

## Description Anatomical study of *Dodonaea viscosa* in Iraq

AL-Aani, Mazin N<sup>1</sup>. AL-Hadeethi, Muazaz A. <sup>1</sup>, AL-Anbari, Aseel, K. <sup>2</sup> and Abd-AL-Gabar, Dina A. <sup>1</sup>

1. Department of Biology, College of Education of pure Sciences Ibn-AL-Haitham, Baghdad, Iraq.

2. Department of Biology, College of education for pure sciences, Diyala.

### Abstract

*Dodonaea viscosa* Linn. is a woody species from Sapindaceae, used as antibacterial, pain relieving antiviral, calming, antiulcer and cancer prevention agent in folk medicine. This study has aimed to contribute to the anatomical identification the anatomy of leaves also identification the important compositions in the cell of plant parts.

The results shown the stomata shape in *Dodonaea viscosa* was anomocytic type and the mesophyll type is bifacial, also the vascular bundle is large and concentric. The xylem and phloem appeared in a ring shape so can see the druses crystals and the oil cavities was very clear in the epidermis of leaf, the petioles have a special shape look like the bird with long wing from the one side and small wing from the other side in the transverse section.

**Keywords:** Anatomy *Dodonaea*, , Sapindaceae, *Dodonaea viscosa* .

### 1. Introduction

*Dodonaea viscosa* an evergreen woody perennial shrub, however it is a local plant of Australia, indigenous and broad all through the tropics.

In Traditional arrangement of medication, different plant parts were used for example, stem, leaves, seeds, roots, bark and airborne parts. drought tolerance plant and is often cultivated in loamy or sandy soils (Smitinand *et al.*, 1990).

Tropics and subtropics plant, The focal point of beginning of *Dodonaea viscosa* is accepted to be Australia, yet it happens all through Africa, Mexico, New Zealand, India, Northern Mariana Islands, Virgin Islands, Florida, Arizona, South America and somewhere else (West and Noble, 1984 Barroso, 1991; Judd *et al.*, 1999).

*Dodonaea viscosa* regenerates profusely by seed, the seeds are drying tolerant and preserve high levels of viability for long periods when dry, Pre-treatment of the seed by scarification, nicking the seed coat or with boiling water to promotes the germination of seeds, rains must follow germination to ensure seedling survival (Rani *et al.*, 2009).

The present review aims to characterize *Dodonaea viscosa* leaves, petioles as well as identification the important compositions in the cell of the plant parts because *D. viscosa* used for medicinal purposes so that's very important to know the anatomical characters of this plant.

The present study addressed the anatomy of plant parts for this species like as (leaves and petioles)

### 2. Material and methods

Fresh material of *Dodonaea viscosa* was collected from gardens throughout Baghdad. The epidermis were prepared followed by washing with distilled water, put it in 10% KOH, then passed through alcohol for 10-15 minute and then stained by 1% safranin for 30-45 minute. Excess stain was washed off with distilled water, dehydrated by ethanol series (70, 95, and 100%) and cleared with pure xylene 10 minute. Finally, the epidermal samples were put on the slides and mounted by cover slides with Dextrin Plasticizer Xylene (D.P.X) artificial mounting medium.

For doing sectioning parts, fresh material of leaves and petioles was fixed in formalin acetic acid alcohol solution (FAA) at 48 hours and changed the solution after this time and put in the (70%) ethanol, then sectioned on a rotary microtome and stained with safranin and fast green stain and then mounted with Dextrin Plasticizer Xylene (D.P.X). The prestaining and staining procedure was performed according to (Thammathaworn, 1996).

The epidermis using stomatal index (Stace, 1965) as follows:

$$\text{Stomatal index} = \frac{\text{number of stomata}}{\text{number of stomata} + \text{number of ordinary epidermal cells}} \times 100$$

All permanent slides were examined by Olympus BH2 light microscope and photographed using Olympus CH3 camera.

### 3. Results and dissection

#### 3.1 Lamina: Epidermis and Stomata

Stomata shape in *Dodonaea viscosa* was anomocytic type, guard cells have kidney shape. The

Species	Epidermal cells				Stomata				Stomatal index
	Adaxial		Abaxial		Adaxial		Abaxial		
	Length	Width	Length	Width	Length	Width	Length	Width	
<i>Dodonaea viscosa</i>	(13-33) 23.50	(14-16) 15.60	(22-34) 26.33	(12-15) 13.55	(21-25) 23.60	(12-17) 16.20	(14-22) 19.20	(13-17.3) 15.42	12.5

measurements of epidermal cells and stomata are concise in **Table 1**. The anticlinal walls of epidermal cells were normally winding (Fig. 1), Venkatesh *et al.* (2008) was confirmed this truth which revealed that stomata in *Dodonaea viscosa* are usually anomocytic type.

Table 1. Epidermal cells and stomata dimensions in leaves of *Dodonaea viscosa* (in micrometer).

\*Note: The numbers in outside brackets represent average and in the brackets represent upper and lower limits.

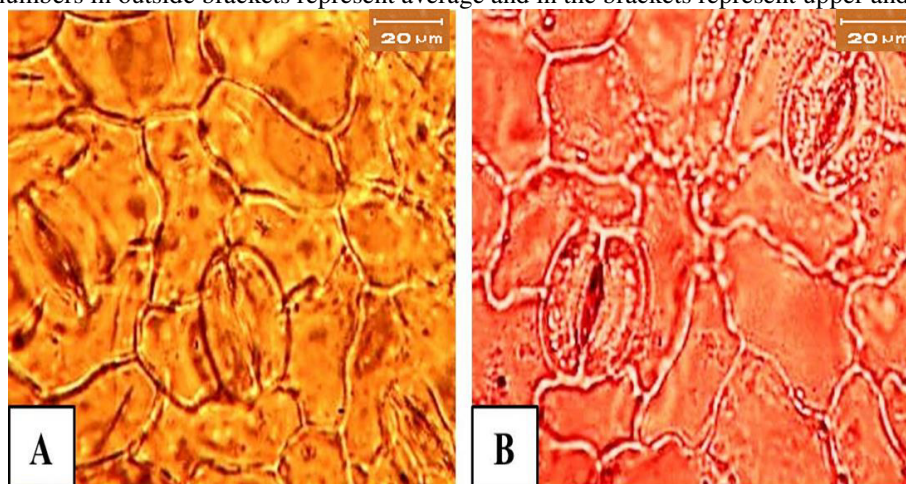


Figure 1. Surface view of epidermal cells and stomata in leaves of *Dodonaea viscosa*, A. Adaxial epidermis, B Abaxial epidermis.

#### 3.2 Cross Sections of Lamina

Upper epidermis have a single layer and the thickness is 14.5 µm with extra or less elongated cells covered by solid cuticle 2.5 µm in thickness. Mesophyll is separated into upper palisade and lower spongy parenchyma that's mean the mesophyll are bifacial (i.e. differentiated into upper palisade parenchyma and lower spongy parenchyma). Palisade parenchyma consists of one layer with a thickness 30.5 µm.

Spongy parenchyma have numerous in layered, oval to circular in shape with a thickness 225.5 µm.

Lower epidermis which have a single layer with 8.5 µm in thickness (Fig. 2).

The margin of lamina is circular shaped (Fig. 3).

As well as can see the druses crystals and the oil cavities in the epidermis of leaf (Fig. 4), this result conformity as the study of Kirtikar and Basu (1995) Who asserted that the oil cavities are characteristic of epidermis *Dodonaea viscosa*.

##### 3.2.1 Midrib

A large concentric vascular bundle is present at the midrib region. Xylem and phloem have a ring shape with 250.5 µm in thickness. Xylem ring appears towards in the center and is surrounded by phloem ring.

Sclerenchyma tissue occurs around the vascular tissues as bundle sheath. The collenchyma layer arranged as a strip after the Sclerenchyma layer (Fig. 5).

Table 3. Anatomical characters of lamina in *Dodonaea viscosa*

Species	Lamina thickness (µm)	Cuticle thickness (µm)	Epidermis thickness (µm)		Mesophyll			
			Upper	lower	Number of Palisade layer	Thickness of Palisade layer (µm)	Number of spongy layer	Thickness of spongy layer (µm)
<i>Dodonaea viscosa</i>	23 6.5	2.5	12- 15.5 ( 14.5)	5.5- 11.5 (8.5)	1	22- 40 (30 .5)	6-9	165- 235 (225.5 )

Table 4. Anatomical characters of midrib in *Dodonaea viscosa*

Species	Midrib shape	Thickness(µm)	Length of vascular elements (µm)	Number of vascular elements	Number of vascular elements in each row	Midrib vascular bundle shape
<i>Dodonaea viscosa</i>	Ring	(237-257.5) 250.5	(113.5- 175) 145.53	25 - 35	2 - 3	Ring shaped

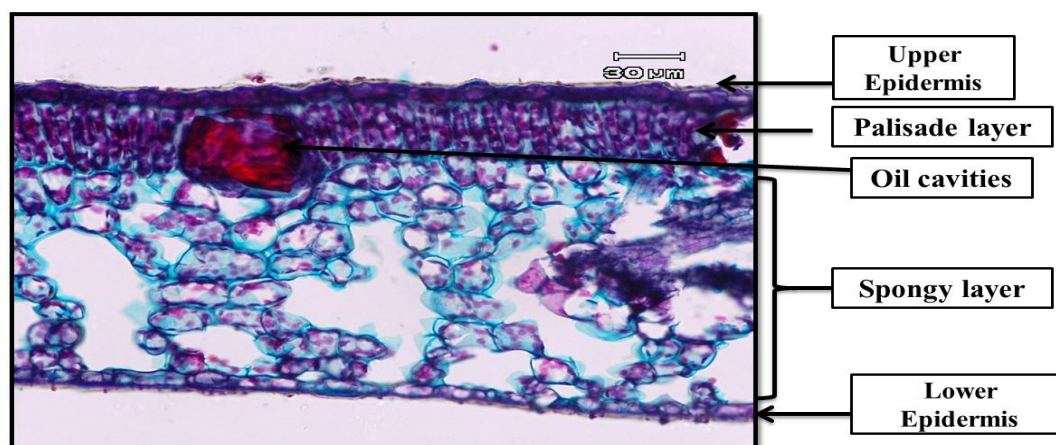


Figure 2. View the cross section of blade in leaf of *Dodonaea viscosa*.



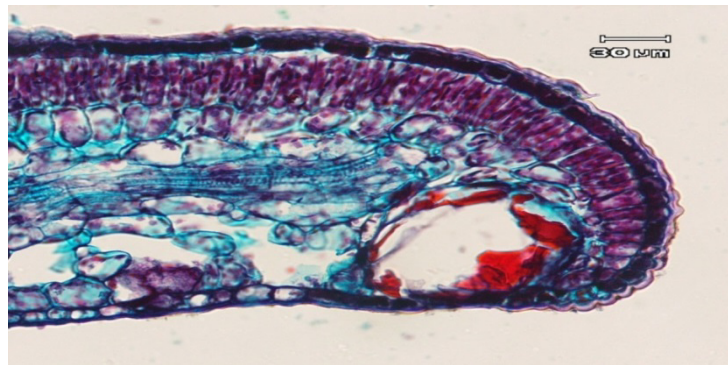


Figure 3. View the cross section of margin in leaf of *Dodonaea viscosa*.

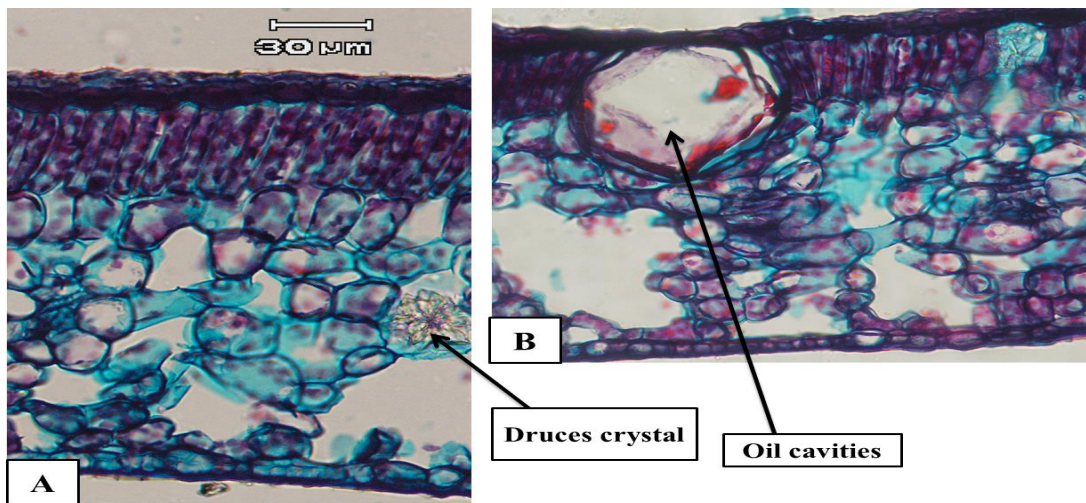


Figure 4. View of: A. druses crystals, B. oil cavities in leaf of *Dodonaea viscosa*.

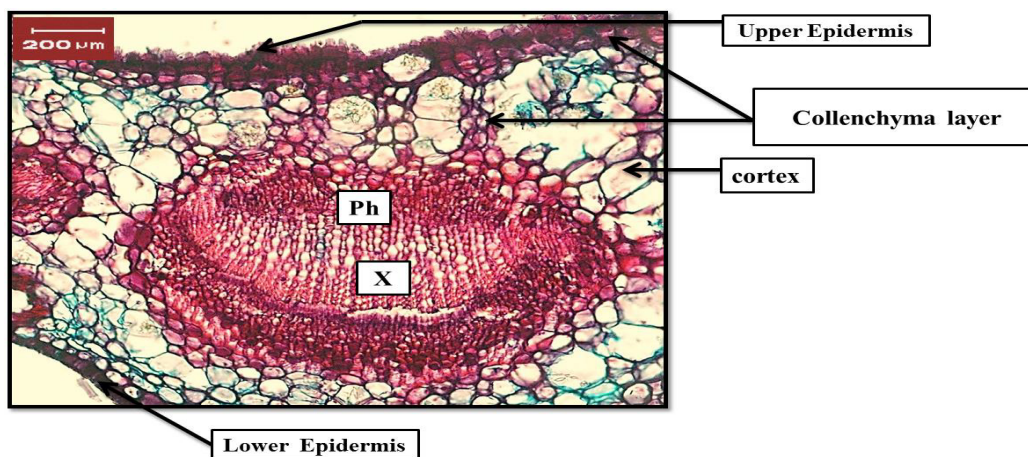


Figure 5. View the cross section of midrib in leaf of *Dodonaea viscosa*. \*The symbol in brackets mean:(Ph) Phloem, (X) Xylem

### 3.3 Transverse Sections of Petioles

Petioles look like the bird have long wing from the right side and small wing from the left side in the transverse section.

Epidermis have one layered, circular shaped, covered with cuticle of variable thickness, followed by a cortex have 2-3 rows of collenchyma this layer spread around the vascular bundle region and contact in some region with vascular bundle, the collenchyma layer arranged as a column in the upper side of vascular bundle. the

parenchyma layer consist of several rows ( 4–7 cells) (Table 5, Fig. 6) this result compatible with Sukkawala and Desai (1962) on in their studies of *Dodonaea viscosa* leaves.

Table5. Anatomical characters of petiole in *Dodonaea viscosa*. (in micrometer).

Species	shape	thickness	Number of vascular bundle	Length of wood arms	Petiole vascular bundle shape	Crystal shape
<i>Dodonaea viscosa</i> .	Winged	(292.3-320) 294.5	1	(165-190) 187.5	Ring	Druses

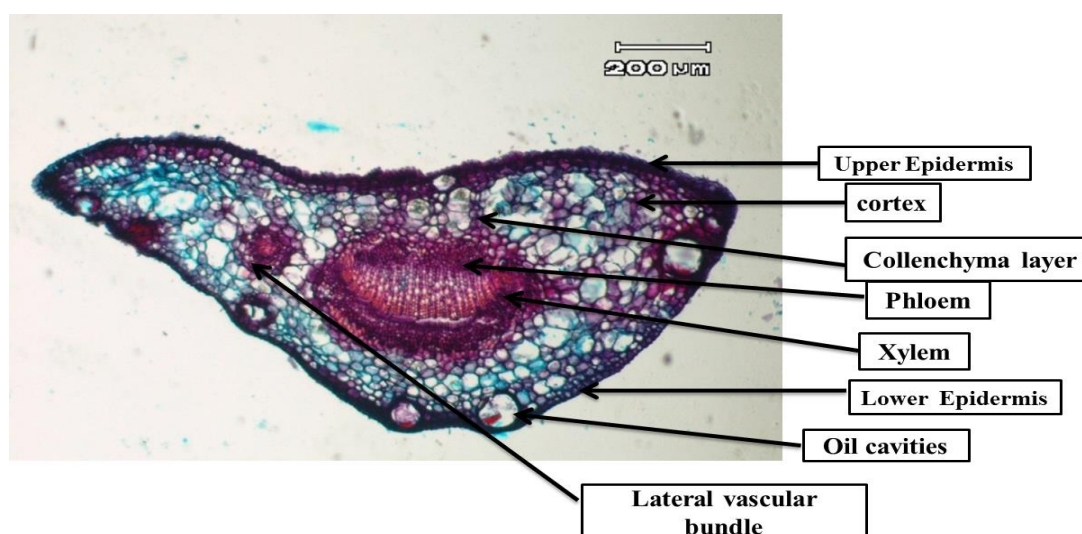


Figure 6. View the cross section of petiole of *Dodonaea viscosa*.

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