

# Surface Epidermis Study of Leaf, Stems and Crystals for Two Species of the Genus *Tradescantia* L.

Dr. Israa Kareem Nassrullah<sup>1</sup>, Marwan Nori Mohammed<sup>2</sup>

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

**Abstract:** The current investigation included study of surface epidermis of upper and lower surface of leaf and stem epidermis beside crystals in the species *T.fluminensis*Vell. and *T.pallida* (Rose)Hunt. The study showed variations in dimension of ordinary epidermal cells, stomata, types of crystals and their distribution in plant body besides other characters.

**Keywords:** leaf and stem epidermis, crystals, *Tradescantia*

## 1. Introduction

*Tradescantia* L. is one of the genera belonging to the family Commelinaceae from monocotyledonae. It is an ornamental plant, and grows in many countries of the world.

There are few anatomical studies about this genus such as Bercu study [1] which included histochemical study of vegetative organs for the species *T.spathacea*, Chimpan and Sipos [2] studied vegetative organs anatomy of *T.pallida* in Romania, while Eminagaoglu and others [3] studied leaf and stem anatomy of *T.fluminensis* in Turkey, Novoa and others [4], study included anatomy of stem and rhizome of some monocotyledonae species in Argentina, Zarinkamar [5] studied density, size and distribution of stomata in different monocotyledonae in Iran, while Abid and others [6], studied stomatal type of monocot within flora of Karachi in Pakistan, the genus is studied at the first time in Iraq in current investigation .

## 2. Materials and Methods

Fresh specimen were collected from different region in Baghdad, the upper and lower surface of leaf and stem epidermis where stripping off by hand and using forcipis and then placed in watch glass containing safranin for 2-5 minutes, The epidermis was then washed in an ethyl alcohol to remove excess dye, then transferred to a slide containing a drop of glycerin and then covered with a cover slide .and examined under microscope to study stomatal complexes and ordinary epidermal cells, in term of their shaped walls, stomatal type, The dimensions of the cells and stomata were measured by ocular micrometer the stomatal index was calculated according to the following equation:

$$\text{Number of epidermal cells} / \text{Number of epidermal cells} + \text{Number of stomata} \times 100 \text{ [7]}$$

For the purpose of studying crystals, cross section of different parts of plant were taken manually or by microtome according to [8], sections were stained with safranin and fast green and examined under microscope to determine the shape and location of the crystals.

## 3. Results and Discussion

### 3.1 Surface epidermis

#### 3.1.1 Ordinary epidermal cells

The epidermal cells on the upper surface were polygonal (plate 1). The shape of the inner, outer tangential, and anticlinal walls was straight to semi-straight or slightly oblique, and the upper epidermis of both species was characterized by free of stomata. This was agreed with the results of both Camelia [9], Eminagaoglu and others [3], Novoa and others [4] on the species *T.fluminensis*, and results of Paiva and others [10] and Chimpan and Sipos [2] on the species *T.Pallida*.

The averages of the dimensions of the cells of the upper surface were different between the two species as it reached 190 x145  $\mu\text{m}$  in *T.pallida*.and 96. 5 x 72.5  $\mu\text{m}$  in *T.fluminensis* (table 1)

The lower surface epidermis was similar to the upper surface as it polygonal and more elongation, while the outer and inner tangential walls and anticlinal walls were straight or semi-straight and sometimes oblique in *T.pallida* (plate 1).

The dimensions of the lower epidermis cells were 108 x 74  $\mu\text{m}$  in *T. pallida* and 92 x 70  $\mu\text{m}$  in *T.fluminensis* (table 1).

As for the epidermis of stem, the cells were linear -elongate and their walls straight in *T.pallida*, while epidermal cells of *T.fluminensis* were more elongation than *T.pallida* (plate 1). This is agree with Esau's [11] which mention that the cells are elongated in the stem where they take a shape that fits the organ in it. Ordinary epidermal cells dimensions were 57.5 x 202  $\mu\text{m}$  for *T.pallida* and 32.5 x 113.5  $\mu\text{m}$  for *T.fluminensis* (table 1).

#### 3.1.2 Stomata

The leaves of the two species are hypostomatic type, the stomata occur on the lower surface of the leaf only.The guard cells were characterized by being elongated and the stomatic aperture is elliptical shape of both species. (plate 2) The average of stomata dimensions were 103 x 75  $\mu\text{m}$  in *T.pallida* and 115 x 80  $\mu\text{m}$  in *T.fluminensis*. The stomatal

index was 11.1 and 8 for *T.pallida* and *T.fluminensis* respectively. (table 2)

The types of stomata in both species are Tetracytic as the stomata are surrounded by four subsidiary cells. The present results, agree with the study of Eminagaoglu and others [3], Novoa and others, [4] on the species *T.fluminensis*, Chimpan and Sipos [2], on the species *T.pallida*, In the fact that the stomata are tetracytic.

The stem was characterized by the presence of stomata, which spread in the form of row or bar and not scattered, and this is characteristics of most of the monocotyledonae according to [11], the guard cells are semi-elongated and stomatic aperture are elliptical, the average of dimensions of the stomata in stem 196 x 80µm for *T.pallida* and 50 x 41 µm in *T.fluminensis*., and the stomata type are tetracytic.

3.2 Crystals

The single needle crystals in *T.fluminensis* were observed in the epidermis of stem, the leaf, the parenchyma tissue of stem and the sheath of leaf, and near the vascular bundles in the leaf, it also observed in the parenchyma tissue of the stem and sheath in *T.pallida*. Raphides crystals found in leaves epidermis and epidermis of sepals and petals of both

species, while the prismatic crystals were observed in the parenchyma tissue of the leaf sheath in *T. fluminensis*. They were also found in the cortex and pith of the root, in leaf epidermis and sheath, and the parenchyma tissue of the stem in *T.pallida*, the druses crystals were observed in the parenchyma tissue of the stem and sheath in *T.pallida*.S and crystals observed in the epidermis of stem in *T.fluminensis*, and in the cortex of root and parenchyma tissue of the leaf sheath in *T.pallida* (plat 3).

These crystals are composed of calcium oxalate. It was noted that the most common types of crystals are the single needle crystals and Raphides, and this is consistent with what Prychid and Rudall [12] pointed out that the most common crystals in Monocotyledon are Raphides.

Crystals were observed in different parts of plant (vegetative and reproductive). This is in line with Dute and others [13] which mention that crystals exist in the reproductive organs as well as the vegetative organs. Prychid and Rudall [12] mention that the presence of crystals and their absence, their types and shapes has great taxonomic value, Kuo-Huang and others [14] pointed out that the effect of light intensity, pH and salinity concentration on crystals density, while Meric [15] stated that the formation of crystals and their types and forms in plants is under genetic influence.

Table 1: Dimensions of ordinary epidermal cells of leaves and stems in *T.pallida* and *T.fluminensis*, measured by micrometer

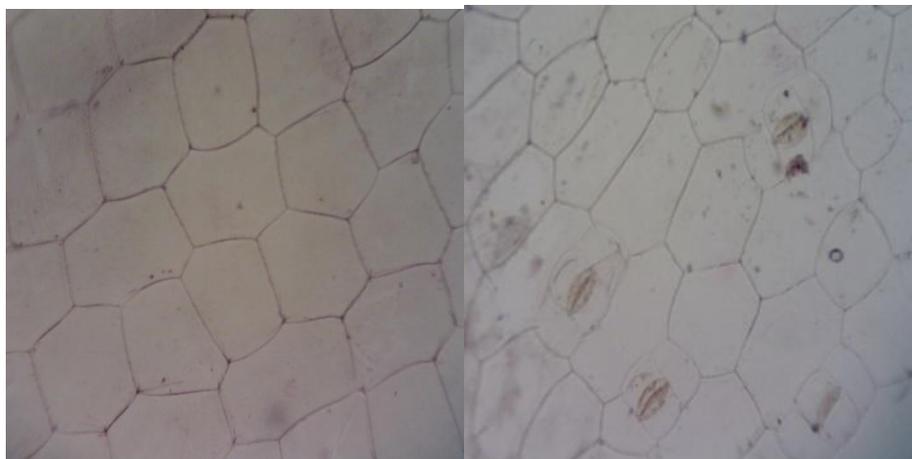
Species	Upper epidermis of leaf		Lower epidermis of leaf		Epidermis of stem	
	length	width	length	width	length	width
<i>Tradescantia pallida</i>	170-217.5 (190)	97.5-152 (145)	82.5-140 (108)	62.5-82.5 (74)	160-245 (202)	50-65 (57.5)
<i>Tradescantiafluminensis</i>	80-105 (96.5)	60-90 (72.5)	57.5-125 (92)	45-87.5 (70)	80-132.5 (113.5)	15-22.5 (19)

The number between the brackets represents the average

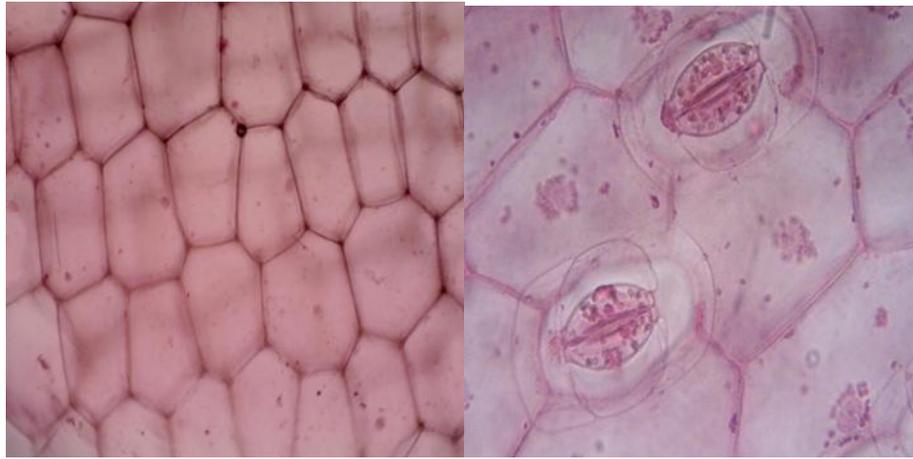
Table 2: Dimensions of stomata of leaves and stems in *T.pallida* and *T.fluminensis*, measured by micrometer, measured by micrometer

Species	Lower surface of leaf			Stem	
	Length	Width	Stomatal index	Length	Width
<i>Tradescantia pallida</i>	95-110 (103)	72.5-77.5 (75)	11.11	175-215 (196)	70-90 (80)
<i>Tradescantiafluminensis</i>	107.5-112.5 (111.5)	72.5-85 (80)	80	45-55 (50)	37.5-45 (41)

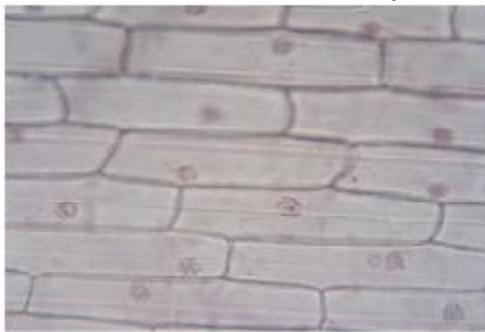
The number between the brackets represents the average



U L  
*T. pallida* (10 X )

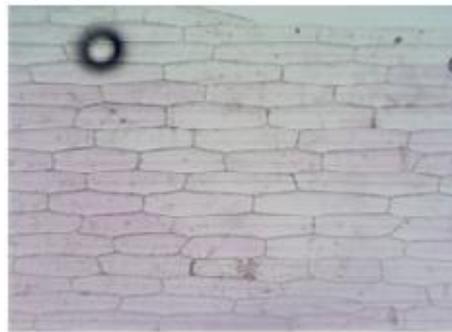


UL  
*T. fluminensis* (40x)



S 40X

*T. Fluminensis*



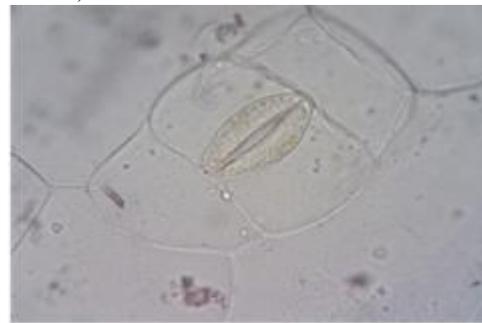
S 10X

*T. pallida*

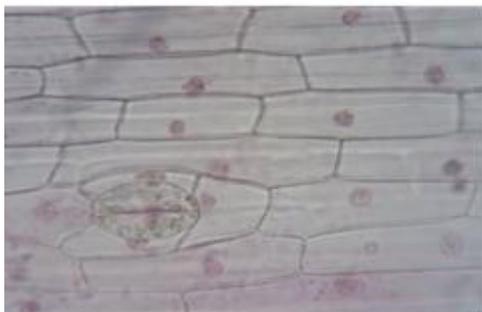
**Plate 1:** Ordinary epidermal cells of leaves and stems in *T. fluminensis* and *T. pallida*  
U: upper surface, L: lower surface, S : stem



A 40 X



A 40 X



B 40X

*T. fluminensis*



B 40X

*T. pallida*

**Plate 2:** Leaf and stem stomata in *T. fluminensis* and *T. pallida*  
A: leaf B: stem

*T. fluminensis**T. fluminensis**T. pallida*

Prismatic Prismatic Prismatic, Sand

*T. pallida**T. pallida**T. pallida*

Needle Druses Raphides

**Plate 3:** Types of crystals in in *T. fluminensis* and *T. pallida* (40x)

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## Author Profile



**Dr. Israa Kareem Nassrullah:** Assistant Professor (PhD.) in Department of Biology, College of Education for Pure Sciences (Ibn Al-Haitham), University of Baghdad, Baghdad, Iraq.



**Marwan Nori Mohammed:** Student MSc. in Department of Biology, College of Education for Pure Sciences (Ibn Al-Haitham), University of Baghdad, Baghdad, Iraq.