The problem of authenticity and good quality of samples of medicinal raw materials Herba Astragali membranacei from various manufacturersA.A. Frolova, E.V. Grishanina, N.A. Durnova, M.A. Berezutsky, W.A. Matvienko Saratov State Medical University. IN AND. Razumovsky (r. Saratov)

The problem of the authenticity and good quality of samples of Herba Astragali membranacei medicinal raw materials from different manufacturers

AA Frolova, EV Grishanina, NA Durnova, MA Berezutsky, WA Matvienko Saratov State Medical University named after VI Razumovsky (Saratov, Russia)

SUMMARY

This study analyzed samples of the herb Astragalus membranacei (Herba Astragali membranacei) from different manufacturers and established the correspondence of each sample to the declared name. Astragalus membranous has a variety of pharmacological properties and belongs to traditional medicines in China, and is also used in traditional medicine in Russia, therefore, its falsification can significantly affect the health of patients. The genus Astragalus is one of the polymorphic genera and includes species similar in morphological characteristics, which can be mistakenly harvested as medicinal plant raw materials: this is facilitated by the professional ignorance of some procurers and insufficient control of the authenticity of raw materials by the control and analytical services.

Key words: Astragalus membranous, Astragalus membranaceus, herba Astragali membranacei, traditional medicine, falsification.

RESUME

In present study we analyzed samples of the herb Astragalus membranacei (Herba Astragali membranacei) from different manufacturers and established the correspondence of each sample to the declared name. Astragalus membranous has a variety of pharmacological properties and belongs to traditional medicines in China, and is also used in traditional medicine in Russia, therefore, its falsification can significantly affect the health of patients. The genus Astragalus is one of the polymorphic genera and includes species similar in morphological characteristics that can be mistakenly harvested as medicinal plant raw materials: this is facilitated by the professional ignorance of some procurers and insufficient control of the authenticity of raw materials by the control and analytical services.

Keywords: Astragalus membranaceous, herba Astragali membranacei, traditional medicine, falsification.

INTRODUCTION

In folk medicine, representatives of the numerous genus Astragalus are widely used for the treatment and prevention of various diseases. One of the promising sources of biologically active substances is astragalus membranous (Astragalus membranaceus (Fisher) Bunge), the extract of which has a tonic and tonic effect [6]. In oriental medicine, the root is used as a hypotensive, cardiotonic, diuretic, diaphoretic, immunomodulatory agent [1, 2, 4, 6]. It has been proven that the extract of the aerial part of Astragalus membranosa has neuroprotective properties [10].

Astragalus membranous is a traditional traditional medicine in China, Mongolia, Tibet, Japan. In many countries, including Russia, scientific data on astragalus membranous root have been accumulated [4, 6, 12], in China and Japan, astragalus root is a pharmacopoeial medicinal raw material [8, 11], therefore this type of raw material is rarely falsified.

In folk medicine of Russia, in addition to the root, the aerial part is used Astragalus membranaceus, regulatory documents governing itauthenticity and good quality, is absent, in connection with which the falsification of this plant raw material, which goes on the free sale as a dietary supplement to food or herbal teas, is possible.

In this regard, a comparative pharmacognostic analysis of herba Astragali membranacei from various manufacturers.

MATERIALS AND METHODS

The objects of research are samples of herba medicinal plant raw materials purchased in online stores. Astragali membranacei threemanufacturing firms: LLC "Tsvet Leta", LLC "Company HORST", LLC "Belovodye".

When conducting macroscopic analysis, we were guided by the OFS 1.5.1.0002 methodology. 15 "Herbs" of the State Pharmacopoeia of the XIV edition. The grass prepared for analysis was placed on a glass plate, carefully straightening the stem, leaves, flowers, and examined with the naked eye and using a stereomicroscope (20x; 40x) [3]. When carrying out microscopic analysis, SP XIV was also guided. Micropreparations were prepared in accordance with the methods specified in the General Pharmacopoeia Monograph 1.5.3.0003.15 "Technique of microscopic and microchemical examination of medicinal plants and herbal medicinal preparations", from crushed leaves, pieces of a leaf blade; calyx and its pieces, corolla, pieces of the stem [3]. The prepared micropreparations were studied using a laboratory microscope "Optika microscopes Italy B-66" for this purpose.

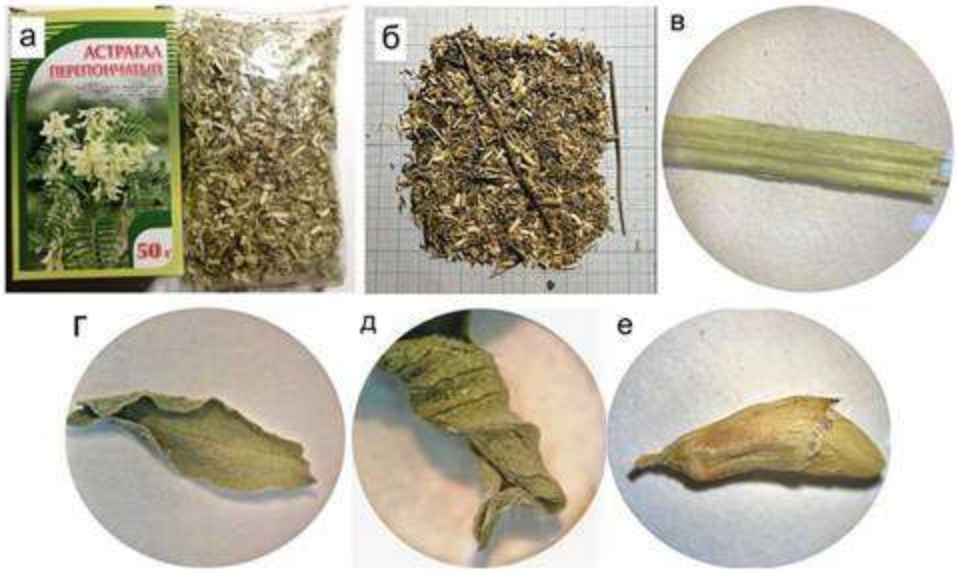
The analysis of the marking was carried out in accordance with TR CU 021/2011 Technical

regulations of the Customs Union "On food safety", Federal Law of 27.12.2018 No. 61 "On the circulation of medicines" [7, 9].

RESULTS AND DISCUSSION

1. Macro- and microscopic analysis of raw materials of the company "Company HORST"Macroscopic analysis of the crushed raw material (Fig. 1a, b) revealed pieces of baskets, individual flowers, leaves, and stems of various shapes. The color is grayish-green with whitish-yellowish blotches.

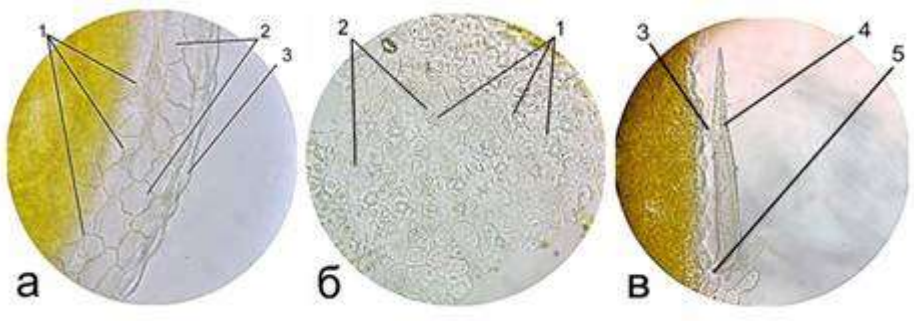
Fragments of stems are ribbed, hollow (Fig. 1c), the shape of the leaf blade is elliptical or oblong-ovate (Fig. 1d), there are single hairs on the underside (Fig. 1e). The calyx is broadly bell-shaped, pubescent on the teeth with whitish hairs, the corolla is moth-shaped, yellow (Fig. 1f).



Rice. 1. Raw materials of astragalus webbed company LLC "Company HORST": a - packaging raw materials;
b - crushed raw materials; c - a fragment of a grooved stem; d - a fragment of a complex odd-pinnate leaf (upper side); e - a fragment of a leaf with hairs (lower side); e - unblown bud

Microscopic analysis made it possible to establish that the cells of the epidermis have an isodiametric shape with sinuous walls, while the cells of the upper epidermis are larger and the tortuosity of their walls is more pronounced (Fig.2a) than in the cells of the lower epidermis of the leaf (Fig.2b).

The leaf is amphistomatic, there are more stomata on the underside of the leaf, they are located more often than on the upper side. The type of stomatal apparatus is anocytic, the number of peri-ostal cells is 3-4 (Fig. 2a, b). On the lower epidermis of the leaf, there are thick-walled, single-celled, simple hairs with a warty cuticle (Fig. 2c).



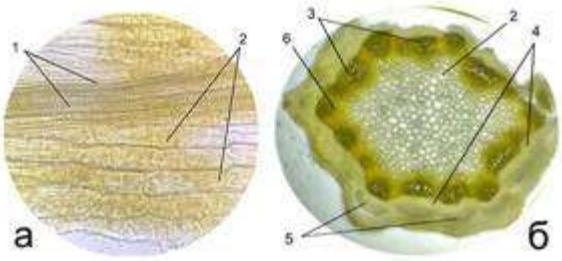
Rice. 2. Microscopic analysis of the leaf of astragalus membranous company LLC "Company HORST ":

a - epidermis of the upper side of the leaf; b, c - fragments of the lower side of the sheet (enlarged. 400 ×):

1 - anomocytic stomata; 2 - cells of the epidermis with sinuous walls; 3 - epidermal cells along the edge of the leaf; 4 - a simple hair; 5 - the base of the hair

The structure of the stem was examined in transverse and longitudinal sections. The epidermis of the stem is represented by rectangular cells with straight walls, elongated along the length of the stem (Fig. 3a).

The ribbed stem has a bundle type of structure. In the ribs, the collenchyma forms cords, under the collenchyma there are bundles consisting of phloem and xylem, with sclerenchyma on their inner side. Large cell parenchyma is located under the sclerenchyma (Fig. 3b).

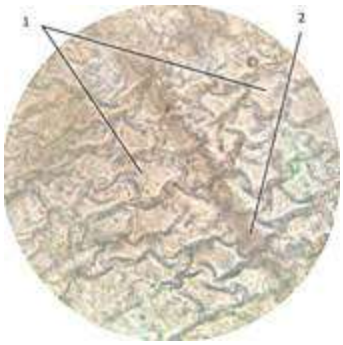


Rice. 3. Microscopic analysis of the stalk of Astragalus membranous company LLC "Company HORST":

a - a fragment of a longitudinal section of the stem (magnified 400 ×); b - a fragment of a cross section stem (enlarged 40 ×):

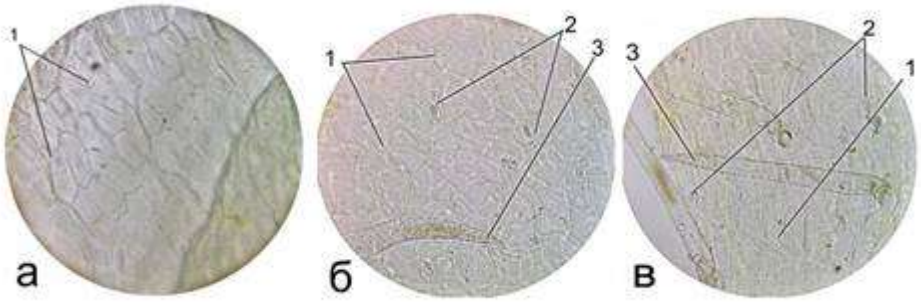
1 - vessels of the conducting beam; 2 - parenchyma; 3 - xylem; 4 - phloem; 5 - collenchyma; 6 - sclerenchyma

When examining the petal from the upper and lower sides, isodiametric cells of the epidermis with winding walls are visible. The cells on the upper side do not differ from the cells on the lower side; no hairs are found on the petal (Fig. 4).



Rice. 4. Fragment of the epidermis of the petal (enlarged.400 ×):
1 - cells of the outer epidermis with convoluted cells; 2 - vein

On the epidermis, the calyx was not found on the outer side of the stomata (Fig. 5a). The walls of the epidermal cells of the calyx are less sinuous on the inner side, there is an abundance of simple hairs with a finely warty cuticle on one or two cell stalks (Fig. 5b, c).



Rice. 5. Microscopic analysis of the calyx of Astragalus membranous company LLC "Company HORST":
a - a fragment of the outer calyx epidermis; b, c - fragments of the internal epidermis cups (magnification 400 ×):
1 - cells of the epidermis; 2 - anomocytic stomata; 3 - simple hair

2. Macro- and microscopic analysis of raw materials of the company "Tsvet Leta"Macroscopic analysis of raw materials from the company "Tsvet Leta" (Fig. 6a, b) revealed a difference from the previously presented data on the herb Astragalus membranous [6]: the color of the corolla is purple-purple (Fig. 6e), but in Astragalus membranous it is yellow ... Macroscopic analysis also revealed that the leaflets have hairs on both sides (Fig.6c, d), in contrast to the membranous astragalus, in which hairs are visible only from the underside, whitish-gray and black hairs were also found over the entire surface of the calyx.

Rice. 6. Raw materials of astragalus membranous company "Tsvetleta" LLC: a - packing of raw materials;b - crushed raw materials; c - a fragment of a leaf (top side); d - a fragment of a leaf (down side);
e - a cup with a lilac-purple corolla.

Also, thick-walled unequal-armed T-shaped hairs with a warty cuticle were found on fragments of the stem, leaflet, and calyx (Figs. 7a, 8a).

The epidermis on the underside of the leaf is represented by isodiametric larger cells than in Astragalus membranous. Cells on the upper side are less convoluted than similar cells inAstragalus membranaceus (Fisher) Bunge. (Fig.7a, b). Also, peculiar hexagonal cells of the calyx with smooth walls were found (Fig. 8b).

Another difference is the structure of the petal, the epidermal cells of which have a rectangular, strongly elongated shape with winding walls (Fig. 8c).

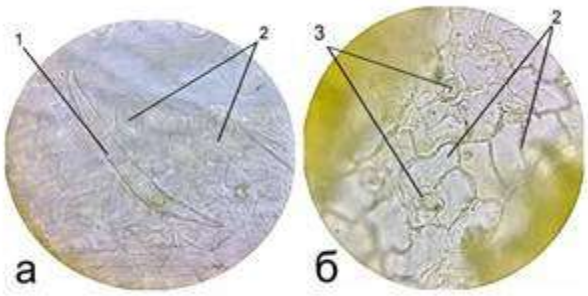
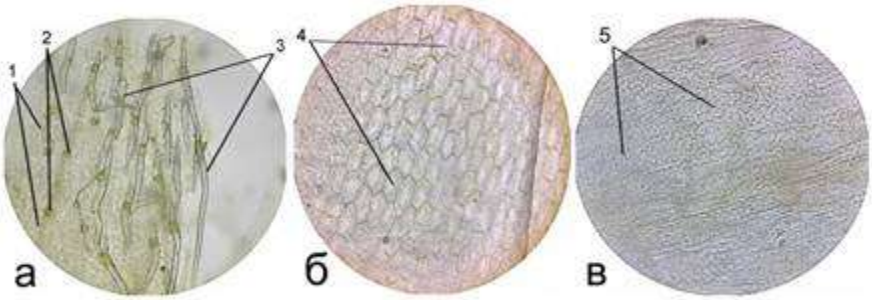


Fig. 7. Microscopic analysis of the leaf of astragalus membranous company "Tsvet summer ":
a - epidermis of the underside of the leaf; b - epidermis of the upper side of the leaf (magnification 400 ×): 1 - unequal
T-shaped hair; 2 - cells of the epidermis with sinuous walls; 3 - stomata

anomocytic type



Rice. 8. Microscopic analysis of the calyx and petal of Astragalus membranous firm LLC "Tsvet Leta":

a - a fragment of the outer calyx epidermis (magnification 100 ×); b - a fragment of the internal calyx epidermis;

c - a fragment of the outer epidermis of the petal (magnification 400 ×): - epidermal cells with winding cells;

2 - the place where the hairs are spotted; 3 - unequal T-shaped hairs;
4 - cells of the epidermis with hexagonal cells; 5 - cells of the epidermis with sinuous cells.

Thus, we can assume that the producing plant from which the raw materials of this company are obtained belongs to the Astragalus genus, but is not membranous Astragalus.

3. Macro- and microscopic analysis of raw materials of the company "Belovodye"Raw materials of the company "Belovodye" (Fig. 9a, b) are fragments of fibers, stems (Fig. 9d) or their shoots with a lignified part. Mineral impurities (Fig. 9e), fragments of the bark (Fig. 9c) and fruits of unknown origin (Fig. 9f, g), as well as several leaves (Fig. 9h, i) were found.

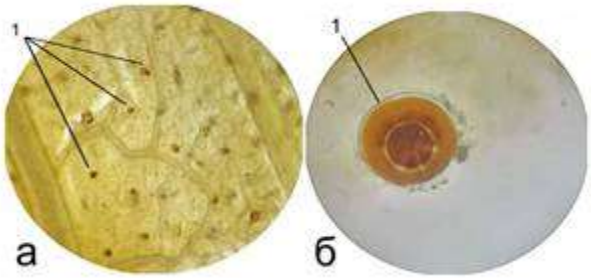
On the discovered leaves, receptacles were visible; hairs on both sides of the leaf were absent (Fig. 9h, i).

Microscopic analysis of the discovered leaves shows containers with dark contents (Fig. 10a, b).

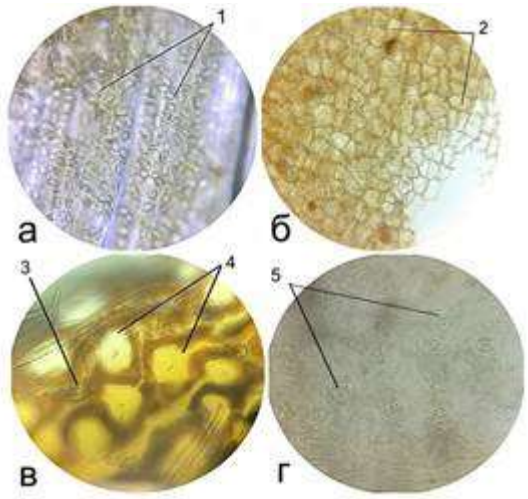
Crystals of calcium oxalate were found on a preparation of a longitudinal section of the stem (Fig.11a). Epidermal cells with smooth walls were found in the bark preparation (Fig. 11b).

Microscopy of unknown fetuses revealed anisocytic stomata - the guard cells of the stomata are surrounded by three peri-stomatal cells, one of which is much larger (or smaller) than the others (Fig.11c). Stomata of the anomocytic type with fused guard cells were also found (Fig. 11d).

Rice. 9. Raw materials of astragalus webbed company LLC "Belovodye": a - packaging of raw materials; b - crushed raw materials; c - a fragment of the bark; d - a fragment of a rounded stem; d - mineral impurities;
f, g - fruits; h - top side of the sheet; and - the underside of the sheet.



Rice. 10. Microscopic analysis of the leaf of astragalus membranous company LLC "Belovodye":
a - a fragment of the leaf epidermis (magnified 40 ×); b - container with contents (magnified 400 ×): 1 - receptacles.



Rice. 11. Microscopic analysis of the stem, bark and fruit of Astragalus membranous firm LLC "Belovodye":

a - a fragment of a longitudinal cut of the stem; b - the epidermis of the cortex; c - bean epidermis; G - micropreparation

from the surface of a fragment of raw material (magnification 400 ×): 1– crystals of calcium oxalate; 2 - cells epidermis;

3 - the place of attachment of the hair; 4 - anisocytic stomata; 5 - stomata anomocytic type

4. Discussion of the results obtained

Thus, the raw materials of the company "Belovodye", represented by fragments of unknown plants, do not at all correspond to the previously declared diagnostic features of astragalus membranous [6] in a number of parameters. In addition, during an external examination of the raw materials, numerous foreign impurities were found, including mineral and organic (remnants of stems, leaves, bark of unknown plants).

When analyzing the labeling of raw materials, it was revealed that the analyzed raw materials of all three manufacturing companies belong to food products. The herb astragalus webbed company LLC "Company HORST" meets the requirements of TR CU 021/2011 Technical Regulations of the Customs Union "On food safety" in terms of "Marking", in contrast to the other two manufacturing companies: on the packaging of LLC "Tsvetleta" date of manufacture, and on the packaging of Belovodye LLC there are no recommendations and restrictions on use, but there is an inscription: "The products have passed radiation control", which is applied to the packaging of raw materials registered as medicinal products, but not on food products, which is a violation of the requirements, established by regulatory documents [7, 9].

CONCLUSIONS

1. The product of the company "Company HORST" for macro- and microscopic signs and indicator "Marking" corresponds to the declared name "Grass Astragalus membranous" and is benign in terms of its

authenticity, the raw materials of two other manufacturing firms do not correspond to these indicators.

2. The grass of the company "Tsvet Leta" LLC has general diagnostic characteristics of the genus Astragalus, but does not correspond to the characteristics of Astragalus membranous, which contradicts the declared name of the raw material on the package. According to the indicator "Marking", the raw materials of the company "Tsvetleta" LLC do not meet the requirements of regulatory documents, since the date of manufacture is not indicated on the packaging.

3. Under the declared name "Herb Astragalus membranous" manufacturer LLC "Belovodye" sells a mixture of various types of raw materials that have no common diagnostic features with the genus Astragalus, with numerous mineral impurities. According to the "Marking" indicator, the raw materials of this company do not meet the requirements of regulatory documents, since there are no recommendations and restrictions on use on the packaging, and there is also an inscription: "The products have passed radiation control."

4. It is advisable to further study Astragalus membranous and develop normative documentation regulating the quality of this type of raw material in order to tighten control over products supplied by different manufacturers to pharmacy organizations, and to provide better quality pharmaceutical care to the population.

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Author's address

Frolova A.A., Assistant, Department of General Biology, Pharmacognosy and Botany

alisa.frolova96@yandex.ru

Grishanina E.V., 5th year student of the Faculty of Pharmacy

grishanina1998@gmail.com

Doctor of Biological Sciences Durnova N.A., associate professor, head. Department of General Biology, Pharmacognosy and Botany

ndurnova@mail.ru

Doctor of Biological Sciences Berezutsky M.A., Professor of the Department of General Biology, Pharmacognosy and Botany

berezutsky61@mail.ru

Matvienko U.A., Post-Graduate Student, Department of General Biology, Pharmacognosy and Botany

homiackova.ulia@yandex.ru

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