

Pharmacognostic study of medicinal raw materials of some representatives of the genus
Paeonia
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Pharmacognostic study of medicinal plants of the genus Paeonia
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SUMMARY

Target: Perfection characteristics authenticity and comparative pharmacognostic analysis of the raw material of the evading peony and the milk-flowered peony.

Research methods: experimental (macroscopic, microscopic, quality chemical).

Results: The morphological and anatomical features of the roots of two peony species are described. Differences in the external and anatomical-diagnostic features and chemical composition of the peony evading different growing areas and the peony of the lacto-flowered peony were determined.

Conclusions: Proposed characteristics of authenticity for whole and crushed rhizomes and the roots of the evading peony and the roots of the milky-flowered peony.

Key words: Evasive peony, lacto-flowered peony, microscopic analysis, thin layer chromatography.

RESUME

Purpose: To improve the characteristics of identification and compare pharmacognostical analysis of raw materials of *Paeonia anomala* L. and *Paeonia lactiflora* Pall.

Methods of analysis: experimental (macroscopic, microscopic analysis, chemical identification). Results:

The morphological and anatomical signs of underground organs of two species of *Paeonia* have been described. Differences have been determined between external and anatomic diagnostic signs and chemical composition of raw materials of and depending on its cultivation place.

Resume: The characteristics of identification for fractional and intact underground organs of *Paeonia anomala* L. and *Paeonia lactiflora* Pall.

Keywords: *Paeonia anomala* L., *Paeonia lactiflora* Pall., Microscopic analysis, thin-layer chromatography.

Introduction

Plants of the genus *Paeonia* fam. Peonies (*Paeo-naceae*) are raw materials in many countries.

In Russia, for harvesting rhizomes and roots, as well as herbs, the Evasive Peony (*Paeonia anomala* L.) is used. In the countries of the Far East - China, Korea and Japan - milk-flowered peony (*Paeonia lactiflora* Pall.) [2, 4].

Peony roots are included in the composition of multicomponent tableting drugs of traditional Chinese medicine. The problem of identifying raw materials in such preparations using microscopic and chromatographic analysis is very urgent [1].

Of interest are the issues of a comparative study of the roots of two types of peony in terms of the qualitative chemical composition and determination of the characteristics of their authenticity.

Materials and methods

Samples of dried rhizomes and roots were used as objects of research.

cultivated plants of the dodging peony, collected in the Moscow and Gorno-Altai autonomous regions in September 2010, as well as samples of the roots of the lactobacillus peony, brought from the PRC.

Studies of morphological and anatomical and diagnostic signs were carried out in accordance with the requirements of the general pharmacopoeial articles "Roots, rhizomes, tubers, bulbs, corms" and "Technique of microscopic and microchemical research of medicinal plants" [3]. Longitudinal and transverse sections were prepared from the roots. Histochemical reactions were carried out with phloroglucinol solution and hydrochloric acid, Sudan III solution and Lugol's solution [3]. The measurements were carried out using an eyepiece micrometer. Studies and photographs were carried out on microscopes "LOMO MIKMED - 1" (eyepiece 7x and objectives: 3.7x, 10x, 20x, 40x) and "MIKMED - 6" (eyepiece 10x and objectives: 4x, 10x, 40x, 100x) using digital cameras Canon Digital IXUS 80 IS; image processing was carried out using the Microsoft Office Picture Manager program.

To carry out qualitative reactions, water extracts from medicinal plant raw materials were used in a ratio of 1:10. For thin layer chromatography - ethanol (95%) extractions in a ratio of 1:5.

Sorbfil PTSKh-AF-A-UF (Russia) plates were used as a stationary phase. Chromatography was carried out in solvent systems: chloroform - ethyl acetate - ethanol - formic acid (40: 5: 10: 0.2) - system 1 and ethyl acetate - acetone - water - formic acid (5: 3: 2: 1) - system 2. Chromatograms were detected with 1% iron (III) chloride solution (methyl salicylate detection), 1% ammonium iron alum solution (tannins), UV light (365 nm) and diazotized reagent (phenolic compounds). Methyl salicylate solution and tannin solution were used as reference samples.

results

A comparative morphological analysis of the raw material of the duck peony and the lacto-flowered peony revealed significant differences in their external features. This is mainly due to the specific primary processing of raw materials of Chinese origin (the roots are cut and boiled in water before drying).

The raw material of the evading peony is a mixture of rhizomes and roots of various shapes, outside - dark brown or yellowish brown, longitudinally wrinkled. The fracture is uneven, whitish-yellowish, sometimes purple along the edge. On the fracture, one can see: from the outside, a thin layer of periderm, a white layer of bark, sharply protruding yellowish wedge-shaped areas of wood with dark purple dots and light pith rays. The smell is strong, peculiar. The taste is sweetish-burning, slightly astringent.

The raw material of the lactobacillus peony is cut across pieces of roots in the form of round or oval plates with a diameter of 1 to 4 cm (Fig. 1). From the outside are visible areas of the preserved cork of a greyish-lilac color. On the sections, a zone of the cortex in the form of a ring and a xylem in the form of whitish protruding rays and rings are visible. The odor is weak, peculiar. The taste is sweetish.



Rice. 1. Roots of peony lactobacillus (PRC).

The next stage of our work was a comparative study of the anatomical and diagnostic features of the roots of the ducking peony and the lacto-flowered peony.

In the course of the study, it was found that the main anatomical and diagnostic signs of transverse sections of the roots of the two species of peonies coincide.

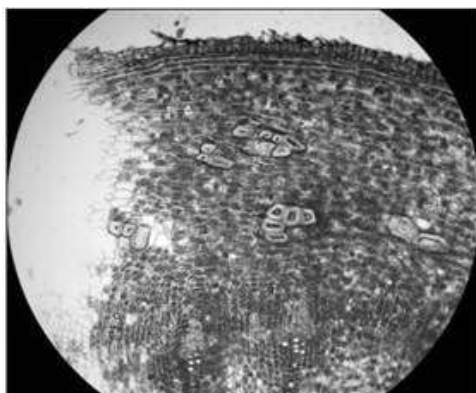
The roots have a secondary structure. A continuous line of cambium divides the root into a rather narrow crustal zone and a woody part.

The integumentary tissue - the cork - consists of 3–7 rows of rectangular cells with thickened dark colored cell walls.

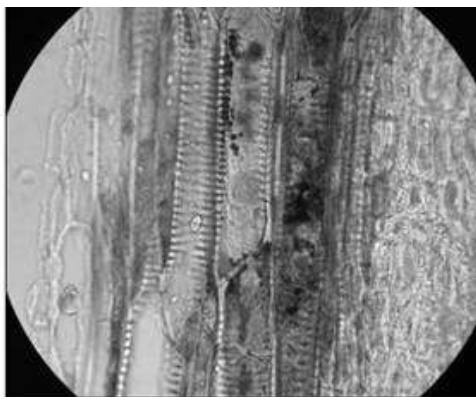
Under the cork is phelloderm, which consists of several layers of rather large tangentially elongated cells with slightly thickened walls and sometimes noticeable pores.

We found stony cells in the bark on the cuts of the root of the dodging peony, collected in the Moscow region - a diagnostic feature previously not described and not found in other samples of raw materials. Stony cells - sclereids - ranging in size from 20 to 40 microns, are located singly or in groups of 3–7 pieces, in shape - isodiametric or slightly elongated, rounded-polygonal with a strongly thickened layered cell wall, permeated with pores and strongly lignified (Fig. 2), which is confirmed by the reaction with phloroglucinol and hydrochloric acid - the cells are stained in a bright crimson color.

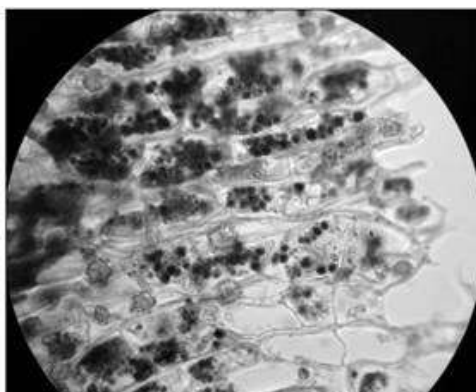
When carrying out a reaction with a solution of Sudan III, it is in the cells of phelloderm that orange oily drops are found, which can presumably be an essential oil. Drops are more numerous and larger in the roots of the evading peony.



Rice. 2. Cross-section of the root of the evading peony (Moscow region). Uv.x100.



Rice. 3. Longitudinal section of the root of the evading peony (Gorno-Altai Autonomous Region). Wood vessels. Uv.x1000.



Rice. 4. Cross-section of the root of the evading peony (Moscow region). Druse oxalate calcium. Starch grains (Lugol's district). Uv.x400.

To the center of the cambium, there is wood, consisting of parenchymal cells, xylem vessels and tracheids. Parenchymal cells form wide, multi-row medullary rays, alternating with the conductive elements of the xylem - vessels and tracheids, radially diverging in the form of narrow stripes or islets. In some sections of the cambium line, young sections of xylem and phloem can form vascular bundles, wide in the upper part and tapering towards the center.

On longitudinal sections of the roots through the xylem, the structure of its conducting elements is visible. Vessels are broad-lumen, articulated with noticeable remnants of perforation plates and slit-like pores of the cell wall. Tracheids are narrow-cavity, fusiform with porous lignified walls.

For the roots of the dodging peony, a feature was found that was absent in the roots of the lactobacillus peony. In some vessels of the xylem there was a yellow-orange, pinkish-red, or crimson content in the form of a glassy or resinous-solidified plaque that did not dissolve in ethanol, chloroform, or an alkaline solution (Fig. 3).

Numerous spiky druses of calcium oxalate, 15 to 25 μm in size, are observed in the parenchyma cells throughout the root (Fig. 4).

Numerous starch grains are visible in the parenchymal cells of all zones of the peony root. They are predominantly simple, round, oval, ovoid or irregularly spherical in size from 5 to 12 microns, less often they are dissyllabic, without noticeable cracks and cracks (Fig. 4).

In the roots of a Chinese peony, starch is also present in all parenchymal cells. However, due to specific primary processing, the starch gelatinizes and appears in the form of a whitish amorphous content that acquires a blue

fiolet color when carrying out a histochemical reaction with Lugol's reagent.

A microscopic examination of the powder of the roots of all objects of study was carried out and specific anatomical and diagnostic signs of raw materials with a particle size of 1 mm were determined.

Micropreparations were prepared according to the method of crushed raw materials - crushed preparation.

Diagnostic value are: fragments of parenchymal tissue, consisting of rounded and elongated cells of the parenchyma with numerous duuses of calcium oxalate; areas of xylem vessels with porous secondary thickening of the cell walls, the contour of the vessels with a characteristic jagged surface contour; brown areas of cork, consisting of rectangular or polygonal cells.

In the course of qualitative reactions to the raw materials of two types of peony, the most significant were the reactions to polysaccharides, phenolic substances and tannins. The results are presented in table. 1.

Table 1

Results of qualitative reactions to raw peony evanescent and peony lactoflower

БАВ	Реактив	Водное извлечение из корней пиона уклоняющегося (Моск. обл.)	Водное извлечение из корней пиона уклоняющегося (Горно-Алтайск. обл.)	Водное извлечение из корней пиона молочноцветкового
Дубильные вещества	Железо-аммонийные квасцы	++	+++	- - +
Фенольные соединения	FeCl ₃	++	+++	-
Полисахариды	95 % этанол	+	+++	+++

As a result of the precipitation of polysaccharides from aqueous extracts with 95% ethanol, polysaccharides were found in all types of raw materials. The most abundant sediment was observed in the raw material of the peony of the deviating Altai collection.

When carrying out reactions to phenolic hydroxyl with 1% FeCl₃ solution, a bright black-violet color appeared in the raw material of the evading peony. It was practically absent in raw materials of Chinese origin.

When carrying out a reaction for tannins, they were well detected in extracts from the raw material of the Pion evading and was practically absent in the raw materials of Chinese origin.

A more detailed comparative analysis was carried out by thin layer chromatography. The results are presented in table. 2.

Methyl salicylate has been found in the raw material of the peony evading two growing areas. The brightest adsorption zone, corresponding to methyl salicylate, was observed in the raw materials collected in the Gorno-Altai Autonomous Region. Methyl salicylate was not found in raw materials of Chinese origin.

The identical composition of phenolic compounds was confirmed in two samples of the raw material of the peony evader. Only one adsorption zone was found in the raw material of the lactobacillus peony.

When the plate was detected by UV light in the raw material of the evading peony collected in the Moscow region, an adsorption zone of bright blue fluorescence was found. No such substance was found in other types of raw materials.

The zone of adsorption corresponding to tannin was found in the raw material of the peony evading different growing areas. The qualitative composition of the tannins of the roots of the two types of peony is somewhat different. Raw materials of Chinese origin again turned out to be much poorer (only one adsorption zone).

table 2

Chromatographic characteristics of phenolic compounds of the raw material of the peony evading and peony lactobacillus

№	Системы, R _f		Реактив, цвет пятен				Свидетель, R _f	Объекты исследования		
	1	2	УФ	FeCl ₂	Диазо-р-в	Железо-амм. квасцы		P.anomala Моск.обл.	P.anomala Алтай	P.lactiflora
1	0,9				Желтый			+	+	
2	0,84				Оранжевый			+	+	
3	0,57				Серый			+	+	
4	0,42				Розовый			+	+	+
5	0,38			Феолетовый			Метил-салицилат 0,38	+	+	
6	0,23		Голубое свечение					+		
7		0,86				Черный	Танин 0,86	+	+	
8		0,74				Голубой		+	+	+
9		0,66				Голубой		+	+	

Discussion and conclusions

In the course of a comparative morphological study of the roots of the dodging peony and the lacto-flowered peony, a significant difference in the external features of the studied types of raw materials was revealed, which is explained by the specific primary processing of raw materials of Chinese origin.

As a result of a microscopic study of the roots of two species of peony, the main similar anatomical and diagnostic signs were established. These include the presence of wide pith rays; radial arrangement of xylem vessels; the presence of numerous druses of calcium oxalate; vascular structure of the xylem.

Differences in the anatomical structure of the roots of the duck peony and the milk-flowered peony were revealed. In the roots of the peony evading in the vessels of the xylem, a bright red content was found, which is absent in the roots of the lacto-flowered peony. The roots of the lactobacillus peony are characterized by the presence of unstructured gelatinized starch in the cells of the parenchyma. A difference was found in some anatomical and diagnostic features in the roots of a peony evading different growing areas.

In the course of carrying out qualitative reactions and chromatographic studies, the difference in the qualitative composition of substances of phenolic nature in the roots of the dodging peony and the lacto-flowered peony was established. The presence of polysaccharides was found in all research objects. The presence of methyl salicylate was found in the roots of the duck peony and does not depend on the place of growth. However, the roots of the dodging peony harvested in the Moscow region are characterized by some difference in the composition of phenolic compounds from the raw materials harvested in the Gorno-Altai region.

New characteristics of authenticity of raw peony evading for the sections "Microscopy. Whole and ground raw materials "and" Qualitative reactions ", it can include reactions for polysaccharides, phenolic compounds and TLC, proving the presence of methyl salicylate.

Anatomical and diagnostic features of the powder of the roots of the peony lactic acid can be used to identify it in multicomponent medicines of traditional oriental medicine.

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