

SECRETORY STRUCTURES IN SPECIES OF THE *HYPERICUM* GENUS FROM BIHOR COUNTY NOTE II. FLOWERS

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Abstract

Histological techniques were employed in order to analyse the secretory structures, namely translucent glands (secretory cavities), black glands, and type B secretory canals (secretory ducts) in the flower elements of four species of the *Hypericum* genera from Bihor County. In the Romanian Pharmacopoeia 10th edition (1993) only the *H. perforatum* species L. is mentioned as a source for *Hyperici herba* [14]. However, for the medicinal use it is possible to harvest other species from the spontaneous flora found in hill and mountain areas. These histological characters could constitute criteria for identifying possible substitutions.

Rezumat

Prin tehnici de histologie s-au studiat structurile secretoare și anume glandele translucide (buzunare secretoare) și glandele negre, canalele secretoare de tip B (ducte secretoare), în elementele florale a patru specii ale genului *Hypericum* din județul Bihor. În Farmacopeea Română Ediția a X-a (1993), pentru *Hyperici herba* este menționată numai specia *H. perforatum* L., dar este posibil să se recolteze și alte specii din flora spontană din zona de deal și de munte. Aceste caractere histologice ar putea constitui criterii de identificare a eventualelor substituiri.

Keywords: secretory structures, flowers, *Hypericum perforatum* L., *H. tetrapterum* Fries, *H. maculatum* Crantz ssp. *typicum* Frohlich, *H. maculatum* Crantz ssp. *immaculatum* Murb., *H. hirsutum* L.

Introduction

Until now, morphological characters of the flowers in species of the *Hypericum* genus have been described [2, 6, 8, 12].

The present study focuses on further understanding the morphology of the flower in the four species from the spontaneous flora of the Bihor County that we have taken into consideration. The black and translucent secretory structures of the floral elements were studied. The characterized species were: *H. perforatum* L., *H. tetrapterum* Fries, *H. maculatum* Crantz (var. *typicum* Frohlich and var. *immaculatum* Murb.), *H. hirsutum* L. The

secretory structures in the stems and leaves of these species have been described in Note I [5].

Materials and Methods

The aerial parts of 4 species of *Hypericum* were harvested during June-July 2011 (Table I). For the histological analyses fresh fragments of stems and flowers were fixed in a alcohol:acetic acid (3:1) mixture.

Table I

Species of the *Hypericum* genera from Bihor district and the areas of harvesting

Current No.	Species	Unit place	Date
1.	<i>Hypericum perforatum</i> L.	Tileagd	08.06.2011
2.	<i>Hypericum tetrapterum</i> Fries	Pietroasa	20.07.2011
3.	<i>Hypericum maculatum</i> Crantz var. <i>typicum</i> Frohlich <i>Hypericum maculatum</i> Crantz var. <i>immaculatum</i> Murb.	Stâna de Vale	16.07.2011
4.	<i>Hypericum hirsutum</i> L.	Vadul Crișului	03.07.2011

The characterization of secretory structures in the floral elements of the 4 *Hypericum* species was performed by examination with a stereomicroscope (7x) and an optical binocular microscope (40x, 100x). A Canon A550 camera attached to the ocular of the stereomicroscope and microscope with an adapter was used for photographs, which were then processed with the ACD See Photo Manager program.

Results and Discussion

Secretory structures identified by stereomicroscopy and optic microscopy in the flower elements of *Hypericum perforatum* L., *H. tetrapterum* Fries, *H. maculatum* Crantz ssp. *Typicum* Frohlich, *H. maculatum* Crantz ssp. *Immaculatum* Murb., *H. hirsutum* L. were: **translucent glands**, spherical or oblong, with one cavity delimited by two layers of cells. The internal layer consists of thin-walled secretory cells. The external layer consists of thicker-walled parenchymatous cells [1]; **type B canals of different length (secretory ducts)** have the same structure as translucent glands and look like elongated glands [1]. Ciccarelli et.al (2001) performed a research on the *H. perforatum* L. species, regarding the composition, the ontogenetic development and the secretion products - resins, lipids, alkaloids, volatile oil [7, 11], tannins - of this type of canals. Soelberg et al (2007) study mentions the accumulation of hyperforin in the translucent glands. Gîtea et al (2010) study establishes the quantity of hyperforin in some *Hypericum* species; **black glands** [3] were spherical or oblong, elongated or pedunculated. The black glands which produce

hypericin were described by Curtis and Lersten (1990). Microscopic and ultra-structural observation demonstrated that hypericin was accumulated in the large central vacuole of mature secretory cells [1, 4, 9, 10, 13]. Translucent glands, type B canals and black glands are located in the parenchyma of sepals and petals.

Hypericum perforatum L. (Figure 1)



Figure 1

Hypericum perforatum L., 1-Sepals; 2-Petals; 3-Stamens; 4-Pistils;
ebkg-elongated black gland; obkg-oblong black gland; pi-pistils; Sd-secretory
duct; Tg-translucent gland

Sepals:

- translucent glands were distributed predominantly along the margins;
- secretory ducts were distributed between the veins;
- rare spherical, oblong or elongated black glands alternating with the veins were observed.

Petals:

- translucent glands were distributed predominantly on the tips and along the margins;
- secretory ducts were distributed between the veins;
- spherical, oblong black glands were distributed predominantly on the tips and along the margins while elongated glands between the veins;

Translucent glands, type B canals and black glands are located in the parenchyma of sepals and petals.

Stamens: each anther had one spherical black gland.

Pistils: no black glands.

Hypericum tetrapterum Fries (Figure 2)

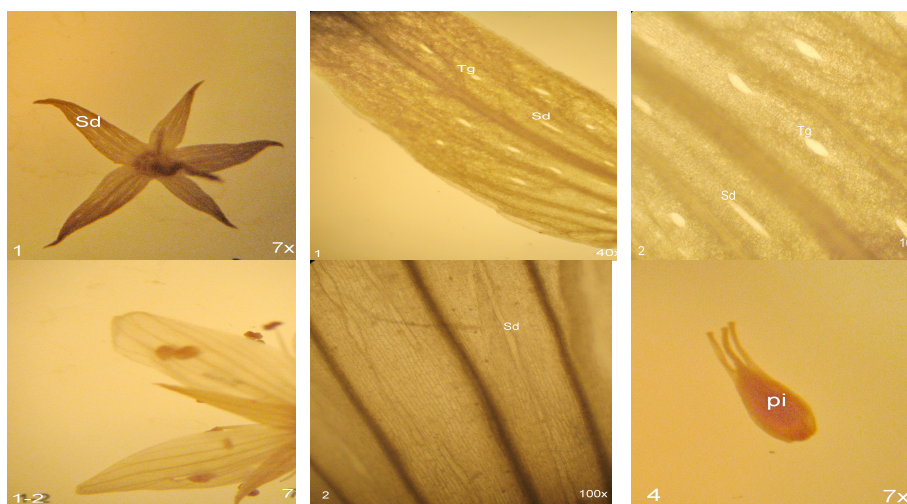


Figure 2

Hypericum tetrapterum Fries, 1-Sepals; 2-Petals; 4-Pistils;
ebkg-elongated black gland; obkg-oblong black gland; pi-pistils; Sd-secretory
duct; Tg-translucent gland

Sepals:

- translucent glands were distributed between the veins;
- rare secretory ducts;
- rare spherical or oblong black glands were observed on the tips.

Petals:

- rare translucent glands were distributed predominantly on the tips and along the margins;
- rare secretory ducts were distributed between the veins;

- rare spherical or oblong black glands were distributed predominantly on the tips.

Stamens: each anther had one spherical black gland (like *H. perforatum*).

Pistils: no black glands.

Hypericum maculatum Crantz var. *typicum* Frohlich (Figure 3)



Figure 3

Hypericum maculatum Crantz var. *typicum* Frohlich, 1-Sepals; 2-Petals; 4-Pistils; ebkg-elongated black gland; obkg-oblong black gland; pi-pistils; Sd-secretory duct; Tg-translucent gland

Sepals:

- translucent glands were distributed predominantly along the margins;
- secretory ducts were distributed between the veins;
- rare spherical or oblong black glands were distributed predominantly around the tips.

Petals:

- translucent glands-no, accidentally;
- without secretory ducts;
- spherical, oblong black glands were distributed predominantly on the tips and along the margins and elongated glands between the veins.

Stamens: each anther had one spherical black gland (like *H. perforatum*).

Pistils: no black glands.

Hypericum maculatum Crantz var. *immaculatum* Murb. (Figure 4)



Figure 4

Hypericum maculatum Crantz var. *immaculatum* Murb., 1-Sepals; 2-Petals; 4-Pistils; ebkg-elongated black gland; obkg-oblong black gland; pi-pistils; Sd-secretory duct; Tg-translucent gland

Sepals:

- both translucent glands and secretory ducts were distributed between the veins;
- accidentally black glands.

Petals:

- translucent glands were distributed predominantly on the tips and along the margins;
- secretory ducts were distributed between the veins;
- accidentally black glands.

Stamens: each anther had one spherical black gland (like *H. perforatum*).

Pistils: no black glands.

Hypericum hirsutum L. (Figure 5)

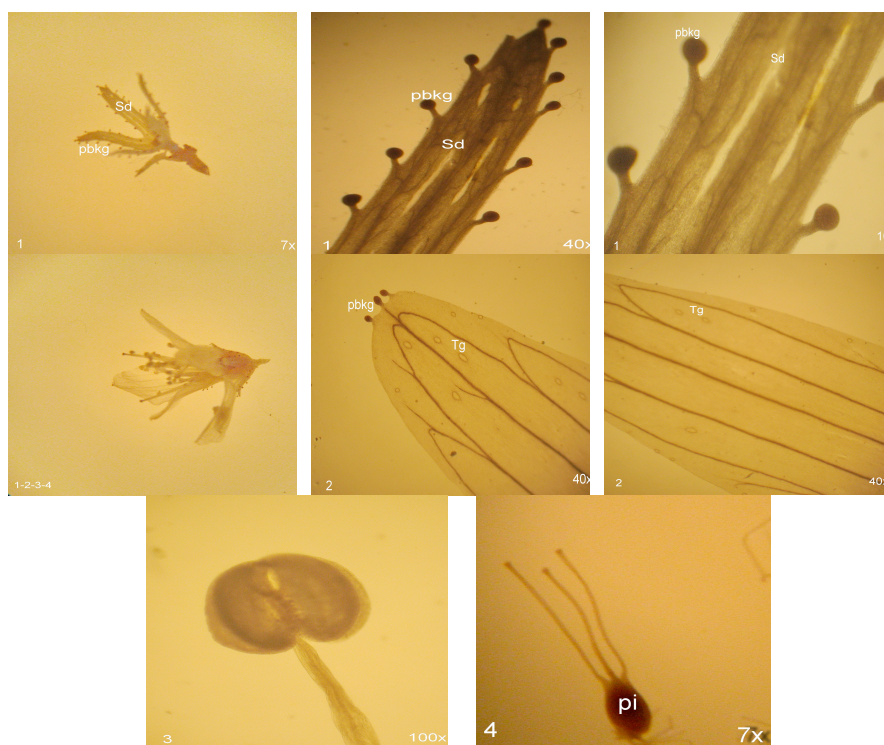


Figure 5

Hypericum hirsutum L., 1-Sepals; 2-Petals; 3-Stamens; 4-Pistils; pbkg - pedunculated black gland; pi-pistils; Sd-secretory duct; Tg-translucent gland

Sepals:

- translucent glands and secretory ducts were distributed between the veins;
- pedunculated spherical black glands were observed along the margins.

Petals:

- rare translucent glands were distributed on the tips and along the margins;
- no secretory ducts;
- 1-4 pedunculated spherical black glands on the tips.

Stamens: no black glands.

Pistils: no black glands.

Conclusions

Considering the morphology of structures that secrete active substances in *Hypericum* flowers, it is recommended to avoid any substitution in *Hyperici herba* of *Hypericum perforatum* flowers with the flowers of other *Hypericum* species that we studied. However, some substitutions with the flowers of the *Hypericum maculatum* Crantz var. *typicum* Frohlich species may be acceptable.

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