



Anatomical study of the vegetative parts of the species *Arum colocasia* L. in Iraq

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Abstract

The current investigation conducted to examine the anatomical aspects of the *Arum colocasia* L. cultured in Iraq. The study included the anatomical characteristics of the different plant parts, including the root, stem and leaf, the results of the study on the vegetative parts were shown the important anatomical characteristics in terms of the form of the sections reviewed and vertical in them, and the study of their tissues, as well as the stomata complexities and the thickness of the epidermis, vascular bundles, pith, additionally the dimensions of mesophyll and in blade of the leaf. The research was conducted as it is one of the monocotyledon plants and because of the lack of anatomical studies on it, therefore it was studied to know the anatomical characteristics indicating its importance and the effect the environmental conditions on it.

Keywords: *Arum colocasia* L., Species, Anatomical study, Iraq.

Introduction

The species *Arum colocasia* L. belong to Araceae family, it is important crop in the humid (Kreike *et al.*, 2004). Taro is an ancient crop of uncertain geographical and genetic origins in Southeast Asia (Matthews 2014). It is considered the main home of the taro, and it is a perennial tropical plant with roots, and it has green leaves that are in the form of a cordate facing upwards with a reticulated vein, about 3 m high, its flowers are not remarkable for their small and collected in a compact manner, on the top is a succulent holder, approximately 20 cm long. All parts of the plant contain calcium oxalate crystals. It is a beautiful indoor coordination plant, which is a distinctive addition to the interior decoration. This plant stands out in its large and shiny leaves that resemble elephant ears; hence the label came (Al-Katib, 1988).

Materials and Methods

The plant sample under study was collected from one of the Al-Adhamiya area nurseries. Fresh parts of the root, stem and leaf were taken from specific areas of the plant and samples were cut about 2-3 cm from the middle of each part of the flowering plant, and after fixation with formalin acetic solution acid alcohol (F.A.A.) with a percentage of (90 ml of 70% alcohol, 5% acetic acid, 5% formalin) for 24

hours at laboratory temperature, then cutting using a rotary microtome with a thickness of (6-12) micrometers, and the sections were safranin satin and fast green, (Al-Mashhadani, 1992; Al-Obeidi, 2014). Stripping off the epidermis of the leaf was done by hand, and peeling method was used, using a dissecting blade and forceps with two-ended ends, forceps in the tissue and ready for microscopic examination and study. The samples were examined by the compound microscope of the type Olympus and the measurements were taken using the ocular micrometer and the samples were photographed under the camera installed on the microscope type Omax. The method of work was carried out according to what was mentioned (Al-Duaiji, 2000). The stomata and epidermal cells were studied and their dimensions were measured and the stomata index was extracted for the species under study according to what was mentioned Al-Duaij (2000) and as in the following law:

Number of stomata in the microscope field
Stomata index = ----- x 100
Number of epidermal cells + Number of stomata.

Results and Discussion

Anatomical the root: All data related to the root were included in Table (1) and figure (A). The results of the study showed that the root is in *Arum*

colocasia. In the transverse section, which is taken from the middle of the root, it has a zigzag circular shape, where it is formed from the outside to the inside of an epidermal layer of one row of rectangular cells with straight walls straight, followed by two layers of collenchyma cells of the type lamellar collenchyma that give an appropriate support to the environmental conditions , followed by the cortex layer, which was formed from a group of parenchyma cells connected to each other, the

regions of the vascular cylinder consisted of xylem and phloem surrounded by a sheath of sclerenchyma cells, this agreed with Al-Hadeethi (2016) who indicated that vascular bundles are a rounded with bundle sheath fiber and these bundles are distributed on vascular cylinder randomly without a specific order, as it was observed within a single vascular bundle in the xylem area and the presence of the cleavage space between the cleavage Schizolysigenus inter cellular space.

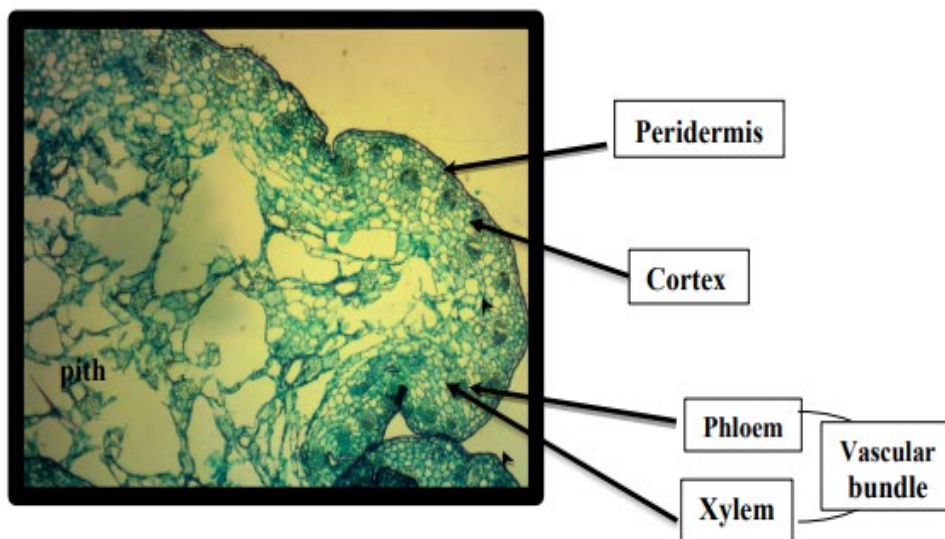


Figure (A): The cross-sectional characteristics of *Arum colocasia* root are shown. 100X.

Table (1): Quantitative characteristics of the trans-sectional components of *Arum colocasia* root under study micrometer (µm).

Peridermis thickness	Cortex thickness	Diameter of vascular cylinder	Root diameter
30 - 35 (32.5)	- 7565 (70)	275- 280 (277)	580-610 (595)

Anatomical the stem: All data related to the stem are included in Table (2) and figure (B). The cross-section of the stem under study appeared composed of layers from the outside to the inside of the epidermis of one layer of cells enveloping the stem interspersed with stomata. The epidermis was covered by a thin, smooth layer of cuticle, and under the epidermis there are 1-2 rows of sclerenchyma cells alternating with chlorenchyma cells and then the cortex, where it appeared undifferentiated, interspersed with scattered vascular bundles, and each bundle was surrounded by a bundle sheath.

Under the xylem region, the first xylem space is called Proto xylem cavity, and this agrees with (Suleiman, 2003) what was mentioned that the stems of monocots contain the first xylem, and the next xylem consists of two large vessels, between which there are some small vessels and tracheids, where the vessels of the xylem are arranged in the shape of the letter V and are The phloem is made of sieve tubes and companion cells, and there is no parenchyma phloem, so the phloem appears regularly in the section

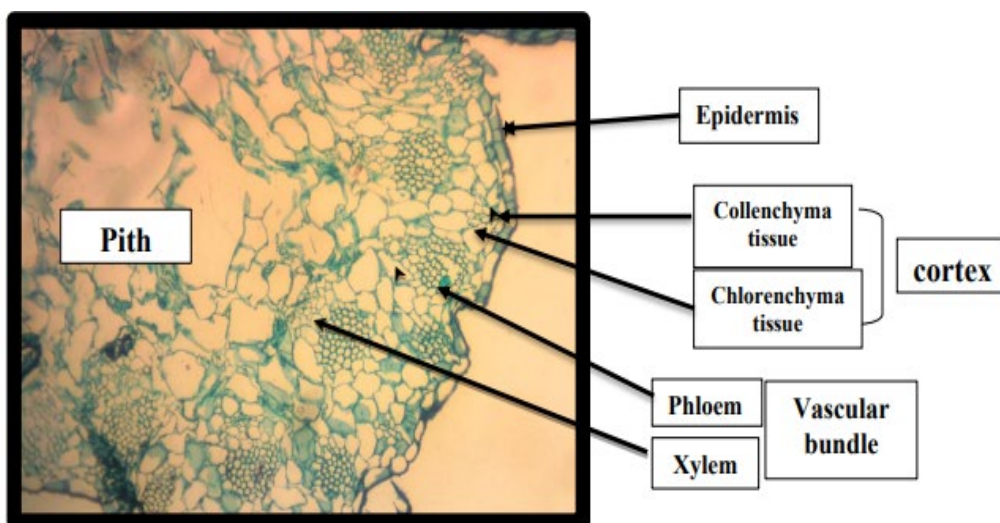


Figure (B): Characteristics of the cross-section stem of *Arum colocasia*, 100 X.

Table (2): Quantitative characteristics of the trans-sectional components of *Arum colocasia* stem under study
Micrometer (µm).

Cuticle thickness	Epidermal cells thickness	Pith thickness	Diameter of vascular cylinder	Stem diameter
6.5-7 (6.7)	15.5-16 (15.7)	130-135 (132.5)	160-165 (162.5)	352-368 (360)

Leaves: The surface view of leaf epidermis: all epidermis related data were included in Table (3) and figure (C). The ordinary epidermal cells appeared with a simple epidermis consisting of a single row of uniseriate polygonal cells, the outer tangential walls of the cells, and the inner tangential walls of the cells with thick straight walls, and the stomata complexes of the epidermis of the leaf appeared paracytic type, elliptical-circular stomata appeared. In this type, the longitudinal axis of the stomatal complex is parallel to the stomata opening. Kidney-shaped guard cells also appeared. Stomata on the lower surface relatively were more than on the upper surface. The dimensions of the stomata also varied among themselves as shown in table (3), and this is consistent with what was mentioned Suratman *et al.* (2016). Also, two types of crystals appeared, the first were of the type of sand crystals and the other of the type of raphids crystal. The crystals usually consist of calcium oxalate, which result from the vital activities of the plant, as oxalic acid is considered an acid. Therefore, cells transform it into insoluble compounds in the form of crystals, which reduce its toxic effect to the greatest extent possible. **Vertical Section of leaf blade:** All data related to the leaf blade are included in Table (4) figure (D). The study showed that the leaf blade

consists of an upper epidermis and a lower epidermis, both of which are uniseriate, that is, they consist of one row of cells of rectangular shapes stacked together, and parenchymal cells of the type chlorenchyma appeared, which contained chloroplast. The mesophyll area was confined between the upper and lower layers of the epidermis and was not distinct to the two layers, the columnar and the spongy, and this is consistent with (Oluwabunmi *et al.*, 2019), which follows the upper epidermal layer, permeated the vascular bundles and consisted of xylem from the outside and phloem inward. The xylem was composed of vessels arranged in rows of about 2-3 rows separated by parenchymal cells. As for the phloem, it consists of sieve tubes, companion cells, and a few fibers. In addition to parenchymal cells, one bundle is topped by sclerenchymal cells represented by bundle sheath fibers. The results of the current study confirmed the existence of differences in the anatomical characteristics shown by the leaf of the species under study, as the leaf is the most plant part possessing anatomical characteristics and the most stable, and this is consistent with (Al-Mashhadani, 1992) which mentioned that the leaves were widely used in solving the most difficult taxonomic problems between different genera and species.

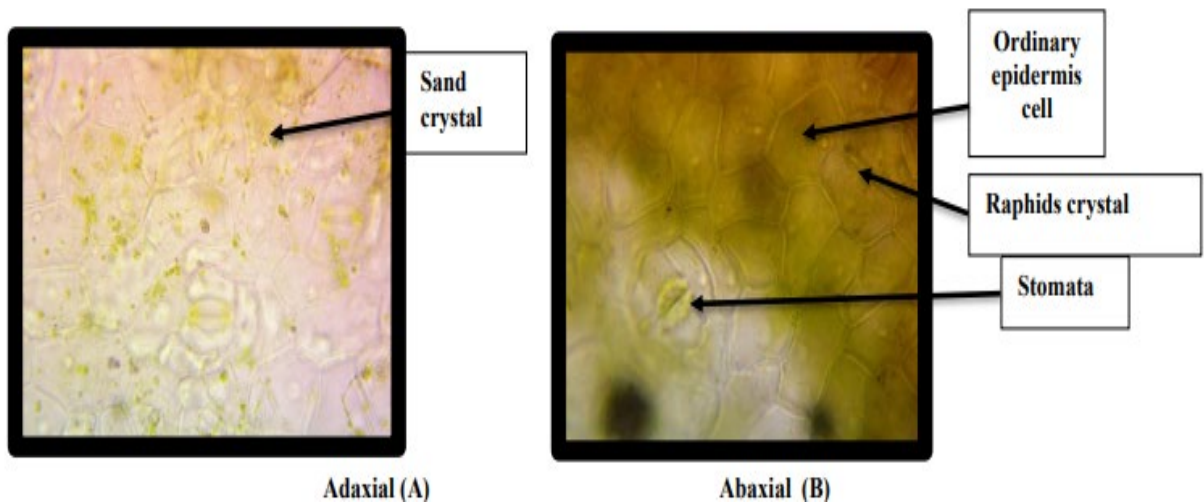


Figure (C): Characteristics of the surface view of *Arum colocasia* leaf, 100 X.

Table (3): Quantitative characteristics of epidermal cells and stomata of *Arum colocasia*.

Lower surface	Stomata index	Width	Length	Upper surface	Stomata index	Width	Length	Ordinary cell wall shape	Stomata shape
	45	10-11 (10.5)	13-14 (13.5)		33	5.5-6 (5.7)	9-10 (9.5)	Straight	Elliptical-Circular

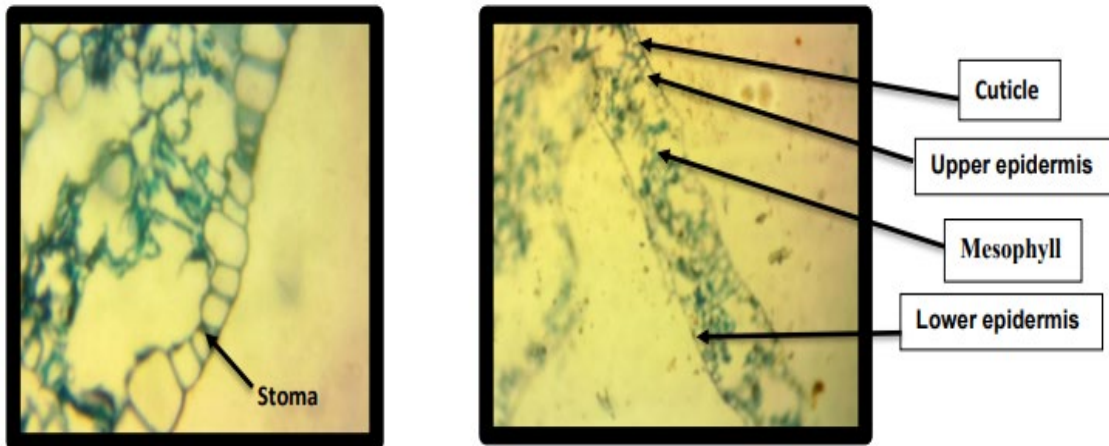


Figure (D): Characteristics of the transverse section of *Arum colocasia* leaf blade, 100x, 400x.

Table (4): Quantitative characteristics of *Arum colocasia* leaf blade (µm)

Cuticle thickness	Upper epidermis thickness	Cuticle thickness	Lower epidermis thickness	Mesophyll thickness
4.5	18-20 (19)	2.5	17-19 (18)	88.5-102 (95.2)

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