

# HISTOANATOMICAL ASPECTS OF THE VEGETATIVE ORGANS OF *PAPAVER RHOEAS* L.

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## Summary

The paper presents histoanatomical features of the root, the stem and leaf structure of *Papaver rhoeas* L. a species belonging to Papaveraceae family. Cross sections were performed by the usual methods used in vegetal histology; the samples were stained using alum-carmin and iodine green and analysed with a BIOROM –T bright field microscope, equipped with a TOPICA 6001A video camera. The study reveals that the root possesses a typical secondary structure due to the activity of the two secondary meristems. The stem exhibits a primary structure with assimilatory cortex and a stele composed of collateral vascular bundles arranged on one circle. The leaf presents a homogeneous hypostomatic mesophyll with few hairs and vascular bundles. This species is an herb used in the food industry and also in traditional medicine.

**Key words:** anatomy, root, stem, leaf, laticifers

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## Introduction

*Papaver rhoeas* L. is a species of flowering plant in the poppy family, Papaveraceae, native of Europe.

The common poppy is an annual herb growing up to 60 cm tall, with slender roots. The stem is straight and hairy. The leaves are once or twice pinnately lobed, cut or toothed and stiffly hairy.



**Fig. 1.** *Papaver rhoeas* L.

The basal leaves are stalked, but the upper leaves are sessile (attached to the stem without a stalk) (Mabberley, 2008).

The two free sepals of the flower fall as the it opens.

The flower is large and showy, with four petals that are vivid red most commonly with a black spot at their base. The fruit is a smooth, hairless capsule 1-2 cm long, which is almost globose and no more than twice as long as wide. The small seeds are released through pores that open at the top of the capsule. They can remain dormant in the soil for 80 years or more.

It forms a long-lived soil seed bank that can germinate when the soil is disturbed. Like many other species of *Papaver*, it exudes white latex when the tissues are broken. It is in flower from Jun to August, and the seeds ripen from Aug to September. The flowers have been used in treating mild pain caused by earache, toothache and neuralgia, and an infusion of the petals is traditionally taken for coughs, insomnia and poor digestion (Brown, 2008).

Metcalf and Chalk (1957) described some anatomical features of *Papaveraceae*. The main characters include the presence of a single ring of collateral vascular bundles but presence of several rings of bundles

sometimes more in *Papaver*. Another feature is uniseriate, biseriate or multiseriate arranged hairs. In spite of above mentioned characters, poor investigation on anatomy of the genus was found. Therefore, this study aims to present common and specific anatomical features of *Papaver rhoes*, for a better knowledge of Papaveraceae family species.

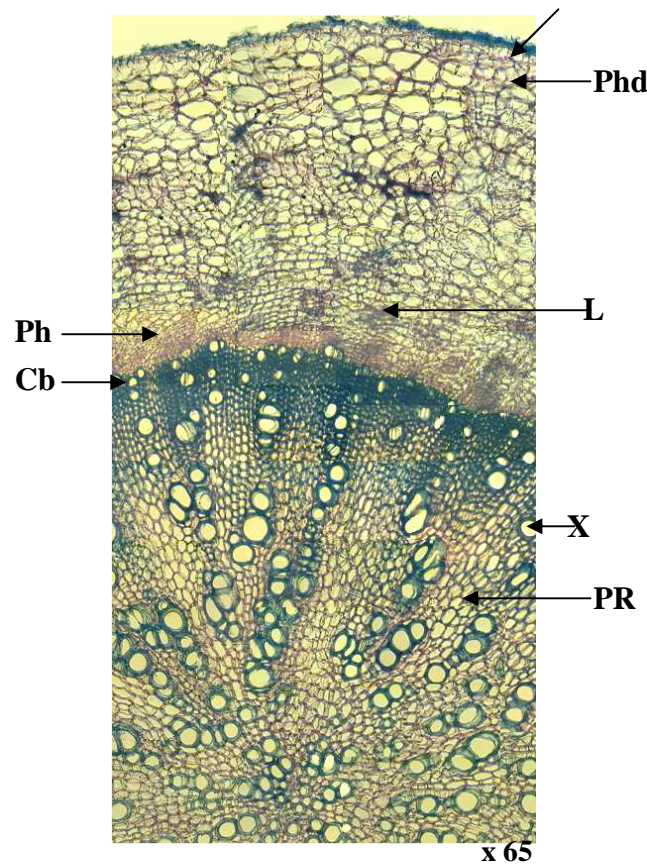
### Material and methods

The samples were collected from plant individuals occurring in Constanza. The species was fixed in FAA 50 and transferred to alcohol 50%. For the

anatomical study, freehand sections were made on the root, stem and leaves. The samples were stained using alum-carmin and iodine green (Bercu & Jianu, 2003). Histological observations and micrographs were performed with a BIOROM –T bright field microscope, equipped with a TOPICA 6001A video camera.

### Results and discussions

Cross sections of the root exhibit a secondary structure with periderm, cambium and stele as most dicotyledonous roots (Bercu & Jianu, 2003).



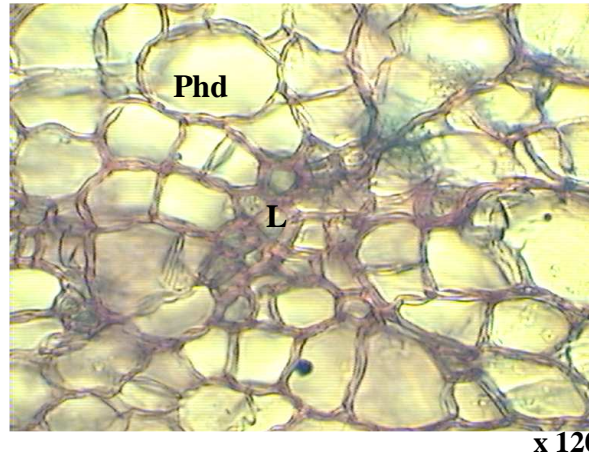
**Fig. 2.** Cross section of the root: Cb- cambium, Ck- cork, L- laticifers, Ph- phloem, Phd- phelloderm, PR- pith ray, X- xylem.

The phellogen, composed of 1-2 layers of mighty flattened cells generates the cork with thickened walled cells towards the outside and the phelloderm (Bavaru & Bercu, 2002), towards the inside, represented by many layers of parenchyma cells.

The phelloderm presents randomly arranged groups of laticifers. The laticifers cells are more or less polygonal in shape with slightly thickened wall cells (Fig. 3). The cambium composed of 1-2 layers of mighty flattened cells generates the phloem outwards, the xylem inwards (Fig. 2) and it also generates the pith rays. The phloem is

represented by sieve tube cells, companion cells and parenchyma phloem. Towards the pheloderm also occur laticifers. The secondary xylem elements are highly lignified. The xylem vessels are more or

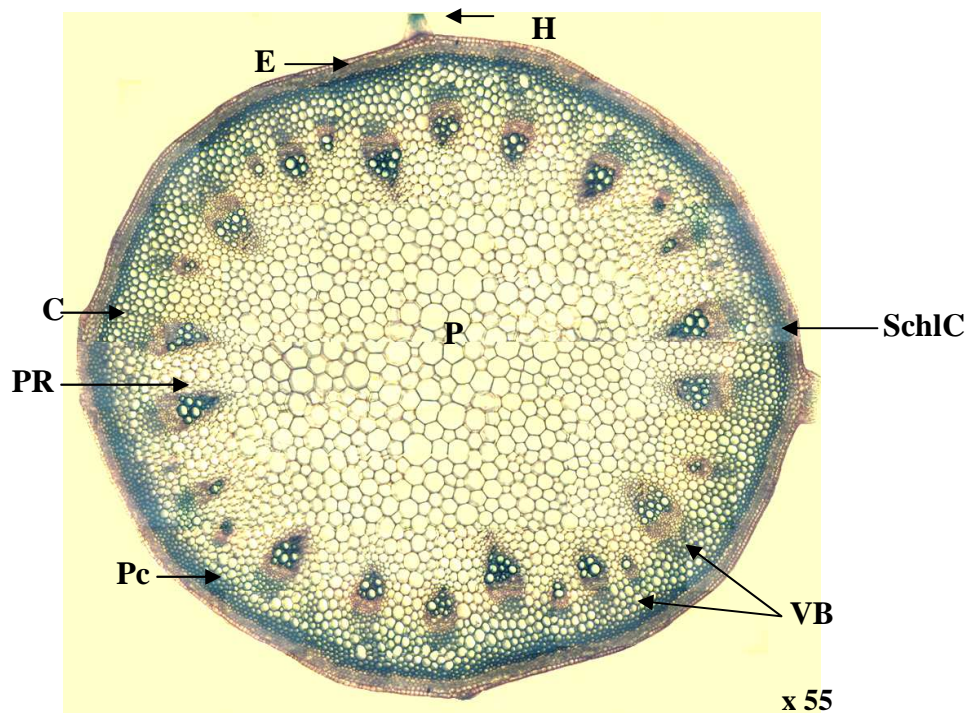
less radial arranged, located in the parenchyma xylem. The continuity of xylem is interrupted by the presence of pith rays. The pith is replaced by xylem vessels.



**Fig. 3.** Group of laticifers in the pheloderm: L- laticifers, Phd- pheloderm.

Cross section of the stem exhibits a more or less circular shape and is represented by epidermis, cortex and stele (Fig. 4). The one layered epidermis is represented by more or less isodiametric cells with slightly thickened external and

internal walls. The epidermal cells are covered by a thick cuticle. The continuity of the epidermis is interrupted by stomata and hairs formed of many cells arranged in bi seriated, tri seriated or even many seriated (Fig. 5B).



**Fig. 4.** Cross section of the stem: C- cortex, E- epidermis, H- hair, Pc- pericycle, PR- pith ray, SchIC- sclerenchyma cells, VB- vascular bundles.

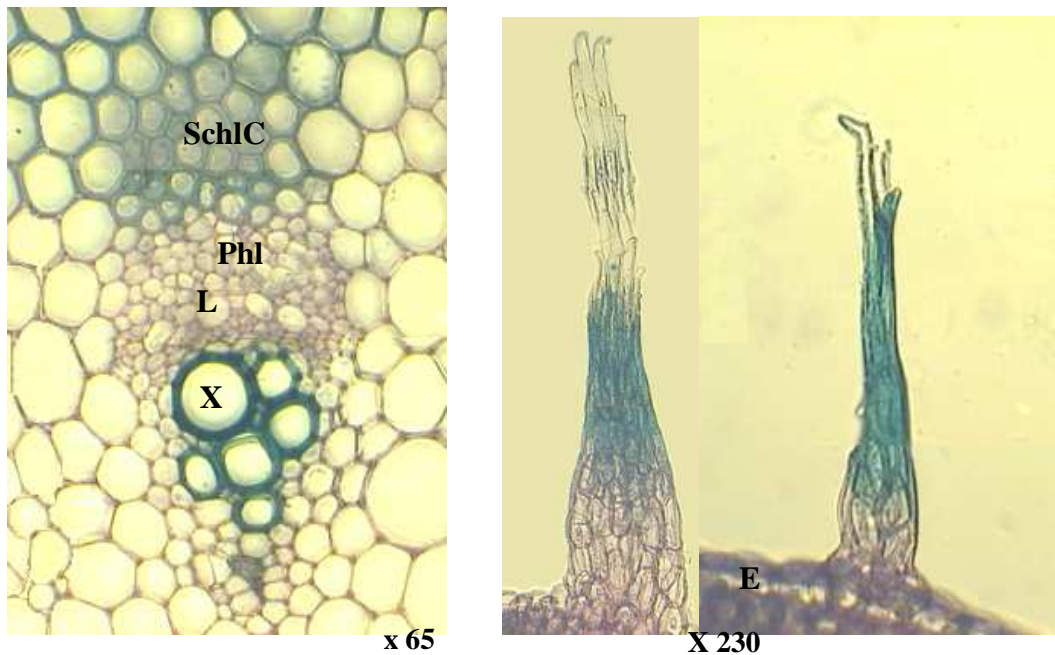


The cortex is composed of 3-4 layers of chlorenchyma cells. In the cortex at the base of the bigger hairs just bellow the epidermal level, groups of collenchyma cells occur.

The stele is represented by 3-4 layered sclerenchymatous pericycle, formed of small highly lignified cells. The layers of parenchymatic cells placed between the pericycle and the vascular bundles are bigger than the pericycle cells and slightly lignified. Such as other authors reported for Papaveraceae species (Bercu *et al.*, 2006; Rahmatpour *et al.* 2010), the collateral vascular bundles are numerous, different in size and regularly arranged in one circle in a fundamental parenchyma. In the periphloemic aria they are protected by a

group of sclerenchyma cells. In the phloem of the vascular bundles non-articulated laticifers with white latex are present (Fig. 5A). As previously reported Esau (1977) and Batanouny (1992), the non-articulated laticifers with white or yellow latex, containing alkaloids were also found in *Papaver somniferum*, *Nelumbo nucifera* and *Nerium oleander* (Dickinson & Fairbairn, 1975; Esau & Kosakai, 1975; Mahlberg, 1959; Reynold, 1963). The xylem vessels are highly lignified placed more or less radial in a cellulose parenchyma. The vascular bundles are separated by pith rays.

The pith is made up of a large number of big parenchyma cells (Fig. 4).

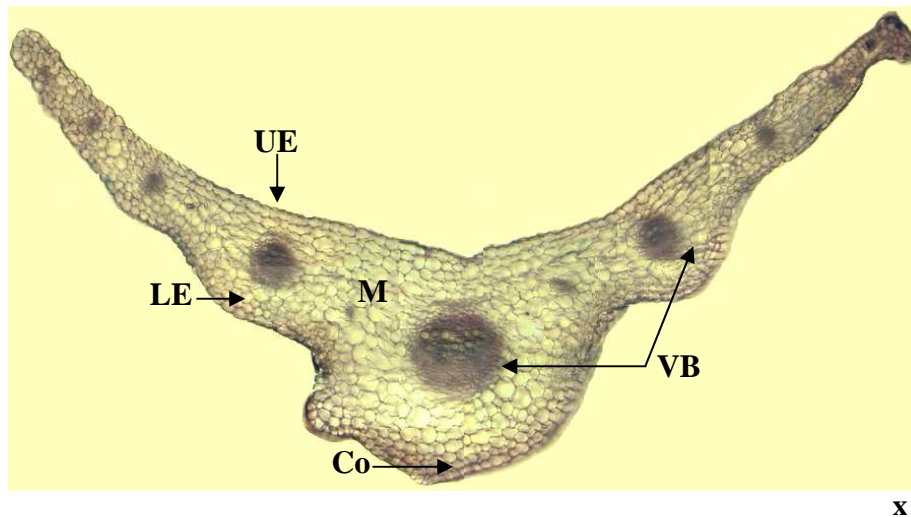


**Fig. 5.** Portion of a stem (in cross section), vascular bundle (A) and a stem hair (B), detail: E- epidermis, H- multiseriate hair, L- laticifers, Phl- phloem, SchlC- sclerenchyma cells, X- xylem.

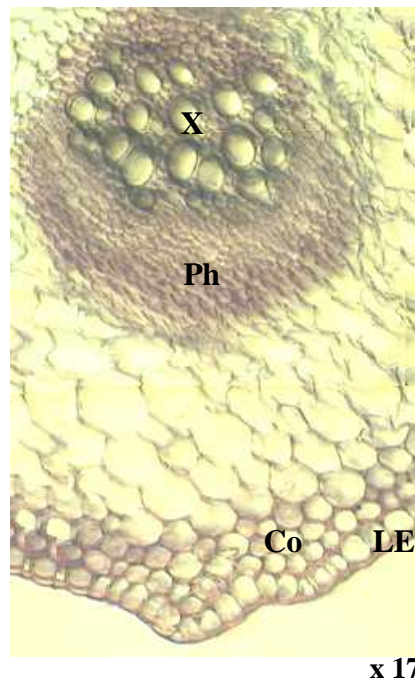
Cross section of the leaf blade exhibits the single layered upper and lower epidermis and the mesophyll in witch vascular bundles are imbedded. In the midrib aria the upper epidermis presents a small ditch and the lower one shows a prominence (Fig. 6). The upper epidermis cells are different in shape and size. The lower epidermis is composed of more or less isodiametric cells. They are smaller than the upper epidermis cells and are interrupted by the presence of stomata.

Both epidermises are protected by a cuticle. Many-celled protective hairs are rare on both epidermises.

The mesophyll is homogeneous composed only of spongy tissues. Notable is the absence of laticifers. The vascular bundles are similar with the ones described in the stem but without the periphloemic group of sclerenchyma cells. In the midrib aria just bellow the lower epidermis 1-2 layers of collenchyma are present (Fig. 7).



**Fig. 6.** Cross section of the leaf blade: Co- collenchyma; LE- lower epidermis; M- mesophyll; UE- upper epidermis; VB- vascular bundles. x 45



**Fig. 7.** Portion with the midrib: Co- collenchyma; LE- lower epidermis; Ph- phloem; X- xylem. x 175

## Conclusions

The present study revealed that the root possesses a secondary structure. The phelloderm is more developed than the cork. Groups of laticifers are present both in the pheloderm and phloem. The secondary phloem is less developed than the secondary xylem.

The stem exhibits a typical to dicotiledons primary structure with the one layered epidermis interrupted by stomata and many celled hairs. The cortex is represented by assimilatory tissue and the

stele presents numerous vascular bundles arranged on a circle, with laticifers in the phloem.

The leaf in cross section exhibits one layered upper and lower epidermises, homogeneous mesophyll and stomata are present only at the lower epidermis. The collateral vascular bundles present the typical foliar arrangement of the conductive elements.

Remarkable is the presence of non-articulated laticifers filled with latex, both in the root and stem.

The mechanical tissue is represented by sclerenchyma present in the stem and collenchyma located below the lower epidermis in the midrib area.

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