ANATOMICAL STUDY FOR CARAWAY (CARUMCARVI L.) PLANT

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Abstract - Study of anatomical features of caraway consider the first one in Iraq,because of very rare planting in it. The study appear newer design of arrangement the tissue in the parts of caraway plant like as arrangement the sclerenchyma tissue as wide grouped in the cortex of root and stem, also the located of oil cavities near the phloem tissue in the root and stem also. So the vascular bundles in the cross section of stem gives a mazing shape when can show the bundle cup fiber and phloem like as the teardrop form stick in the heart shape of xylem. Epidermis of leaf and stem consist of stomata, the type of stomata in the stem paracytic type and in the leaf anomocytic type also appear the prismatic crystals dendroid crystals in the epidermis of leaf, leaves are bifacial type with two layers of palisade cells and 4-5 layers of spongy cells. The cross section of petiole polygonal shape and the sclerenchyma layers located on the corner of petiole and appear as grouped wide and oval to elongated in shape, the vascular bundles open and collateral give the V-shaped in cross section consist from the xylem and phloem and covered by bundle cup fiber and the parenchymal bundle sheath surrounded the vascular bundle from the outer, also the oil ducts distributed in the cortex, the pith is hollow.

Key words - Caraway plant, anatomy, Apiacea.

I. INTRODUCTION

Nowadays, caraway (Carumcarvi L.) plant belongs to family Apiaceae is planted in the most of country its native to Northern Africa, Western Asia and Europe, it's considered the most important plants containing volatile oils and the genusincludes 192 species (Mohamed, 2007).

Caraway seeds have been found in remains food from 3500 BC and used as herbal medicine,as well as has been known by many names in different countries, like as fennel,al-karawya, Persian cumin in the Arabic countries also known asalcaravea in Spanish,siahzeera in India, karvy in Dutch, kummel in German and kimyon in Turkish(Rosengarten, 1969).

Caraway annual or biennial plant and in the world, cultivars many varieties of it and some of the varieties are registered, Annual caraway requires a long period to mature and biennial caraway requires a second growing season to produce seed and this type used as commercially in many countries (Špaldonet al., 1986). Usually, Caraway grows in the second growing season with small roots and not produces seed but the vegetative organs mature through this time and produce seed in the following year, the seeds crescent-shaped, curved, sharpened at the end and, dark brown color (Mheen, 1994.). Have several medicinal purposes of caraway plants because included the essential oil in the fruits, used as antispasmodic, conservative stomach and digestive disorders also dry fruits added to the most of food to give the flavor in it (Maríaet al., 2008). The present study aims to identify the anatomical features of Caraway plant and diagnosis the important tissue and the cells in the parts of the plant, also this study considered the first study and newer in Iraq andthere are rare anatomical studied of caraway plant in the worldwide therefor less of references found in the present paper.

II. MATERIALS AND METHODS

Fresh material of Caraway was collected at flowering stage from gardens after sowing in the Pot in the old garden belong to Department of Biology , College of Education for pure Science-Ibn-AL Haitham, during the growth seasons 2016-1017. The epidermis were prepared followed by Thammathaworn (1996) as washing the epidermis with distilled water then put it in 10% KOH and passed through alcohol for 10-15 minute, finally, the epidermal samples were put on the slides and mounted by cover slides with Dextrin Plasticizer Xylene (D.P.X.) to fix the cells. For doing sectioning parts, fresh samples of roots, stems, leaves and petioles followed by Al-Hadeethi (2016) was fixed in formalin acetic acid alcohol solution (FAA) at 48 hours and changed the solution after this time by (70%) ethanol, then sectioned by a razor bladeand put it on the slides and mounted by cover slides with Dextrin Plasticizer Xylene (D.P.X.) to fix the tissue. All permanent slides were examined by Olympus KRÜSS light microscope then photographed using Olympus Am scope camera.

III. RESULTS AND DISCUSSION

1. Root:

The measurement of Caraway root appears in the table 1.

The cross section of root ispolygonal covered by epidermis layer, under the epidermis located the cortex, the cortex consist from three types of tissues, the first layer are collenchyma tissue consist from four row after it the parenchyma tissue consist from polygonal cells and the sclerenchyma tissue grouped

as a bundle contacted between the collenchyma and parenchyma layers and there are numerous small oil cavities in it, in most cases are near to the phloem from above and beneath the vascular bundles.The pericycle consist from open and collateral vascular bundles that consist from the xylem and phloem and each vascular bundle covered by a bundle cup fiber from above the phloem. The pith consists from parenchyma cells polygonal in shape and intercellular spaces among them (Figure 1A and B).

2. Stem

The measurement of Caraway stem appears in the table 1.

The cross section of stem is polygonal shape, consist from cuticle layer covered the epidermis (Fig 2A)and the stomata diffuse in the epidermis paracytic in type (Fig 2B), under the epidermis there are located the cortex also contain from three types of tissue like as the cortex of root, the first one are collenchyma layers consist from 3-4 row and parenchyma layers in addition the sclerenchyma layers distributed as a bundles in the cortex around the cortex (Fig 3A) and there are many small oil cavities diffuse in the cortex near the phloem from above and in the pith. The pericycle consist from the open and collateral vascular bundles were oval to elongated in shape consist from the phloem and the xylem and covered by bundle cap fiber from above of phloem and the contacted between these tissue xylem, phloem, bundle cup fiber gives a distinctive shape when can show the bundle cup fiber and phloem like as the teardrop form stick in in the heart shape of xylem (Fig. 3B).

3. Leaves:

A. Epidermis of leaf

The epidermis of leaf consist from ordinary epidermal cell with wavy cell wall in the adaxial and abaxial side of leaf and the stomata occur on the both epidermis that's mean the leaf type is amphistomatic type, stomata are anomocytic type, the result agree with (Guyot, 1971), the length of stomata reached to 30.4 µm and the width of it reached to 21.7 µm (Fig. 4A & B), also distributed many crystals in the epidermal cell, the crystals have two types prismatic crystals (Fig. 4C) and dendroid crystals (Fig. 4D).

B. Cross section of leaf

The measurement of Caraway leaf appears in the table 2.

The cross section of leaf blade is covered by cuticle follow it the epidermis consist from one layer of cell oval in shape and the size of the adaxial epidermis cells are larger than the abaxial one. Leaves are bifacial type, with two layers of palisade cells and 4-5 layers of spongy cells (Fig. 5). The midrib region of leaf consist from one layer of epidermis and the vascular bundle located in the central of it surrounded by parenchymal bundle sheath oval in shape consist from xylem and phloem and the fascular cambium located between them, also the oil duct appear near the phloem like as the stem and root. (Figure 5).

4. Petioles of leaf

The measurement of Caraway petiole appears in the table 1.

The cross section of petiole polygonal shape (Fig. 6A) covered by the cuticle and follow it one layer of epidermis, the cells of epidermis oval in shape, after epidermis located the cortex consist from three type of tissue the first one are the collenchyma layers located under the epidermis consist from two row of cells and the second one are the sclerenchyma layers located on the corner of petiole and appear as grouped wide and oval to elongated in shape, the third tissue are the parenchyma cell polygonal in shape (Fig. 6B and D). The vascular bundles open and collateral give the V-shaped in cross section consist from the xylem and phloem and covered by bundle cup fiber and the parenchymal bundle sheath surrounded the vascular bundle from the outer, also the oil ducts distributed in the cortex, the pith is hollow (Fig. 6 C). All the results that were referred to and studied were reported inKorsmo, 1954; Esau, 1969 and 1977; Fahn, 1982 and Crowden et al., 1969)

Table (1): measurement of Caraway plant parts.

Characters (µm)	Root	Stem	petiole
diameter	325.5	521.2	310.5
epidermis thickness	4.5	4.7	7.8
Parenchyma layers	23.5	55.5	80.7
Collenchyma layers	22.5	26.5	26.9
Sclerenchyma layer	30.5	41.2	65.1
vascular bundles thickness	75.5	109.2	111.4

Table (2): measurement of Caraway plant leaf.

Leaf blade				Leaf midrib			
Upper epidermis	Lower epidermis	Palisade layers	Spongy layers	epidermis	Vascular bundle thickness	Row of xylem	Number of vessels in the row
10.5	8.5	101.4	131.5	11.9	142.4	8-12	8-10

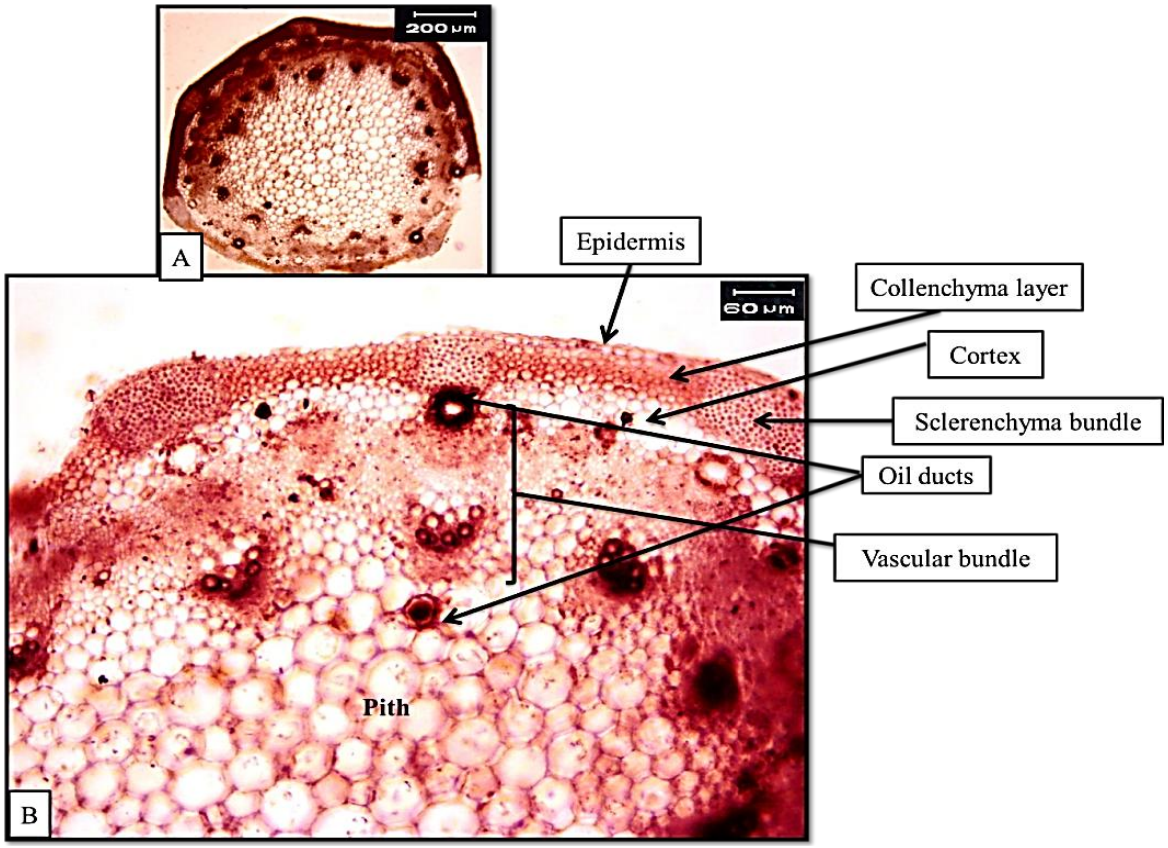


Figure 1: A: cross section of whole shape of root (4X), B: Magnified view of root parts on (10X).

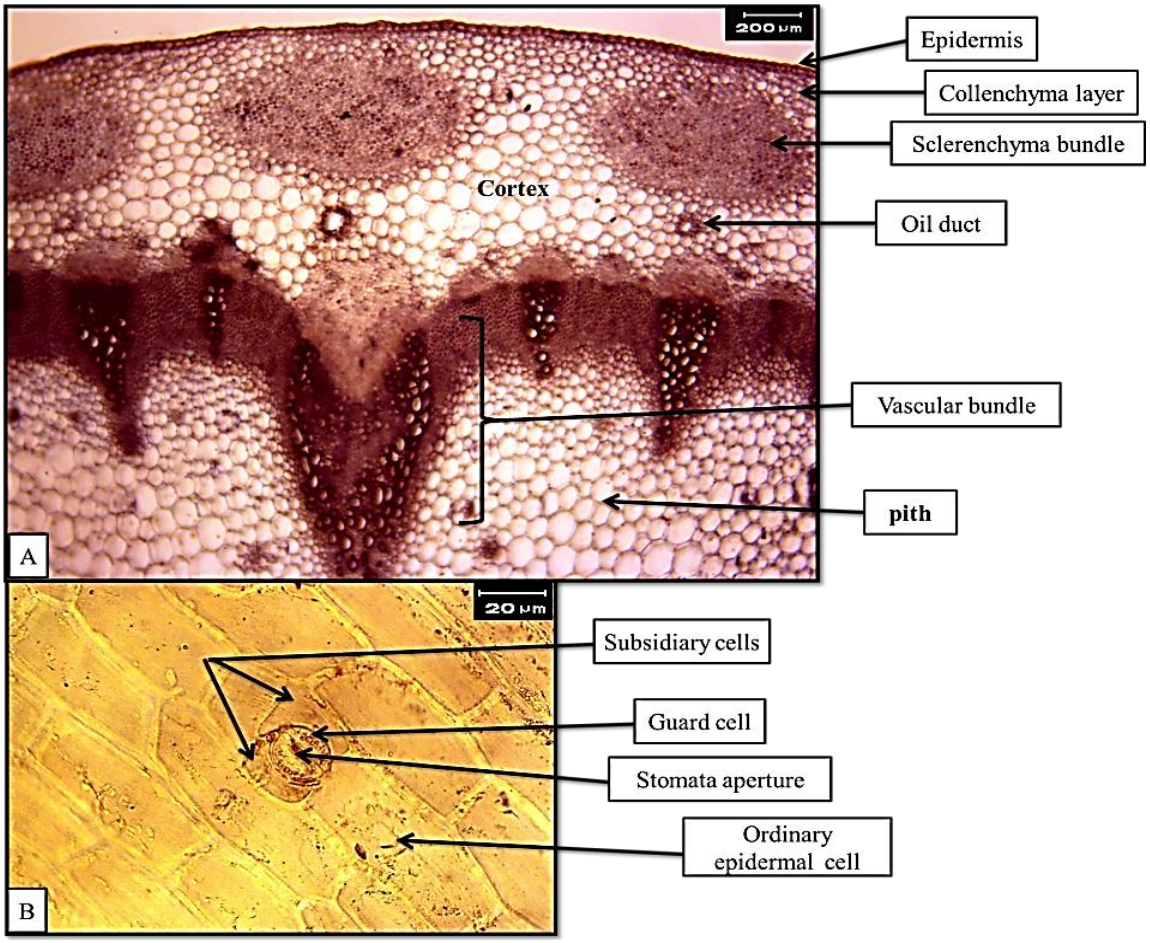


Figure 2: A: cross section of stem, B: epidermis of stem.

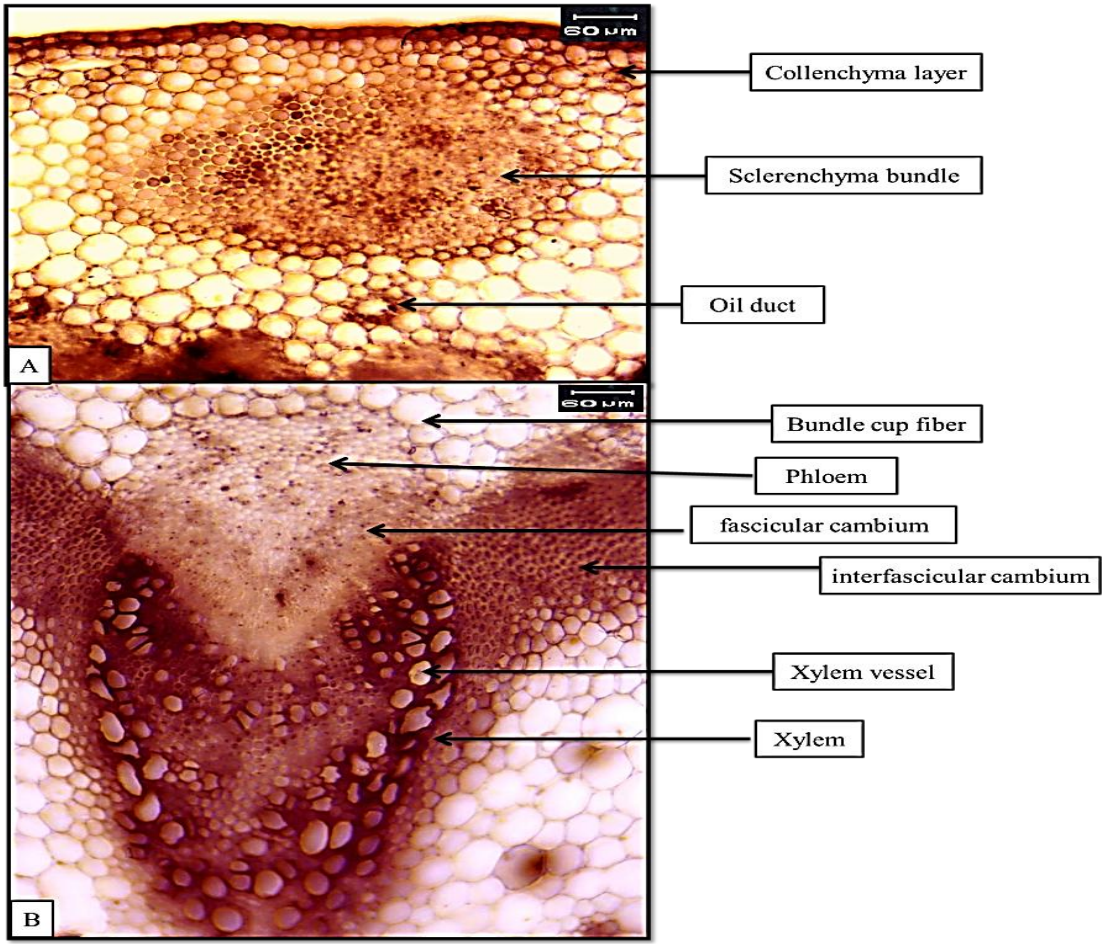


Figure 3: A: cross section of stem appears the sclerenchyma layers, B: vascular bundles of stem.

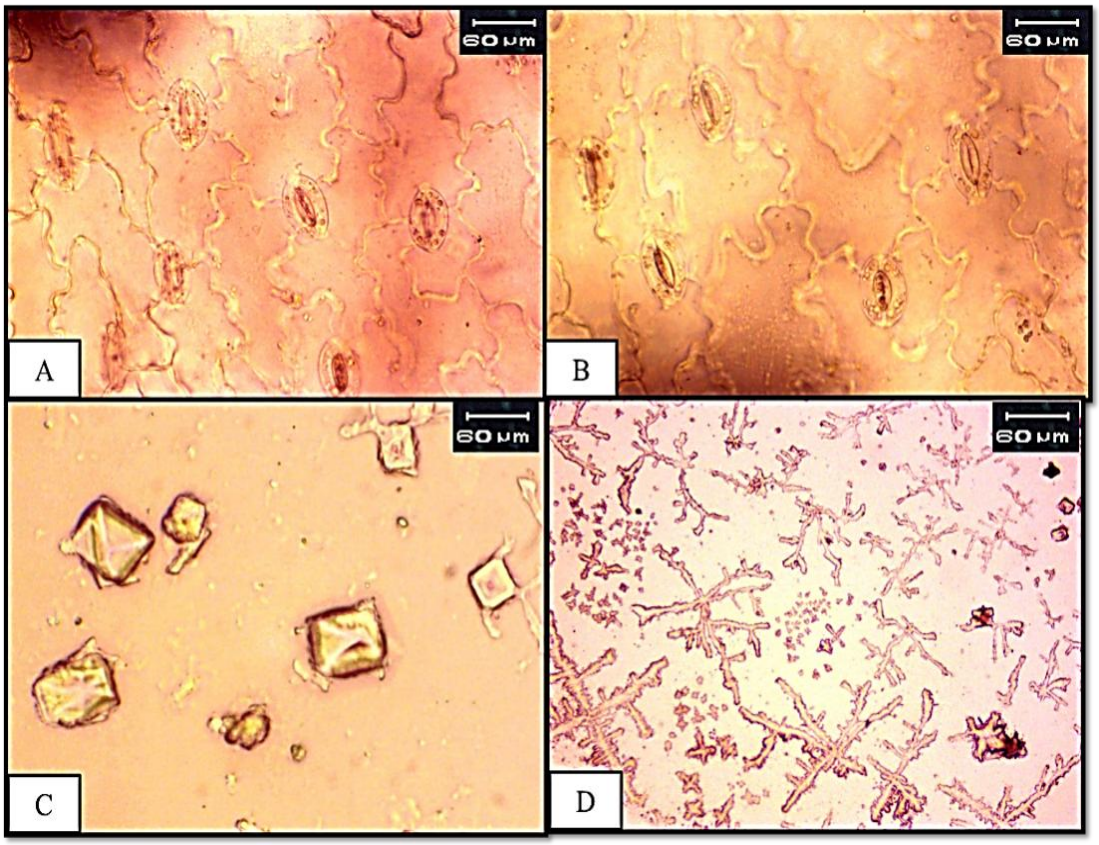


Figure 4: A: adaxial epidermis of leaf, B: abaxial epidermis of leaf, C: prismatic crystals in the leaf, D: dendroid crystals in the leaf.

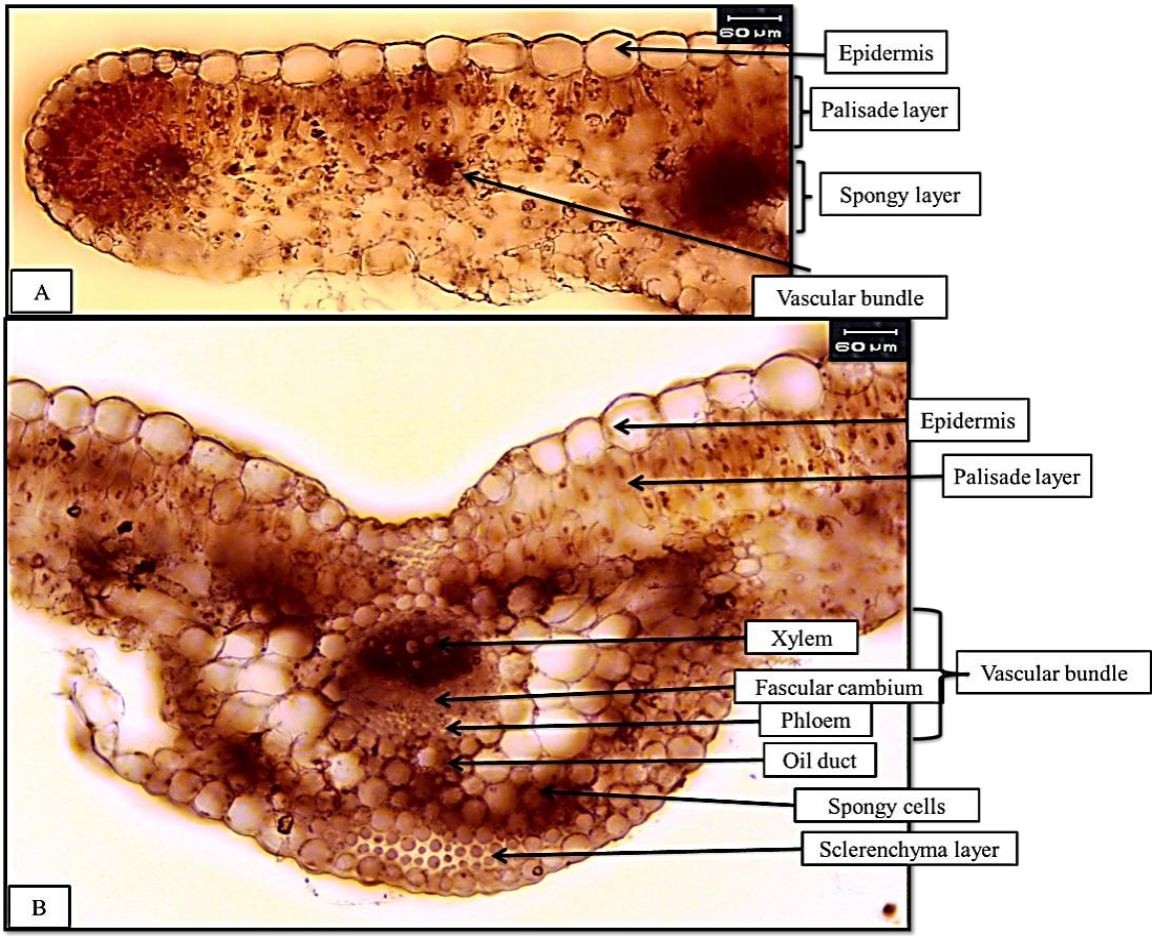


Figure 5: A: cross section of blade leaf, B: cross section of midrib leaf.

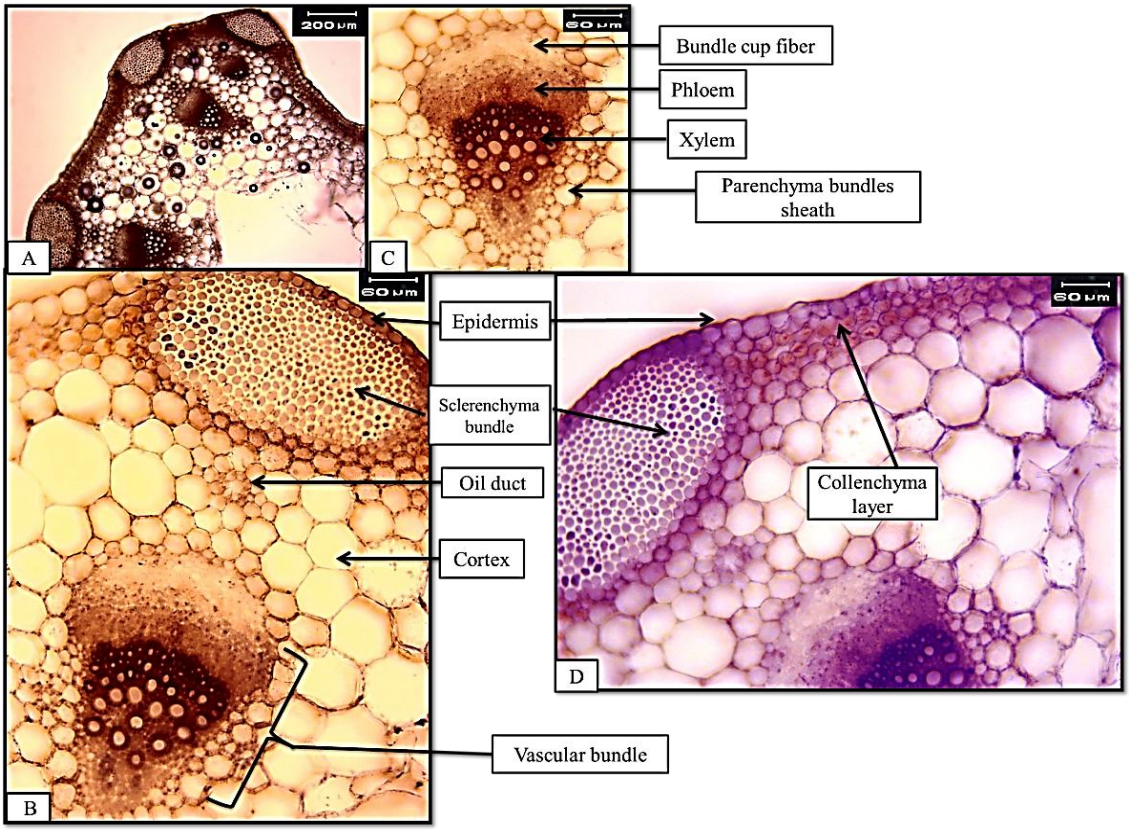


Figure 6: A: cross section of petiole, B: vascular bundle, C: sclerenchyma bundle and vascular bundle, D: sclerenchyma bundle and collenchyma layer.

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