Modern Phytomorphology **4**: 65–68, 2013

MORPHOLOGICAL AND ANATOMICAL STUDIES OF *CYANI HERBA*

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Abstract. Morphological and anatomical investigation were carried out on stem, leaves, flowers and bracts of the species *Centaurea cyanus* L. The diagnostic parameters of vegetal product *Cyani herba* were defined.

Key words: *Centaurea cyanus, Cyani herba*, macroscopy, microscopy, diagnostical features

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Introduction

Centaurea cyanus L. is one of the species of Asteraceae family that has not been the subject of many investigations. It is an annual plant, growing as a weed in the fields. It is also used as ornamental plant because of its intense blue flowers. Cornflower has a long history of herbal use. The officinal vegetal product is *Cyani flores*. Externally it is used as anti-inflammatory and astringent for eye ailments and skin cleansing. An eye wash made with cornflower blossoms is used for conjunctivitis as well as to relieve strained, tired and puffy eyes. The dried flowers are antipruritic, antitussive, weakly diuretic, emmenagogue, ophtalmic, very mildy purgative, and tonic (Garbacki *et al.* 1999).

According to our investigations (Turcan *et al.* 2011) and in agreement with (Pîrvu *et al.* 2008, 2012) aerial parts of *C. cyanus* are an incontestable source of many phenolic compounds and polysaccharides. Pharmacological studies pointed out strong gastroprotective effect of the *Cyani herba* selective extracts (Pîrvu *et al.* 2012). Since *Cyani herba* is not officinal vegetal product we decided to conduct morphological and anatomical studies of cornflower aerial parts. The aim of this research was to define diagnostical features of organs of vegetal product *Cyani herba*.

Results and discussion

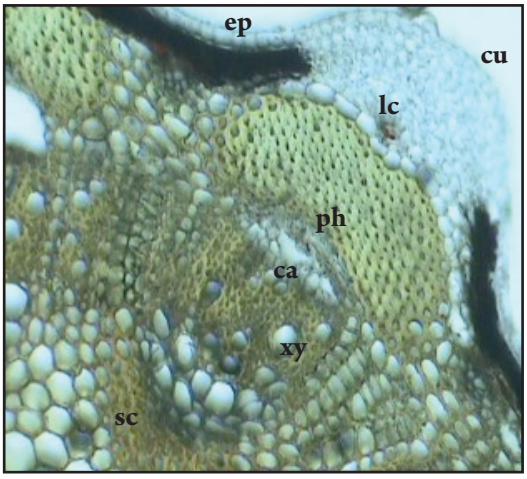
Common morphology of Centaurea cyanus

C. cyanus is an annual plant growing to 1-1.5 m tall, with grey-green branched stems and tap root system. The leaves are lanceolate, 1-4 cm long, arranged alternately on the stem, and like the stem are covered more or less with white cobwebby down that gives the whole plant a somewhat dull and grey appearance. The flowers are most commonly of an intense blue colour, produced in flowerheads 1.5-3 cm diameter, with a ring of a few large, spreading ray florets surrounding a central cluster of disc florets. The fruits are achenes.

Macroscopic identification of Cyani herba

Cyani herba consists of dried fragments of stem, leaves, inflorescences, and marginal, central flowers, bracts. Stem up to 3 mm in diameter, fistular, bright green, longitudinally furrowed, slightly pubescent. Leaves linear, a prominent central vein, both surfaces pubescent (Fig. 1). The flowers are produced in flowerheads 1.5-3 cm diameter, with a ring of a few large, spreading ray florets surrounding a central cluster of disc florets. The ray florets up to 2 cm length, sterile, consist of fused petals with small 5-8 upper teeth. In the disc florets the petals are fused into a tube five apical lobes. They are bisexual, containing both fertile anthers and a fertile pistil. The bracts, 12-15 mm length, 5-9 mm width, enclosing the hard head of the flower are numerous, with tightly overlapping

Fig. 1. *Centaurea cyanus* leaf with protective trichomes.



◄ **Fig. 2.** Cross section through the *Centaurea cyanus* stem: **ep** – epidermis; **ca** – cambium; **cu** – cuticula; **lc** – latex channel; **ph** – phloem; **sc** – sclerenchyma; **xy** – xylem.

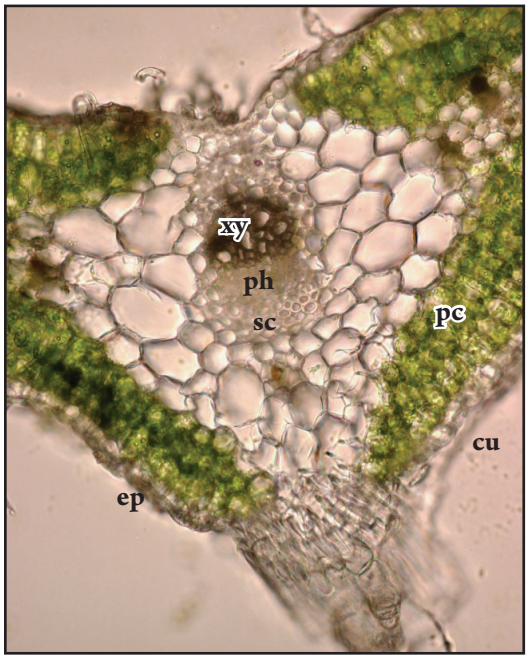


Fig. 3. Cross section through the *Centaurea cyanus* leaf: **ep** – epidermis; **cu** – cuticula; **pc** – palisade cells; **ph** – phloem; **sc** – sclerenchyma; **xy** – xylem.

scales, each bordered by a fringe of brown teeth. Odour is faint, pleasantly aromatic.

Microscopic characteristic of Cyani herba

Microscopic stem features. The stem is wavy in outline, with distinct ridges and furrows. The epidermis with a thick cuticle, composed of a single, outermost layer of cells. Cortex is multilayer. It comprises a monolayer collenchyma close to the epidermis and parenchymatous cells. There are latex vessels. The stem contains vascular bundles of various size embedded in the parenchyma of the stem. They are collateral and open, consist of xylem, cambium and phloem, as well as capped by a sheath of sclerenchyma (Fig. 2).

Microscopic leaf features. The leaf has isobilateral structure. Both the adaxial epidermis and the abaxial epidermis are simple, with thick cuticle. The leaves are amphistomatic, with anomocitic stomates. The leaves are densely covered with protective trichomes on both sides, very numerous on the abaxial epidermis. Trichomes are pluricellulare, with one-celled sharp apex and widened at the base (Fig. 5). The mesophyll consists of three layers of condensed long palisade cells. The vascular bundles bordered by parenchyma and sclerenchymatous sheath. In the median region of the leaf, there is a large vascular bundle. In the leaves one can contains latex vessels (Fig. 4).

Microscopic flower features. The epidermis of the ray florets consists of elonged cells, straight walls. They contain anthocyanins. Disc florets have brown, spheric polen grains on stigma.

Microscopic bract features. There is a single layered epidermis having flat-ovoidal cells. The adaxial epidermis has protective, bicellular,

scutiform trichomes, lenght 3.75 μm (Fig. 6). Latex vessels are present.

Based on the characters of morphology and anatomy the key features for identification of vegetal products *Cyani herba* are presented below:

Stem – fistular, longitudinally furrowed, slightly pubescent; collateral, open vascular bundles.

Leaves – linear, prominent central vein, both surfaces pubescent; pluricellulare trichomes, with one-celled sharp apex and widened at the base.

Flowers – elonged epidermic cells contain anthocyanins.

Bracts – protective, bicellular, scutiform trichomes.

In stem, leaves, and bracts one can observe latex vessels.

Fig. 4. Leaf protective trichomes and latex channals in *Centaurea cyanus*.

Fig. 5. Base of leaf protective trichome in *Centaurea cyanus.*

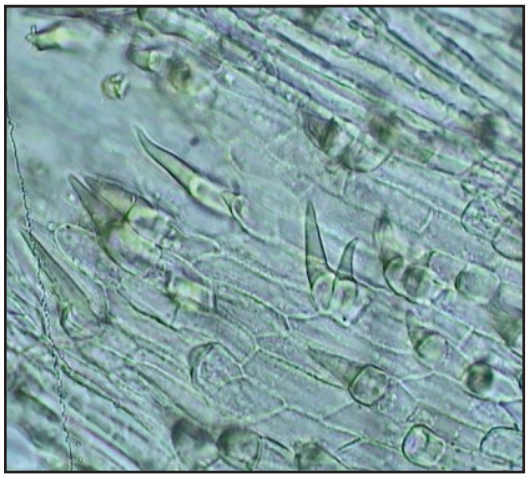


Fig. 6. Epidermis of *Centaurea cyanus* bract.

Conclusions

Morphology and anatomy of *Cyani herba* were examined in this study. For macroscopic identification of *Cyani herba*, fistular furrowed stem, pubescent with prominent median vein leaves, and flowerheads with ray and disc florets are the most important features to be considered. Microscopically, the aerial parts of *C. cyanus* can be clearly identified from protective pluricellulare long trichomes on the epidermis of leaf, whereas on the epidermis of bracts from protective bicellulare scutiform trichomes. Moreover, the presence of latex vessels was observed in the stem, leaves, and bracts.

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