

Epidermal Formation - Trichomes

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Abstract: The following types of trichomes were established in this paper: pluricellular tector T-shaped and glandular with the unicellular secretor gland at *Chrysanthemum morifolium*; unicellular tector trichomes and scaly pluricellular ones at *Gazania splendens*; non-ramified pluricellular tector trichomes with antocyanins at *Gynura aurantiaca*; non-ramified pluricellular tector trichomes on the leaf of *Impatiens walleriana*; unicellular tector trichomes at *Symphytum officinale*; glandular trichomes with pluricellular secretor gland and unicellular tector trichomes at *Lonicera caprifolium*; massive pluricellular trichomes under the form of a small barrel, non-ramified pluricellular tector trichomes and glandular with the unicellular gland at *Cucurbita pepo*; unicellular hooked tector trichomes at *Phaseolus vulgaris*; non-ramified pluricellular tector trichomes and glandular ones with the unicellular gland at *Pelargonium zonale*; non-ramified pluricellular tector trichomes on the leaf of *Achimenes longiflora*; unicellular tector trichomes at *Cydonia oblonga*; non-ramified pluricellular tector trichomes and glandular ones with the pluricellular gland at *Lycopersicum esculentum*; glandular trichomes with the pluricellular secretor gland at *Nicotiana glauca*; glandular trichomes with the unicellular glandular part at *Petunia hybrida*; star-shaped pluricellular tector trichomes at *Solanum melongena*.

Key words: tector trichomes, glandular trichomes

Introduction

The epidermis, as a primary defense tissue, has as epidermal formations the trichomes (tector and glandular) and the stomata. The trichomes have been studied and classified according to various criteria at numerous vegetal species (Grințescu 1985, Andrei 1997, Toma and Rugină 1998). Contribution have been brought to this paper concerning the expansion of the data regarding the type of trichomes at various plant species: *Chrysanthemum morifolium*, *Gazania splendens*, *Gynura aurantiaca*, *Impatiens walleriana*, *Symphytum officinale*, *Lonicera caprifolium*, *Cucurbita pepo*, *Phaseolus vulgaris*, *Pelargonium zonale*, *Achimenes longiflora*, *Cydonia oblonga*, *Lycopersicum esculentum*, *Petunia hybrida*, *Nicotiana glauca* and *Solanum melongena*.

Materials and methods

The studied material was represented by 15 species, belonging to 10 families of angiospermae, collected from Oradea. The distribution of the trichomes on the aerial organs of the plants, the type and dimensions of the trichomes were aimed.

The vegetal material used was represented especially by fresh leaves, there having been made operations of peeling off the epidermis (upper and lower epidermis) or cross-sections - with or without pith of *Sambucus nigra* - through the lamina.

In order to obtain the microscope slide we applied the optic microscopy technique (Șipoș 2004). The microscope slide was analysed with various ocular-objective sets (7x and 4x; 7x and 10x; 7x and 40x) and photographed with a Canon A550 camera, attached to the ocular of the microscope with an adapter. Also the micrometry of the trichomes, as well as that of their component parts was applied (Andrei & Paraschivoiu 2003). The value of the micrometric indices was established to be of: 25 μm (at the ocular set 7x and objective 4x), 10.1 μm (at the ocular set 7x and objective 10x) and 2.5 μm (at the ocular set 7x and objective 40x).

Results and Discussions

Asteraceae Family

Chrysanthemum morifolium

This species presents tector and glandular trichomes which cover the supraterraneous vegetative organs (Petruș et al. 2007). The tector trichomes are pluricellular, in the upper part with a great flame, having the form of the letter T. The dimensions established by us are between 80-100 μm for the foot of the trichomes and between 300-555 μm for the flame (Fig. 1.A). The glandular trichomes from the *Chrysanthemum* have a base cell, 3-4 cells and the glandular cell can be

observed at the level of the foot (Fig. 1.B). Their dimensions were comprised between 50-100µm.

Gazania splendens

At *Gazania splendens* we can notice the presence of two morphological types of tector trichomes. On the abaxial face of the leaf there are long trichomes, their dimensions being approximately 2020µm. They are unicellular, thin tector trichomes (Fig. 1.C). On the stem and on the leaf petiole, at the level of the nervations, there are pluricellular, scaly, massive, rigid, tector trichomes with dimensions ranging from 606-1414µm (Fig. 1.D).

Gynura aurantiaca

Is a pubescent ornamental plant, with the tector trichomes spreading all over the stem, the leaf petiole and in both epidermis of the lamina. The tector trichomes are pluricellular, alive, non-ramified, pink-violet coloured due to the presence of antocyanins in the vacuolar system. The micrometry performed by us determined the dimensions of the tector trichomes as ranging from 550-1500µm (Fig. 1.E).

Balsaminaceae Family

Impatiens walleriana

Presents pluricellular tector trichomes, with the cells disposed in a single row, very crowded, smaller and smaller to the top. They are spread in the upper epidermis of the leaves and have dimensions ranging between 400-550µm (Fig. 1.F).

Boraginaceae Family

Symphytum officinale

At *Symphytum officinale*, the stem, the leaf petiole, the lamina and all of the aerial organs are covered with rigid unicellular tector trichomes (Fig. 1.G). The abaxial epidermis of the lamina presents a higher density of unicellular tector trichomes, more numerous than in the upper epidermis. The dimensions of the tector trichomes were between 353.5-1414µm.

Caprifoliaceae Family

Lonicera caprifolium

In the abaxial and adaxial epidermis of the lamina there are tector and glandular trichomes (Fig. 1.H). The dimensions we established for the unicellular tector trichomes were between 151.5-454.5µm. The glandular

trichomes have a foot and glandular part, both of them are pluricellular (Fig. 1.H).

Cucurbitaceae Family

Cucurbita pepo

It presents two morphological types of tector trichomes and glandular ones. The small tector trichomes are spread all over (stem, leaf petiole, nervation, abaxial and adaxial epidermis). These trichomes are pluricellular, uniseriate, with sharp apex. Their dimensions are comprised between 202-505µm (Fig. 1.J). The big tector trichomes have a barrel shape. These are missing only from the upper surface of the lamina. The micrometry we carried out shows that the big tector trichomes are pluricellular. The following dimensions were established: the barrels comprised between 1000-2250µm and the pluricellular apex comprised between 2000-2500µm (Fig. 1.I).

The dimensions of the glandular trichomes established by us vary between 202-282.2µm. Glandular trichomes (Kolb & Müller 2004) have a pluricellular foot, 3-4 prozenchymatic cells smaller and smaller towards the globular glandular cell (Fig. 1.J).

Fabaceae Family

Phaseolus vulgaris

At *Phaseolus vulgaris* the tector trichomes are present on the aerial organs of the plant (Dahlin et al. 1992). In the abaxial and adaxial epidermis of the lamina, there are more numerous hooked tector trichomes. The trichome has a base cell followed by a shorter cell and a longer hooked cell. The dimensions of the tector trichomes established by us further to the micrometric measurements ranged from 100µm to 300µm (Fig. 2.K).

Geraniaceae Family

Pelargonium zonale

The tector and glandular trichomes are present on the aerial organs of the plant. In the abaxial and adaxial epidermis there are a lot of glandular and tector trichomes. The tector trichomes are pluricellular and uniseriate. The micrometry we performed established the dimensions of the tector trichomes as being comprised between 171.7-646.4µm (Fig. 2.L). The glandular trichomes are pluricellular, the last glandular cell is yellowish in a microscopic field because it has eteric oil. The glandular trichomes are more numerous in the adaxial epidermis and have dimensions ranging from 100µm to 400µm (Fig. 2.L).

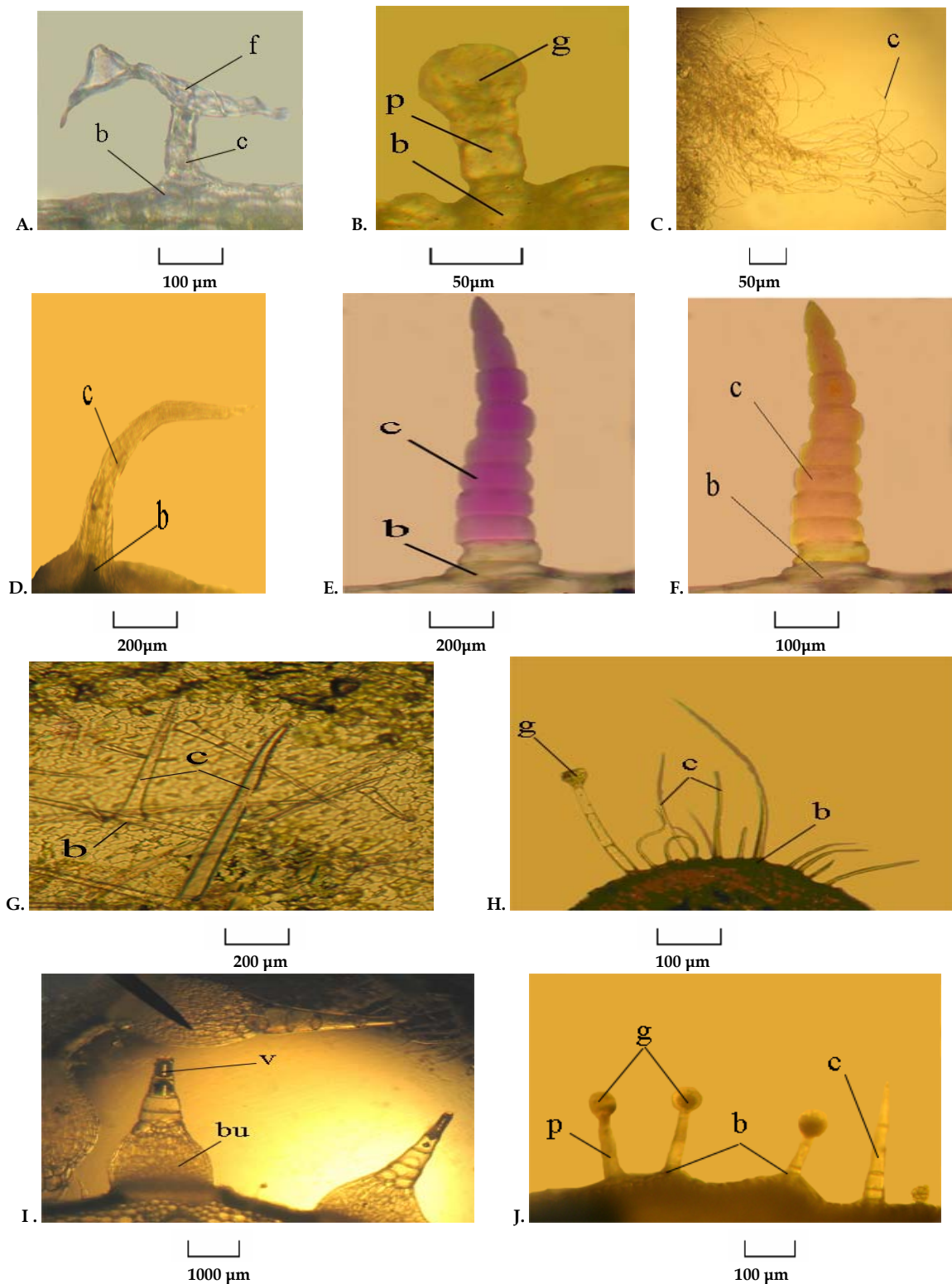


Figure 1. Pluricellular tector T-shaped (A) and glandular with the unicellular secretor gland (B) at *Chrysanthemum morifolium*; unicellular tector trichomes (C) and scaly pluricellular ones (D) at *Gazania splendens*; non-ramified pluricellular tector trichomes with antocyanins (E) at *Gynura aurantiaca*; non-ramified pluricellular tector trichomes (F) on the leaf of *Impatiens walleriana*; unicellular tector trichomes (G) at *Symphytum officinale*; glandular trichomes with pluricellular secretor gland and unicellular tector trichomes (H) at *Lonicera caprifolium*; massive pluricellular trichomes under the form of a small barrel (I), non-ramified pluricellular tector trichomes and glandular with the unicellular gland (J) at *Cucurbita pepo*; b-base of trichome, bu-barell, c-body, f-flame, g-glandular part, p-foot, v-pluricellular apex.

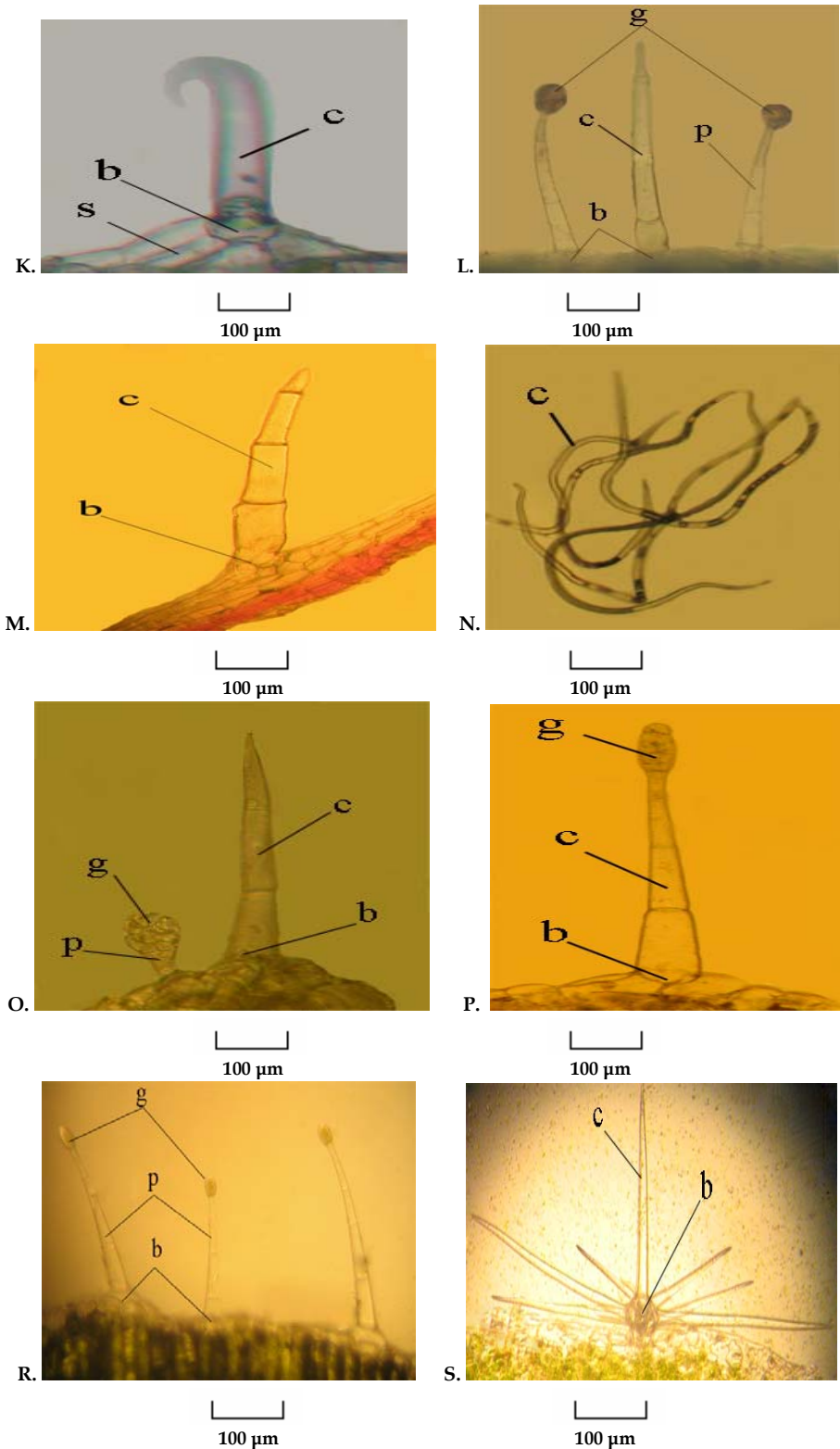


Figure 2. Unicellular hooked tector trichomes (K) at *Phaseolus vulgaris*; non-ramified pluricellular tector trichomes and glandular ones with the unicellular gland (L) at *Pelargonium zonale*; non-ramified pluricellular tector trichomes on the leaf of *Achimenes longiflora* (M); unicellular tector trichomes at *Cydonia oblonga* (N); non-ramified pluricellular tector trichomes and glandular with the pluricellular gland at *Lycopersicon esculentum* (O); glandular trichomes with the pluricellular secretor gland at *Nicotiana glauca* (P); glandular trichomes with the unicellular glandular part at *Petunia hybrid* (R); star-shaped pluricellular tector trichomes at *Solanum melongena* (S). ; b-base of trichome, c-body, g-glandular part, p-foot.

Gesneriaceae Family

Achimenes longiflora

The tector trichomes are spread onto the stem, the stem ramifications, the leaves petiole, at the level of the foliar limb, both in the upper epidermis and in the lower one and on the corolla of the flower. The tector trichomes are pluricellular uniseriate. The measurements we completed show their dimensions to range from 303µm to 757.5µm (Fig. 2.M).

Rosaceae Family

Cydonia oblonga

This species presents unicellular tector trichomes covering the lower face of the *Cydonia oblonga* leaves. The upper epidermis does not present the tector trichomes. The trichomes are easily visible with the eye (Fig. 2.N). The dimensions we established ranged between 4000µm to 6000µm.

Solanaceae Family

Lycopersicum esculentum

The stem and the leaves of *Lycopersicum esculentum* are covered with tector and glandular trichomes (Voigt et al. 2007) having a characteristic smell (Fig. 2.O). The tector trichomes are pluricellular uniseriate, more numerous in the abaxial epidermis of the lamina in comparison with adaxial one. We established the dimensions of the tector trichomes to range from 121.2 to 400µm. Glandular trichomes are more densely present in the adaxial epidermis having dimensions around the value of 150µm with the pluricellular glandular part.

b) *Nicotiana alata*

It presents trichomes with a pluricellular glandular part. They are present on the aerial vegetative organs of the plant. The dimensions we established for the glandular trichomes were between 275–600µm (Fig. 2.P).

Petunia hybrida

It presents glandular trichomes spread onto the stem, the stem ramifications, the leaves petiole, in the adaxial and abaxial epidermis, as well as on the flower corolla. The measurements we carried out show that the glandular trichomes have the dimensions ranging between 202µm–757.5µm. The glandular trichome is composed of a base cell, 4-5 prozenchymatic cell in the foot and the oval glandular cell (Fig. 2.R).

Solanum melongena

At *Solanum melongena* the tector trichomes are spread on the aerial vegetative organs. These tector trichomes are pluricellular, star-shaped (Voigt et al. 2007) a pulverulent type (Fig. 2.S). The measurements we performed show that the dimensions of the tector trichomes vary between 303µm–909µm.

In conclusion, we established the following types of trichomes: pluricellular tector T-shaped and glandular with the unicellular secretor gland at *Chrysanthemum morifolium*; unicellular tector trichomes and scaly pluricellular ones at *Gazania splendens*; uniseriate pluricellular tector trichomes with antocyanins at *Gynura aurantiaca*; uniseriate pluricellular tector trichomes on the leaf of *Impatiens walleriana*; unicellular tector trichomes at *Symphytum officinale*; glandular trichomes with pluricellular secretor gland and unicellular tector trichomes at *Lonicera caprifolium*; massive pluricellular trichomes under the form of a small barrell, uniseriate pluricellular tector trichomes and glandular with the unicellular gland at *Cucurbita pepo*; unicellular hooked tector trichomes at *Phaseolus vulgaris*; non-ramified pluricellular tector trichomes and glandular ones with the unicellular gland at *Pelargonium zonale*; non-ramified pluricellular tector trichomes on the leaf of *Achimenes longiflora*; unicellular tector trichomes at *Cydonia oblonga*; non-ramified pluricellular tector trichomes and glandular ones with the pluricellular gland at *Lycopersicum esculentum*; glandular trichomes with the pluricellular secretor gland at *Nicotiana alata*; glandular trichomes with the unicellular glandular part at *Petunia hybrida*; star-shaped pluricellular tector trichomes at *Solanum melongena*.

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