



Received on 11 December 2022; received in revised form, 25 January 2022; accepted, 28 January 2023; published 31 January 2023

DETERMINATION OF MORPHOLOGICAL AND ANATOMIC SIGNS OF *CYNOGLOSSUM OFFICINALE* L. (BORAGINACEAE)

F. K. Serebryanaya^{* 2}, Z. B. Rubaeva¹ and D. A. Konovalov²

Northern Ossetian State Medical Academy¹, Vladikavkaz, Russian Federation, Russia.

Pyatigorsk Medical and Pharmaceutical Institute², Pyatigorsk, Russian Federation, Russia.

Keywords:

Black root officinalis (*Cynoglossum officinale* L.), Morphological and anatomical examination, Anatomical and diagnostic signs, Microscopic examination

Correspondence to Author:

F. K. Serebryanaya

Northern Ossetian State Medical Academy, Vladikavkaz, Russian Federation, Russia.

E-mail: f.k.serebryanaya@pmedpharm.ru

ABSTRACT: The expansion of research on finding herbal sources for producing new effective and safe medicinal herbal remedies is an urgent pharmacy task. One of the ways to increase the amount of herbal medicinal preparations is a broad study of the pharmacological action of non-pharmacopoeial medicinal plants used in folk medicine. One of these plants is Black root officinalis (*Cynoglossum officinale*), which grows wild in the European part of Russia, Siberia, Central Asia, and the Caucasus, including North Ossetia, but does not form significant thickets. Today *Cynoglossum officinale* is used mainly in folk medicine as an anti-inflammatory, analgesic, sedative, and expectorant. When applied externally, *Cynoglossum* exhibits antipruritic properties and is capable of tissue regeneration. Therefore, the pharmacognostic study for further research on pharmacological effects on the human body is quite promising.

INTRODUCTION: The black root of medicine is widely used in the folk medicine of the Russian Federation and foreign countries, also actively used in homeopathy, but no normative document has been developed for it, which determines the relevance for morphological-anatomical signs to introduce them into official medicine^{8, 13, 14}. The black root medicinal a Pharmacologically and biologically highly active plant, contains alkaloids, saponins, essential oil, tanning agents, resins, and organic acids^{3, 5}. Heliosupine, heliosupine N-oxide, 3'-acetylheliosupine and viridiflorine were isolated and identified from *Cynoglossum officinale*⁷. Altogether 14 pyrrolizidine alkaloids were

separated and identified by GLC and GLC-MS in the alkaloid extracts from different parts of *Cynoglossum officinale*⁹. From *Cynoglossum amabile* five pyrrolizidine alkaloids were recorded: supinine, amabiline, rinderine, echinatine and 3'-O-acetylechinatine. They exhibit a high antibacterial activity and have sedative, soft, binder, anti-inflammatory, anticonvulsant and anaesthetic actions⁶.

The leaf extracts of *Cynoglossum amplifolium* have been used as traditional medicine for managing eye, ear, and wound infections in Ethiopia⁷. The leaf extracts of *C. amplifolium* exhibited broad-spectrum antimicrobial activity, highlighting their potential as phytotherapeutic drugs in preventing and treating infections caused by *S. aureus*, *S. pneumoniae* and *E. coli*. Further investigations for isolating specific compounds and elucidating mechanisms are required to address the need for novel antibacterial drugs^{7, 10, 11}.



The Aim of the Present Study:

Morphological: anatomical investigation of *Cynoglossum officinale* medicinal making it possible to determine authenticity and identify signs of plant raw material in detail.

MATERIALS AND METHODS: The object of research of this work is the herb of *Cynoglossum officinale* growing in the territory of North Ossetia in the cultivated form in the GGAU Biotechnology Research Institute. Microscopic studies were carried out according to FFS.1.5.3.0003.15 Technics of microscopic and microchemical investigation of raw materials and medicinal plants.

RESULTS AND DISCUSSION: In the study of external signs of raw material, it was found that it is a two-year-old herbaceous plant with a straight-stemmed branch stalk 35 cm high **Fig. 1**. The leaves are simple, regular, lancet-shaped, covered with thin greyish felt, reaching in the lower part of the stem length 30-35 cm. The plant has a characteristic hard-haired hemorrhage, consisting of spaced hairs sitting on warts^{1,2}.

The inflorescences are cymoid, and monochazial and form long curls. Flowers with a double circumflower, the crown is practically actinomorphic, funnel, folding 5-7 mm in diameter, with ovoid-rounded blades. The crown is blue-purple, purple (dirty-purple, rarely blue, yellowish or white), with blunt, velvety, almost white scales, cup up to the middle divided into lancet, sharp lobes⁴. There is a change in the colouring of the petals of the crown from muddy raspberry to purple. The flower legs are felt, with the fruit lengthening to 15 cm and arcally lowering.

The fruit is dry, disintegrating at ripening into 4 nuts, flattened, planted all over the surface with hooked spikes. The parts of the fruit are wrinkled, at the base hollowed out, with a folded ring around the recess, oblique, egg-shaped, attached to a flat flower¹⁵. Transverse cuts were made with blades and coloration was carried out with appropriate reagents: a solution of phloroglucine and 50% sulphuric acid. Microarrays fixed glycerine to water in a ratio of 1:1^{8,13}.



FIG. 1: VIEW OF THE HERBACEOUS PLANT OF *CYNOGLOSSUM OFFICINALE*

The sheet plate is of the dorsoventral type. The cross-section of the sheet plate has a well-defined cover tissue - an epidermis - characterized by abundant powdering, formed by simple single-celled and multi-celled hairs. Beneath the epidermis is a palisade mesophyll, which forms one layer of elongated cells tightly pressed against each other. The sponge mesophyll is represented by parenchyme cells of various shapes. Under the lower epidermis there is an additional layer of palisade parenchyme, the cells of which are

significantly smaller than the upper layer. Conducting system type in the area of the main vein it is possible to find a single sufficiently large conducting collateral bundles, lateral secondary veins also have a collateral structure. Mechanical tissues are represented by sclerenchyme, which is adjacent to the fluorine part of the conductive bundles, as well as collegiate cells. The leaf is amphistomatic. The lower epidermis has more curved anticlinal cell walls and stomatal anomocytical-type apparatuses are often located.

On the top of the sheet plate, the curvature of anticlinal walls is significantly smaller the number of stomata is significantly smaller compared to the lower epidermis^{1,12}.

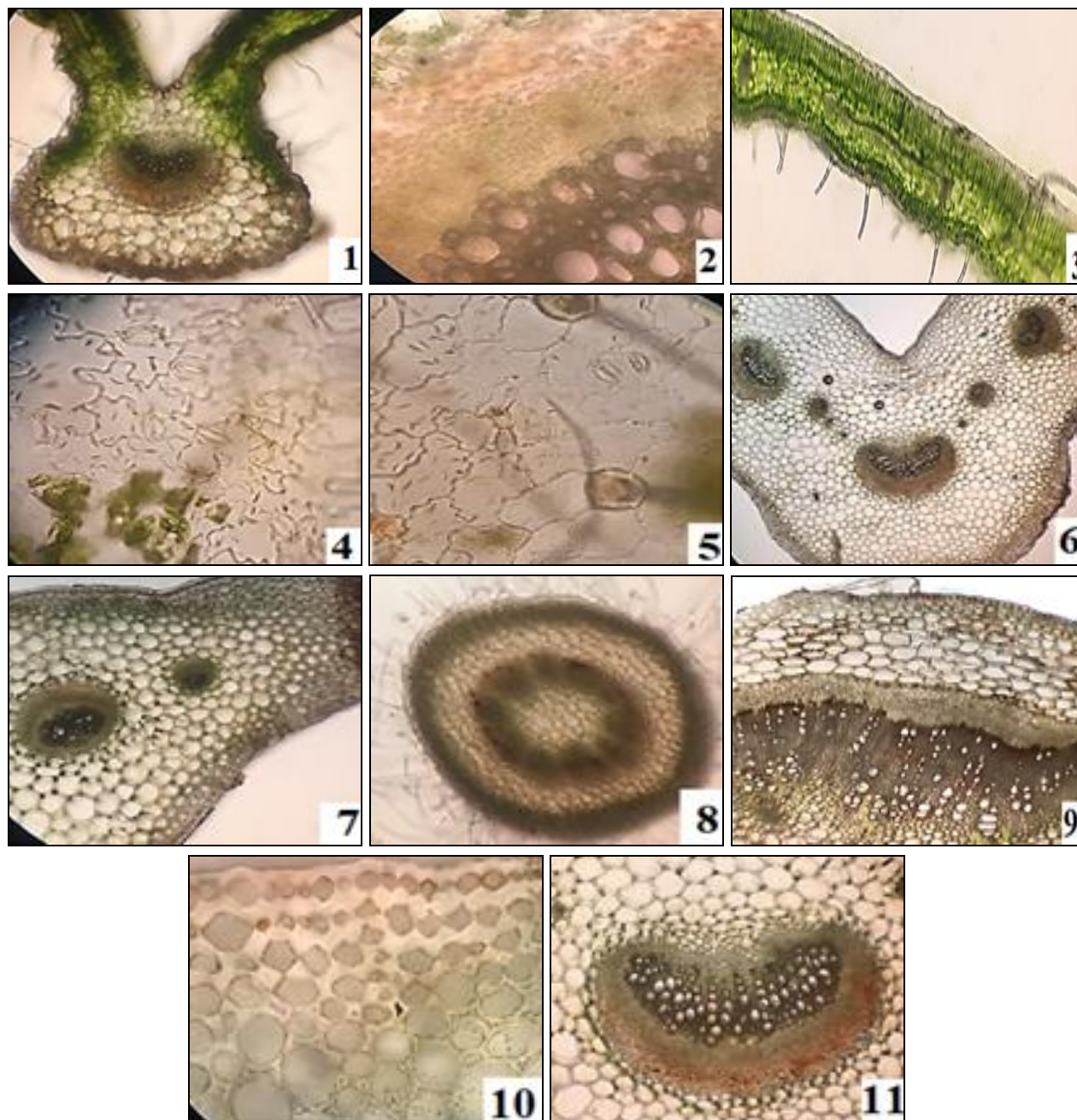


FIG. 2: MICROSCOPICAL INVESTIGATIONS OF *CYNOGLOSSUM OFFICINALE*. 1, Transversal leaf section, 2 - vascular bundle of the leaf, 3- mesophyll types on the transversal section, 4- upper epidermis of the leaf, 5-lower epidermis of the leaf, 6- cross section of the petiole, 7-vascular bundles, 8- cross section of the stem, 9-stem vascular bundles, 10 –angular collenchyma of the petiole, 11- collateral vascular bundle of the leaf petiole.

The cross-section of the leaf stem has a characteristic saddle shape with a characteristic notch on the abaxial side. The cover tissue is represented by an epidermis the hemorrhage is represented by rare hairs. The presence of several layers of collenchyma of both an angle and a plate type is characteristic. In the area of lateral protrusions, the number of layers of collenchyma

reaches 4-5. The number of conductive beams conducting the beam system varies from 3 to 9. Conductive collateral vascular bundles, the dorsal conventional single bundle, or accompanied by 2 small additional vascular bundles. The parenchyma lining of the vascular bundles is characteristic and is represented by cells with light pink content. The fluorine part of large vascular bundle is adjoined by

sclerenchyme. The stem on the cross-section has a rounded shape, the covering tissue of the epidermis. Dense pollination, represented by numerous large single- and multi-cellular hairs, is located under the epidermis assimilation parenchyma. Parenchyme elements and sclerenchyme fibers represent the pericyclic zone. The conducting system of the transition type, at the top of the stem, the conducting system is represented by separate conductive sheaves of the collateral type, arranged in a circle, forming the eustele.

As for the stem in the lower part, the conducting system forms a non-scheduled type, with the activity of the inter-tuple cumbia. The xylem is differentiated into large receptacles and small-scale ligated parenchyme elements. Parenchyma is well developed and is represented by large parenchyme cells.

CONCLUSIONS: The plate epidermis's structure, the plate's cross-section, and the leaf stem's cross-section of the stalk are studied. The results of the studies reveal morphological and anatomical characteristics that enable them to be identified and determine the authenticity of plant material.

ACKNOWLEDGEMENT: Nil

CONFLICT OF INTEREST: Nil

REFERENCES:

1. Akçin ÖE, Çoşkunçelebi K and Şenel G: Foliar anatomy of *Cynoglossum* L. (Boraginaceae) from North Anatolia, Turkey//Bangladesh J. Plant Taxon Bangladesh Association of Plant Taxonomists 2012; 19(2): 101-108.
2. Akçin ÖE: Seed coat and fruit surface micromorphology of some *Cynoglossum* L. (Boraginaceae) species. Bangladesh J Bot 2008; 37(2): 115-119.

3. Akçin ÖE and Bilgener M: A chemotaxonomical study on the some *Cynoglossum* L. (Boraginaceae) species. Ondokuz Mayıs University. The Scie J 2000; 11(1): 76-84.
4. Boorman LA and Fuller RM: The comparative ecology of two sand dune biennials: *Lactuca virosa* L and *Cynoglossum officinale* L. New Phytolo 1984; 96: 609-29.
5. Azimova S and Glushenkova A: *Cynoglossum officinale* L. In book: Lipids, Lipophilic Components and Essential Oils from Plant Sources 2012. DOI: 10.1007/978-0-85729-323-7_504
6. Engiso H, Worku T, Nureye D, Salahaddin M, Woldeeslassie W and Hambisa S: Antibacterial Activity of *Ritchiea albersii* Gilg and *Cynoglossum amplifolium* Leaves Extracts against Selected Bacteria. Saudi J Med Med Sci 2020; 8: 201-7
7. Joshi K: *Cynoglossum* L.: a review on phytochemistry and chemotherapeutic potential. J Pharmacognosy Phytochem 2016; 5: 4: 32-39.
8. Pharmacognosy. Atlas: tutorial. In 3 volumes. Volume 1. Samylina I.A., Anosova O.G. 2010.
9. Poly [3-(3,4-Dihydroxyphenyl)Glyceric Acid] from *Cynoglossum officinale* L. (Boraginaceae) Lali Gogilashvili, Lela Amiranashvili, Maia Merlani, Antonio Salgado, Bezhan Chankvetadze, Vakhtang Barbakadze//BULLETIN of the Georgian national academy of sciences.-2020.-vol. 14, no. 1.-p.108-113. <https://www.researchgate.net/publication/340033583>
10. Ravi Subban, Ravikumar T and Lakshmanan AJ: Pyrrolizidine Alkaloids from *Cynoglossum furcatum*. / Nigerian Journal of Natural Products and Medicine 2008; 11(1).- DOI: 10.4314/njnp.v11i1.11892
11. Pyrrolizidine alkaloids of *Cynoglossum officinale* and *Cynoglossum amabile* (Family Boraginaceae) Assem El Sahzly, T. Sarg, A. Ateya\ Biochemical Systematics and Ecology.-1996.-24(5): 415-421. Stabell E, Upadhyaya MK and Ellis BE: Role of seed coat in regulation of seed dormancy in hound's tongue (*Cynoglossum officinale*). Weed Science 1998; 46: 344-50.
12. State Pharmacopoeia of the Russian Federation / Ministry of Health of the Russian Federation. - XIII ed. -Vol.1.- Moscow, 2015.- OFS.1.5.3.0003.15. Technique of microscopic and microchemical study of medicinal plants and herbal medicines.
13. State Pharmacopoeia of the Russian Federation. 14th ed. Ministry of Health RF; 2018.
14. Taxonomic revision of the southern African species of the genus *Cynoglossum* L. (Boraginaceae) Lydia Madika, Annah Moteete\Author-formatted, not peer-reviewed document posted on 31/08/2021. DOI: <https://doi.org/10.3897/arphapreprints.e73746>

How to cite this article:

Serebryanaya FK, Rubaeva ZB and Konovalov DA: Determination of morphological and anatomic signs of *Cynoglossum officinale* L. (Boraginaceae). Int J Pharmacognosy 2023; 10(1): 224-27. doi link: [http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.10\(1\).224-27](http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.10(1).224-27).

This Journal licensed under a Creative Commons Attribution-Non-commercial-Share Alike 3.0 Unported License.

This article can be downloaded to **Android OS** based mobile. Scan QR Code using Code/Bar Scanner from your mobile. (Scanners are available on Google Playstore)