

## Pharmacognostic study of *Cyperus rotundus* L.

V.A. Ermakova, N.V. Bobkova, Chan Thi Tuet  
(Sechenov First Moscow State Medical University, Moscow)

## Pharmacognostic study of *Cyperus rotundus*

LVA Ermakova, NV Bobkova, Chan Thi Tuet  
Medical University First MG MU them. IM Sechenov (Moscow, Russia)

### SUMMARY

**Purpose:** morphological, anatomical and high-quality chemical study of raw material round to develop characteristics of its authenticity. **Research methods:** experimental (macroscopic, microscopic, qualitative chemical). **Results:** The morphological and anatomical features of the round rhizomes of Chinese and Vietnamese origin were described. Differences in the external and anatomical-diagnostic signs and chemical composition of the rhizomes of the round root of Chinese and Vietnamese origin were determined. **Conclusions:** The characteristics of authenticity are proposed for whole and crushed rhizomes of the round feed.

**Key words:** Stit round, medicinal herbal raw materials, oriental medicine, microscopic analysis, thin layer chromatography, essential oil, flavonoid complex.

### RESUME

**Purpose:** To study the morphological and anatomical signs and chemical composition quality of *Cyperus rotundus* L. for elaboration the identity characteristics of its raw material. **Methods of analysis:** experimental (macroscopic, microscopic analysis, chemical identification). **Results:** The diagnostic signs have been described for underground organs of *Cyperus rotundus* L. cultivated in Chinese and Vietnam. Differences have been determined between external and anatomic diagnostic signs and chemical composition of raw materials depending on its cultivation place. **Resume:** The paper presents the characteristics for identification of fractional and intact underground organs of *Cyperus rotundus* L.

**Keywords:** *Cyperus rotundus* L., east medicinal herbals, microscopic analysis, thin layer chromatography, ether oil, flavonoid composition.

### Introduction

Round Syt is a fairly widespread plant from the family of sedges (Cyperaceae). The genus *Cyperus* has about 300 species, growing mainly in the tropics and subtropics. On the territory of the Russian Federation, the round is widespread in the southern regions, it also grows in Central Asia, in China, Vietnam, and various regions of Europe. Its habitat is confined to damp, swampy places [3]. Round rhizome is used in folk medicine in different countries as a diaphoretic, diuretic, digestive aid,

having an anthelmintic and antibacterial effect. In scientific and folk medicine in China and Vietnam, the rhizome of the round feed is used to treat gynecological diseases. Raw materials are part of many complex medicines of oriental medicine [1, 2]. Despite the fairly widespread use of feed rhizomes in medicine, from a pharmacognostic point of view, this raw material (and the plant as a whole) has not been sufficiently studied.

In the fourth State Pharmacopoeia of Vietnam, to characterize this type of medicinal raw material, only a description of its external signs is given [5]. The State Pharmacopoeia of the People's Republic of China describes the external signs of the rhizome of the round feed and microscopy [6]. Taking into account the rather widespread prevalence of round feed and its popularity as a source of obtaining medicines, an in-depth pharmacognostic study of feed rhizomes is of interest.

The purpose of this study was the morphological, anatomical and qualitative chemical study of the raw material round to develop the characteristics of its authenticity.

#### Materials and methods

The material for the study was the rhizomes of the round feed (whole, crushed and powder) of Chinese and Vietnamese origin. Raw materials were collected in autumn in places of natural growth in various regions of China and Vietnam. The collected raw materials underwent special processing provided for by the Chinese Pharmacopoeia: they were first dried, then fired to remove the remains of stems, leaves and small roots. Then it was washed with water and dried after drying, or it was steamed, dried and dried at a temperature of 50–60-C under good ventilation conditions.

The study of external signs, microscopy, qualitative chemical composition and the determination of some numerical indicators was carried out in accordance with the requirements of the State Fund XI [4]. The external signs of raw materials were studied visually in daylight and using a stereomicroscope.

Anatomical and diagnostic signs of whole raw materials were studied on cross sections; the structure of the epidermis - on preparations from the surface. The study was carried out on a LOMO 4820 microscope with x40 objectives; x100; x400; x1000 and with eyepieces x10, and x40 for 2-3 series of 10 micropreparations.

Micropreparations were prepared from raw material powder according to the method of preparing micropreparations from plant powders. Determination of moisture content, the content of essential oil and tannins was carried out according to the methods of the State Pharmacological Institute.

When carrying out thin-layer chromatography of the essential oil, we used Sorbfil plates (STX-1A silica gel, grain size 5–7  $\mu\text{m}$ , layer thickness 110  $\mu\text{m}$ ); mobile phase - chloroform; Essential oils of sage leaves and eucalyptus served as working standards. Anisic aldehyde solution was used for detection: 1 ml of anisic aldehyde was placed in a 100 ml flask, 10 ml of glacial acetic acid, 85 ml of 96% ethanol and 95.5 ml of sulfuric acid were added. The study of the qualitative composition of flavonoids was carried out by TLC on Sorbfil plates (PTSKh-A-UV). As solutions

Comparisons used solutions of working standard samples of rutin, quercetin, luteolin-7-glycoside. Extraction from the test raw material was prepared as follows: 2 g of raw material, crushed to a particle size passing through a sieve with holes 1 mm in diameter, was placed in a flask with a capacity of 500 ml, 100 ml of 70% ethanol was added; the flask was connected to a reflux condenser and heated in a boiling water bath for 30 minutes; the contents of the flask were cooled to room temperature and filtered through a paper filter. The resulting extract was evaporated on a rotary evaporator to a volume of 20 ml. The supernatant was decanted — solution No. 1 (alcohol fraction). The precipitate was dissolved in 10 ml of butanol and evaporated to half the volume - solution No. 2 (butanol fraction).

Identification components was carried out on chromatographic behavior when compared with reliable samples of bystanders in UV light (365 nm) before and after treatment with 3% alcoholic solution of aluminum chloride.

#### results

The study of external signs of rhizomes of round feedingThe raw material is cut along the pieces of rhizomes of an oval-ovoid or fusiform shape, pointed at the ends from 1 to 3 cm in size (raw materials of Vietnamese origin are larger). The surface is longitudinally wrinkled with transverse parallel internode scars. The color of the outer surface is dark brown (for Chinese raw materials) and dark gray (for Vietnamese raw materials). Outside, the rhizome is covered with hairs of black-brown color (mostly in raw materials of Vietnamese origin). The color at the break is orange-brown. The smell is strong, fragrant. The taste of the aqueous extract is spicy-bitter with a sweetish aftertaste (Fig. 1).

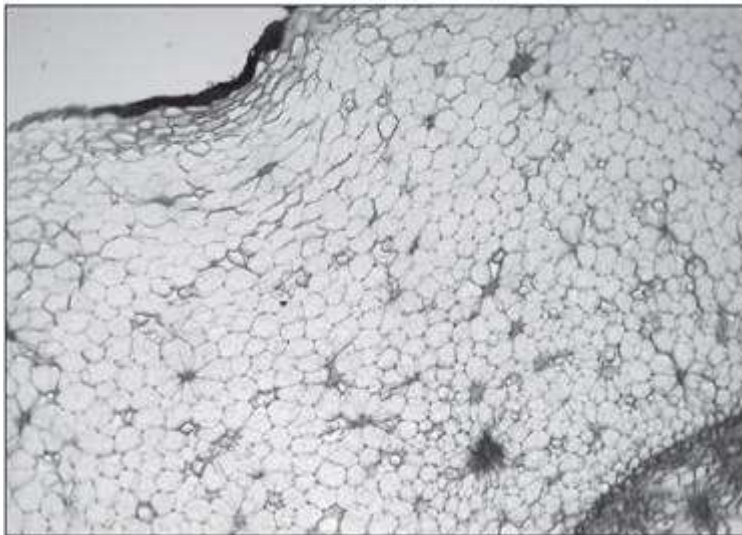


Rice. 1. Rhizomes of the round feed (of Chinese origin)

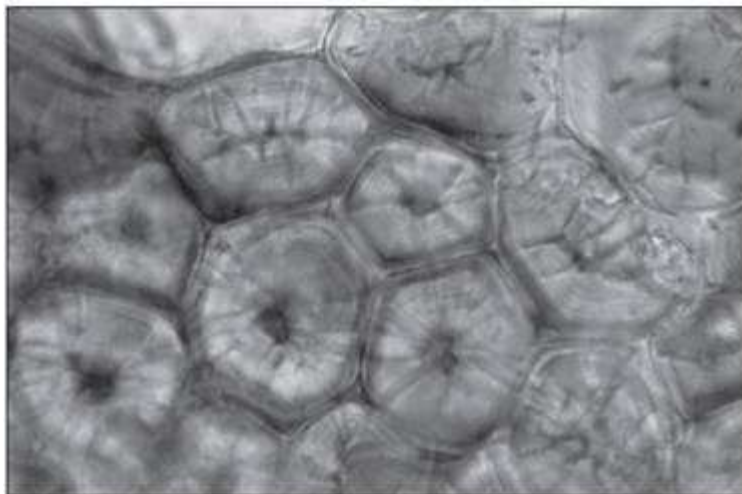
Thus, raw materials of Vietnamese and Chinese origin of various types of processing do not have significant differences in terms of external features.

The study of anatomical and diagnostic signs of raw material roundThe rhizome has a primary structure, which is typical for monocotyledonous plants (Fig. 2).

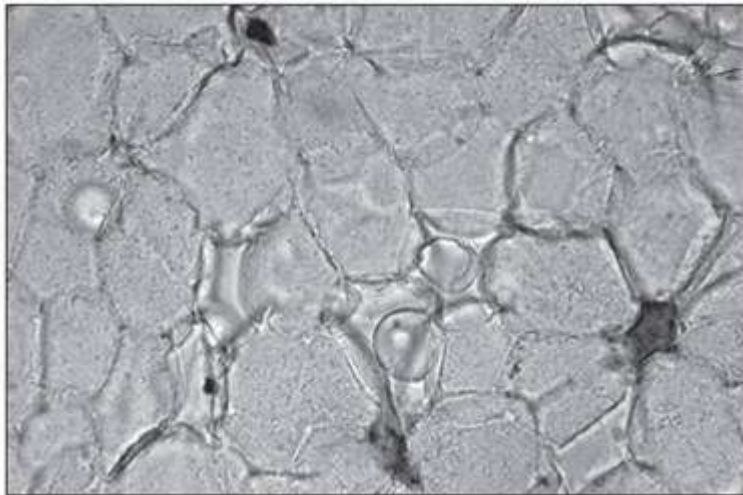
The integumentary tissue is a single-layer epidermis, consisting of small rectangular cells with thickened dark cinnamon walls, occasionally with dark contents inside. Under the epidermis is the hypodermis, which includes groups of narrow-lumen fibers with strongly thickened walls of a layered structure of dark brown color and 3-5 layers of rather large tangentially elongated cells with slightly thickened yellowish walls.



Rice. 2. Round rhizome (Chinese origin). Cross section. Cow part. Endoderm. Uv.x40



Rice. 3. Round rhizome (Vietnamese origin). Cross section. Stony cells of the hypodermis. Uv.x1000



Rice. 4. Rhizome of the round feed (of Chinese origin). Cross section. Idioblast cells with essential oil and tannins. Uv.x1000

The endoderm consists of small rectangular cells with thickened inner and side walls, which gives the cell walls a horseshoe shape.

The cortex of the rhizome is about 1/3 of the rhizome and is represented by rather large cells filled with numerous oval starch grains, layered structure 8–12  $\mu\text{m}$  in size, in some rhizomes the starch is gelatinized and fills the parenchyma cells in the form of an amorphous mass (reaction with Lugol's reagent). In the parenchyma, two types of idioblast cells are visible: the first contain drops of a transparent colorless or slightly yellowish essential oil (reaction with Sudan III solution); the second - with a brownish-orange content, which includes tannins (black-blue coloration with a solution of iron-ammonium alum) (Fig. 4).

Vascular-fibrous vascular bundles are randomly located in the cortex and in the central axial cylinder (COC). There are many conductive beams in the CSC (12 per  $\text{mm}^2$ ), they are concentric amphivasal (centrofloemic), of different sizes, rounded or oval in outline. Some of the bundles are located close to the endoderm or adjacent to it. There are few beams in the cortex (2 per  $\text{mm}^2$ ), they are closed, lacking phloem - they contain only xylem vessels, are often rounded in outline and have a continuous lining of cells with thickened pigmented walls. For rhizome powder, the following are of diagnostic value: parenchymal cells with drops of essential oil, fragments of vascular-fibrous vascular bundles with porous and scalene vessels and tracheids. The rhizome of a well-fed round Vietnamese origin by anatomical features differs in the structure of the hypodermis, endoderm and vascular bundles.

The hypodermis most often represents a continuous mechanical belt, consisting of 3-5 layers of isodiametric sclereids (stony cells) of a rounded-polyhedral shape with highly thickened layered porous walls of light brown color ranging from 20 to 50  $\mu\text{m}$  (Fig. 3). In structure

The mechanical belt also includes groups of narrow-cavity thick-walled fibers with a diameter of 10–15  $\mu\text{m}$ .

The endoderm of the rhizome of Vietnamese origin is distinguished by the presence of groups of small stony cells or mechanical fibers of a brownish color with a diameter of 8–25  $\mu\text{m}$  in some areas.

In the CTC, numerous concentric centrofloemic bundles are visible, located chaotically. There are closed collateral bundles with a pronounced lining of mechanical tissue. For rhizome powder (Vietnamese raw materials), diagnostic value are: parenchymal cells with drops of essential oil, fragments of vascular-fibrous conducting bundles with porous and scalene vessels and tracheids, groups of stony cells of the hypodermis, fragments of the epidermis with brown underlying fibers.

Study of the qualitative chemical composition of the rhizomes of the round feed was carried out with the aim of developing additional characteristics of the authenticity of raw materials.

According to the literature, the raw materials of the round feed contain: essential oil, flavonoids, tannins, starch, alkaloids, etc. With the help of generally accepted qualitative reactions, we have confirmed the presence of round essential oil, flavonoids, alkaloids, tannins in the rhizomes. Further study of the qualitative composition of essential oil and flavonoids was carried out using TLC, the conditions of which are described above. As a result of the analysis of the essential oil, the presence of at least 9 compounds was established, two of which were identified with cineol and camphor by their chromatographic behavior when compared with standard solutions of essential oils of sage and eucalyptus, as well as with a reliable sample of a solution of camphor.

The study of the qualitative composition of flavonoids by TLC showed the presence of at least 7 compounds of a flavonoid nature in the raw material under study, three of which were identified with quercetin, rutin, and luteolin-7-glycoside. In the course of the analysis, the quantitative content of essential oil was also established: in raw materials of Chinese origin - about 0.5%, in Vietnamese raw materials - 0.78%. The content of tannins in Chinese raw materials was about 4%.

#### Discussion and conclusions

Thus, in the course of the pharmacognostic study of the raw material of the round feed of Chinese and Vietnamese origin, the external and anatomical-diagnostic signs of two samples of raw materials were studied in a comparative aspect and the distinctive features were revealed; Qualitative chemical reactions established the presence of essential oil, flavonoids, alkaloids and tannins in the raw material. TLC methods have been developed to determine the composition of essential oil and flavonoids of the rhizomes of the feed. TLC revealed the presence of cineole and camphor in the essential oil, and also proved the presence of quercetin, rutin, and luteolin-7-glycoside in the flavonoid complex.

According to the methods of GF XI, the quantitative content of essential oil and tannins in samples of raw materials of Chinese origin was determined.

The results obtained can be used in the development of a draft FS for the rhizomes of round feed for the Pharmacopoeia of Vietnam, as well as serve as a prerequisite for further in-depth research of round feed growing in Russia.

#### Literature

1. Bobkova N.V., Ermakova V.A., Samylina I.A. Authentication natural raw materials in the multicomponent preparation "Venteronova" // Pharmacy №2, 2011. - pp.19-23.
2. Kiseleva T.L., Smirnova Yu.A. Medicinal plants in the world medical practice: state regulation of the range and quality. - M.: Publishing house of the Professional Association of Naturotherapists, 2009. - 295 p.
3. Ulyanova T.N. Weeds in the flora of Russia and other CIS countries. - SPb: VIR, 1998. -- 344 p.
4. State Pharmacopoeia of the USSR. 11th ed. - M.: Medicine, 1987, issue 1. - 336 p.
4. State Pharmacopoeia of Vietnam, 4th ed. - Hanoi: Ministry of Health, 2009. (in Vietnamese)
5. Pharmacopoeia of the People's Republic of China. - VI, 2005. -- 234 p.

Author's address

Ph.D. Bobkova N.V.

bobkovamma@mail.ru

---

Ermakova, V.A. Pharmacognostic study of the Round Cyperus rotundus L. / V.A. Ermakova, N.V. Bobkova, Chan Thi Tuet // Traditional medicine. - 2013. - No. 4 (35). - S.41-44.

[To favorites](#)