystal and tannins are found in all sample stems.

The outgrowth from the epidermis are presence in all parts of the taxa; which are multicellular or unicellular and glandular or non-glandular.

KEYWORD: *Ononis* anatomy, morphology of *Ononis*, Stem anatomy of fabaceae, Taxonomy of fabaceae, leaf anatomy of *Ononis*, distribution of fabaceae family.

INTRODUCTION

Fabaceae is the largest family of flowering plants and importance to humans; its cosmopolitan family. In different zones in the world the more species of this family are cultivated for foods; as beans, peas, peanuts, and soybean (Doyle and Luckow, 2003) that is essential sources of gums, tincture, oils, insecticides, fiber, fuel, lumber, curative and throb (Wang and Grusak, 2005). The morphological, anatomical, and geographical traits of Fabaceae family were studied by researchers, because of a few studies of anatomical and morphological merit about some *Ononis* species as Siahpoosh *et al*, 2015 and Ceter *et al* 2012. (Turini *et al* 2010) mention is included the genus *Ononis* within the tribe Trifolieae and comprises 86 species are allocation in temperate territory. (Linnaeus, 1753, 1754) recognized only 17 species, based on leaf stipules free or stipules adhere to the petiole.

(De Candolle, 1825) classified the genus into two sections: *Euononis* and *Lotononis*. *Ononis*

subdivided into four sections and six subsections based on habit, leaf composition, presence or absence of spines, pedicel elongation and flower color (Fayed *et al* 2019). The *Ononis* species are used in classic medication to diuretic, antiseptic and antimicrobial effects, and the anatomical implementing are the considerable importance in the recognize of medicinal plants (Baytop, 1999), (Baldemir and Coşkun, 2016). The leaf epidermal surveys are benefit in setting their anatomical possession (Ogie-Odia *et al* 2010) consequently assisting to know the evaluation of a taxonomic connection base on similarities and differences between the species (Arihan and Güvenç, 2011). The current study was concentrated on the anatomical study of some *Ononis* species of Fabaceae which have scattered in Kurdistan region-Iraq.

MATERIALS AND METHODS

The paraffin methods as adopted by (Najmaddin and Mahmood, 2016), (Najmaddin *et al* 2019), were applied to the preparation of permanent slides for tissues. Samples of *Ononis*

were prepared from herbarium specimens. The collected specimens were stored in the herbarium of the Department of Biology / college of Science / University of Salahadin/ Erbil/Iraq. The parcel of samples has been put in FAA and have been dehydrated using a series concentration of alcohol after which the samples were cleared by xylene for 3-4 hrs. Later, they were embedded in a mixture of xylene and paraffin for 30 min., then transferred into pure paraffin wax and left in it at 60°C for overnight. After that preparation of paraffin blocks were made and sections were prepared with the thickness of 8 µm using the rotary microtome. Then the sections were stained using safranin and fast green or light green. Finally, the sections were mounted by DPX, examined and imaged by Light Microscopes (Olympus AC100 with a camera, Japanese-made).

RESULTS & DISCUSSION

1. Leaf anatomy:

1.1 *Ononis sicula*

The adaxial and abaxial cells of leaf are quadrate or rectangular-shaped, and are monolayer with anticlinal walls. Cells are either isobilateral or elongated with wavy, straight or undulate walls. Cuticle is smooth to straight. Under epidermis there are generally 2-4 layers of palisade parenchyma. The spongy parenchyma cell composed of 2-5 layers with thin-walled cells, isodiametric parenchymatous cells with few intercellular spaces. Multicellular-glandular and unicellular non-glandular trichomes are observed. Tannins and fibers presence above vascular bundle, secretory canals are present. Solitary Prismatic non-living component with various shapes and sizes present in mesophyll. The abaxial cells are covered with a thin cuticle Fig.(1).

The midrib outline of adaxial and abaxial surfaces are straight in shape. The abaxial cells are tiny than the adaxial; and are covered with a thin cuticle. Two layers of parenchyma located beneath the epidermis. The margin is straight rounded Fig. (2). Sclerenchyma cells generally crescent-shaped; which are groups around the phloem and the xylem. Solitary ergastic

substance which are very changeable in size and shape (styloids) are characteristically observed (Arıhan and Güvenç, 2011).

1.2 *Ononis spinosa* subsp. *Leiosperma*

The adaxial surface of the leaf are quadrate or rectangular shape and superfine walled, major than the upper layer cells; and covered with a thin layer called cuticle. Commonly 2-3 layers of palisade cells found under the epidermis. The spongy layer is involve 2-4 parenchyma cells, which formed from thin walled, equal size parenchymatous cells with big intercellular spaces, and are irregular arranged. Multicellular-glandular, and unicellular non-glandular trichomes are presence, and secretory canals are present Fig. (1).

The midrib outline is adaxially concave with abaxial surface is rounded in shape. The adaxial and abaxial cells have same shape as square or rectangular-shaped, and are unicellular-layered with anticlinal walls and lid with a thin cuticle. The margin is rounded with presence multicellular non-glandular trichomes. Tannin's presence in epidermis and parenchyma. The fiber presence on the vascular bundles Fig. (2).

1.3 *Ononis viscosa* subsp. *Breviflora*

The lower layer cells of leaf are bigger than the upper epidermis, they are square or rectangular in shaped. The lower layer covered with straight cuticle. Beneath the epidermis cells found ordinarily 2-3 layers of palisade cells. The spongy parenchyma cells have a unicellular-layer or double layers of cells. The equal size parenchymatous cells with few intercellular spaces are unequal arranged. Glandular-unicellular and non-glandular multicellular trichomes are observed. The secretory canals are present Fig. (1). Tannins and solitary prismatic crystallization with various shapes and sizes present in epidermis and parenchyma cells

The midrib outline is adaxially concave with abaxial surface is "V" in shaped. The margin is pointed straight with found trichomes Fig. (2). Tannins and solitary prismatic crystals with various shapes and sizes presence in parenchyma and vascular bundle. The fiber present on the vascular bundle. Multicellular non-glandular trichomes are observed.

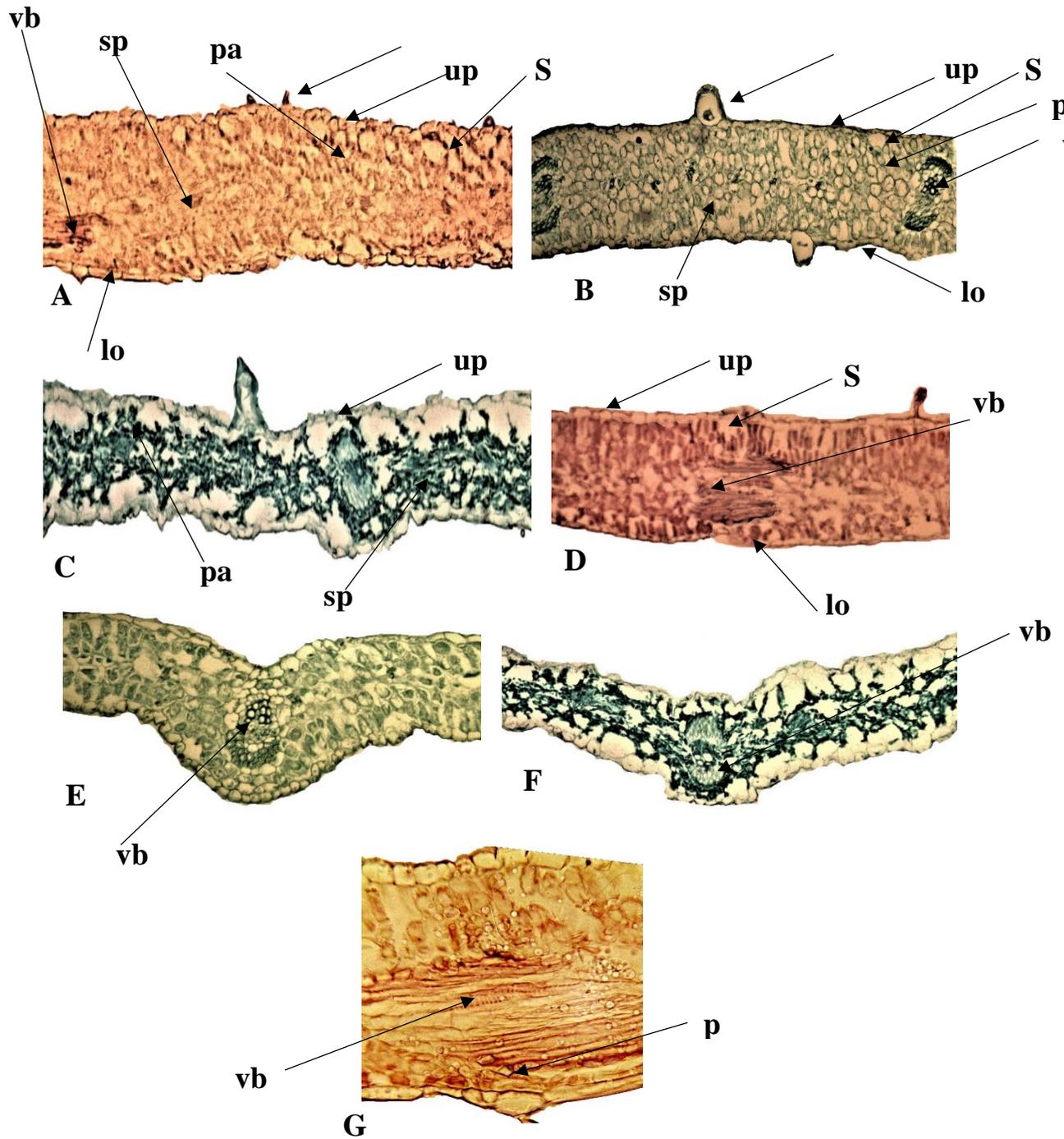


Fig. (1): T.S of lamina and midrib, A. *Ononis sicula* lamina, B. *Ononis spinosa* subsp. *leiosperma* lamina, C. *Ononis viscosa* subsp. *breviflora* lamina, D. *Ononis sicula* midrib, E. *Ononis spinosa* subsp. *leiosperma* midrib, F. *Ononis viscosa* subsp. *breviflora* Midrib. up: upper epidermis, lo: lower epidermis, pa: palisade layer, sp: spongy layer, S: secretory canal, vb: vascular bundle, p: prismatic crystals, trichomes (small black arrow). A,B,C,D,E,F=10X. G. *ononis sicula* lamina (magnified portion 40X)

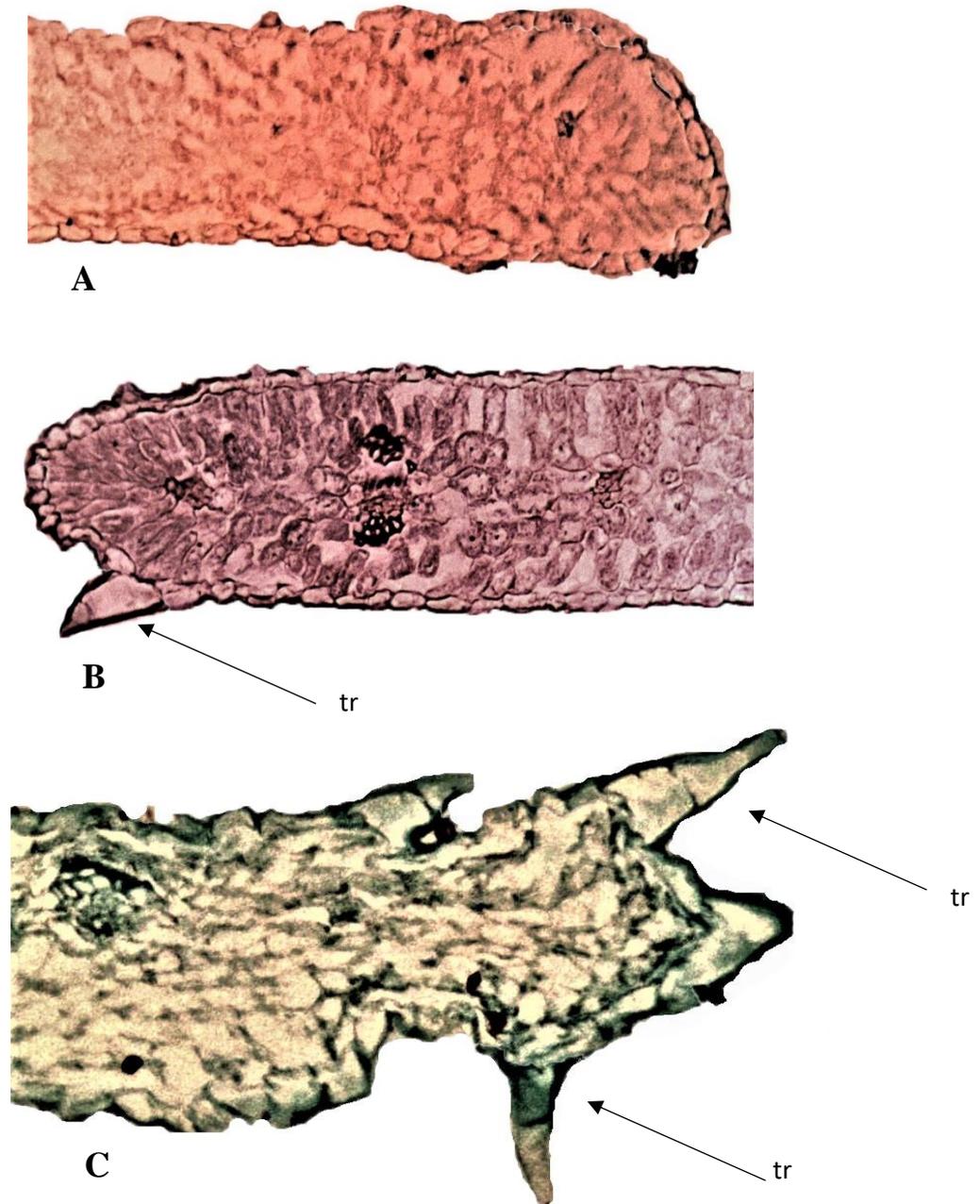


Fig. (2): T.S margin, A. *Ononis sicula*, B. *Ononis spinosa* subsp. *leiosperma*, C. *Ononis viscosa* subsp. *breviflora* tr: trichomes (small black arrow). A,B,C =10X.

2. Stem anatomy describes

2.1 *Ononis sicula*

The outline of the stem is sub-circular to rounded with presence thin-layered of cuticle. The outer layer of stem encompass of a monolayer of square or short rectangular cells. Parenchyma cells are thin cell wall and have 1-4 lines, which have number of prismatic crystals, secretory cells with tannins and fibers. The vascular bundles are closed arrangement. The collenchyma is angular Fig. (3). The pericycle

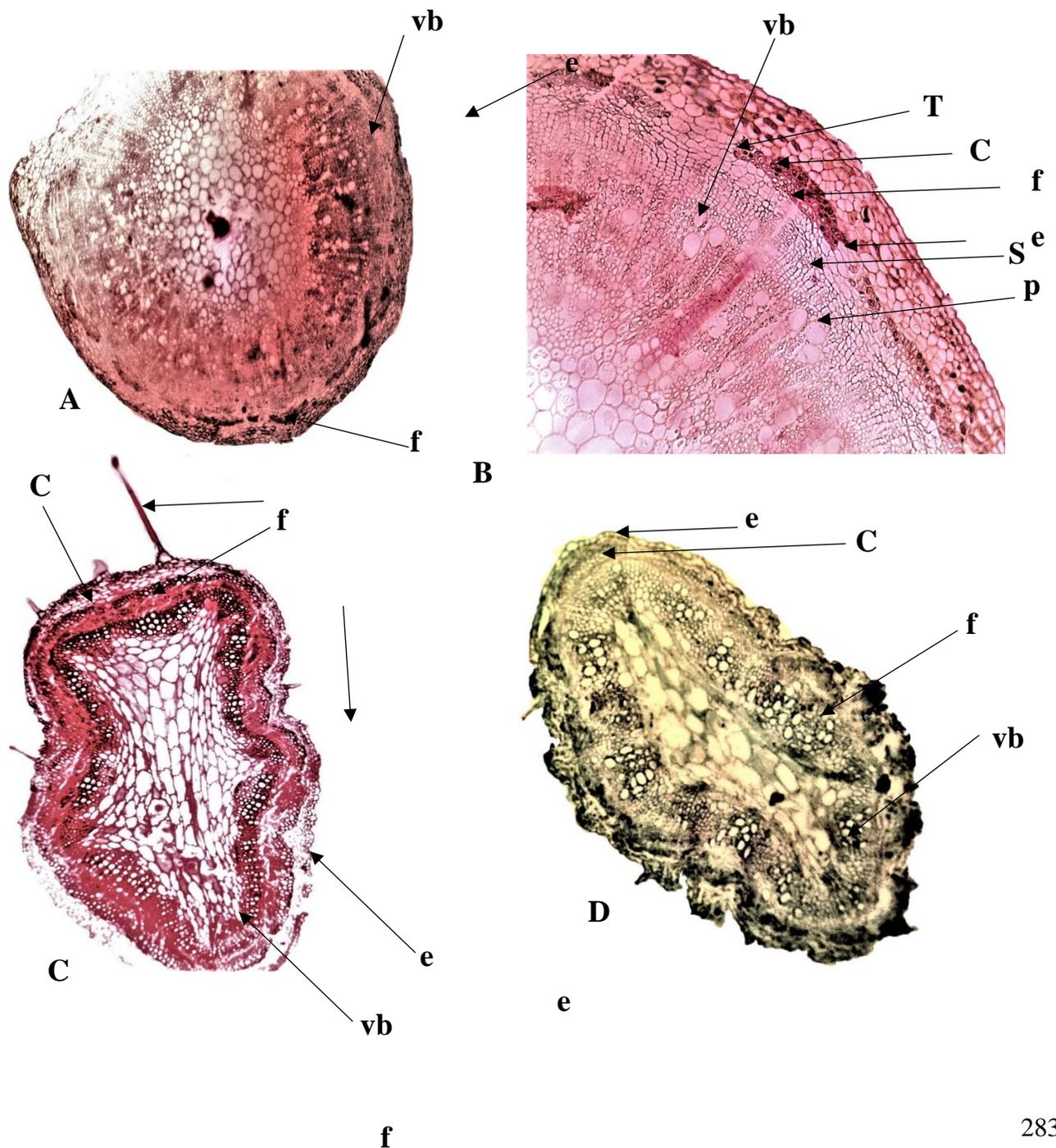
surrounded by the parenchyma cells and usually not clear. The fiber cells which are bloc as crescent-shaped. The Phloem is composed of small and patchy shaped cells. The cambium forms 1 or 3 rows at the start of the xylem. However, it is not very obvious and endodermis layer is not apparent. Pith is rounded with big parenchymatic cells; also is identified charactersitically by secretory cells in places (Baldemir and Coşkun, 2017).

2.2 *Ononis spinosa* subsp. *leiosperma*

The transverse sections of the stem are oblong to irregular shaped. The epidermis consists of an one layer of rectangular cells. Parenchyma has 1-3 lines. The prismatic crystals and tannins present in the cortex. Sclerenchyma cells which are clustered irregular shaped as fiber. The collenchyma is angular. The fibers are presence as a continuous ring. The pith area is tighter than that of *O. sicula* and numbers of pith rays are 5-7 layers. The trichomes of stem are multicellular glandular, unicellular and non-glandular Fig. (3) (Amirabadizadeh *et al.*, 2015).

3.3 *Ononis viscosa* subsp. *Breviflora*

In the transverse sections the stem are oval shaped. The epidermis consists of unicellular-layer cells. The parenchyma cells are elliptical-shaped with 2-4 lines. The prismatic crystals and tannins present in parenchyma cells. The pith area is narrower cells which are large and irregular shaped and large intercellular spaces. The stem has multicellular glandular and multicellular non-glandular trichomes. The collenchyma is angular Fig. (3).



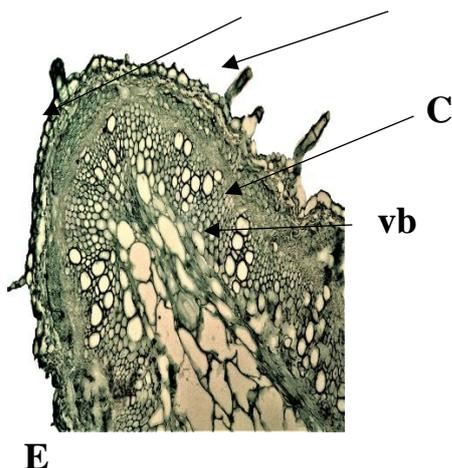


Fig. (3): T.S of stem, A. *Ononis sicula*, B. magnification power of *Ononis sicula*, C. *Ononis spinosa* subsp. *leiosperma*, D. *Ononis viscosa* subsp. *breviflora*, E. magnification power of *Ononis viscosa* subsp. *breviflora* e: epidermis, S: secretory canal, vb: vascular bundle, C: collenchyma cells, T: tannins, p: prismatic crystals, f: fibers, trichomes (small black arrow). A,C,D=4X, B, E =10X.

CONCLUSION

In this study provides comprehensive information on anatomical stem and leaf characteristics of all *Ononis* species growing in Kurdistan region - Iraq are revealed anatomically is describe for the first time. This research display that the anatomical study provide to be most important in applying information of taxonomy.

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