Anatomical and morphological study of Senna fetuses V.A. Kurkin, A.A. Shmygareva, A.N. Sankov (GBOU VPO SamGMU MH RF, Samara)

Microscopic and morphological examination of Senna alexandrina Mill. fruits V.A. Kurkin, AA Shmygareva, AN Sankov Samara State Medical University (Samara, Russia)

SUMMARY

The morphological and anatomical features of the fetuses of Senna Alexandria Senna alexandrina Mill were studied. As a result of morphological, anatomical and histological studies of the seed, bean valves and the stalk of Alexandria Senna, additional diagnostic signs were identified. On the basis of the results, the criteria for differential diagnostics were developed, which make it possible to reliably identify the medicinal raw material of a given plant.

Keywords: senna of Alexandria, Senna alexandrina Mill., Fruits, bean valve, peduncle, morphological and microscopic features.

RESUME

The morphological and anatomical characteristics of the fruits of Senna alexandrina Mill. were studied. As result of morphological-anatomical and histological studies of seed, the folds of the pod and the stalk of Senna alexandrina additional diagnostic features were determined. On the basis of this results there were developed the criteria of differential diagnostics, allowing the precise identification of medicinal raw material of this plant.

Keywords: Senna alexandrina Mill., Fruits, the folds of the pod, stalk, morphological and microscopic characteristics.

Introduction

To date, the range of herbal laxatives includes about 20 items. Senna Alexandria can be noted as the most popular herbal raw material for obtaining laxatives. Senna Alexandria Senna alexandrina Mill. (family Legumes - Fabaceae) is widely used in medicine as a source of laxatives (decoction, dry extract, collection of laxatives, etc.) [3-5, 7, 9]. However, the problems of standardization of raw materials and senna preparations have not yet been resolved. Within the framework of improving the standardization of medicinal plant materials - the fruits of Alexandria senna, it is urgent to identify additional diagnostic signs related to the peculiarities of the anatomy and histology of the bean valves, peduncle and seed.

Purpose of the study: morphological and anatomical examination of the fetus Senna of Alexandria.

Material and methods

The object of this study was herbarium specimens (Fig. 1) of the Herbarium of the Department of Management and Economics of Pharmacy, Pharmaceutical

technologies and pharmacognosy of the Orenburg State Medical University, biennial shoots of Alexandria Senna, as well as raw materials for an industrial sample of the fruits of Alexandria Alexandria "Vitaflor" (France) (2014).

For anatomical and histological research used light microscope of the following brand: digital microscope "Motic DM111" (the possibility of increasing the device: 4x10; 10x10; 40x10; 100x10).

Micropreparations of plant material samples were prepared according to the following procedure: the fruits were placed in a porcelain cup and boiled with purified water for 5 minutes. The softened pieces of raw material were leveled with a scalpel and transverse and longitudinal cuts were made with a hand blade. The obtained sections were placed on a glass slide in a drop of glycerol with water [1, 2, 10].

Results and discussion

The sizes of the beans are from 35 mm to 60 mm in length and from 14 mm to 18 mm in width. The apex of the fruit is round, obtuse, asymmetrical. Carpophorus - the lower constricted part of the fruit - arising from the short stem of the ovary. The pericarp of ripening fruits is hard, thin, dry, smooth on the surface. In ripe fruits, the pericarp is woody and brittle in consistency (Fig. 1A).



Rice. 1. The fruit of the senna of Alexandria. Legend: A - bob, general view; B - seed bob (x20).

The fruits, as a rule, contain 6–8 seeds with a flattened and obovate shape, the color of the seeds is light brown (Fig. 1B) [10].

The seeds have a noticeable seed stalk. Its length varies in length from 0.5 to 5 mm. The seedling (aryllus) is a dry residue of the funicular, located near the scar in the form of a "drop" (the place of attachment of seeds to the seedling) (Fig. 1B).

1. Anatomical and histological examination of the valves of the bean senna of

Alexandria The anatomical structure of bean valves (pericarp) is conventionally divided into three blocks: exocarp, mesocarp, endocarp [6]. In fact, the pod valve of the analyzed sample has a classical structure, namely, all three above-named layers of the pericarp are expressed on its transverse sections (Fig. 2–4). For a detailed study of the histological features of the layers of the pericarp, transverse sections of the valves in the basal, medial and apical parts were analyzed.

The exocarp of a pod is represented by a layer of the outer epidermis (Fig. 2). Cells

the exocarp have a flattened oval shape in cross section. The outer wall of exocarp cells is greatly thickened. On the surface of the exocarp, stomatal apparatuses are easily diagnosed, which are quite common; they are surrounded by peri-stomatal cells that do not differ in shape from the cells of the main epidermis. The number of peri-stomatal cells is three to five (anomocytic type) (Fig. 2). The epidermis of the fetus is pubescent, but slightly. The frequency of occurrence of trichomes increases towards its basal part. Trichomes have a classic structure typical of legumes [6]. These are simple multicellular hairs (usually of 2–3 cells), which are attached by the basal part to a large, slightly elevated epidermal cell (Fig. 3).

The mesocarp is the middle block of the valve, represented by numerous thin-walled cells of a rounded-oval shape with a large number of intercellular spaces. The cells of the mesocarp are alive, contain a protoplast (in immature fruits - chloroplast), which turns brown when treated with aniline sulfate solution (Fig. 2). The conducting system of the mesocarp is represented by bundles located both along the fetus and transversely to its length. They are of a collateral type, with the most developed phloem part (Fig. 4).

The endocarp of the studied fruits is complexly organized and is represented mainly by mechanical elements of the xylem. In the center, the main parenchyma of the cells is localized, the cells of which are often sclerefied (Fig. 3, 4).



Rice. 2. Bean flap. Cross section of the medial part (x400). A - fragment with stomata; B - fragment, stained with aniline sulfate. Designations: 1 - cuticle; 2 - stomata; 3 - mesocarp; 4 - exocarp; 5 - placental parenchyma.



Rice. 3. Bean flap. Cross section of the basal part. A - general view (xone hundred); B - fragment of exocarp (x400). Designations: 1 - endocarp; 2 - conductive elements;
3 - parenchyma of the mesocarp; 4 - exocarp; 5 - druse; 6 - trichomes.



Rice. 4. Conducting bundle in the longitudinal section of the pod valve in the middle part. A - general form; B - coloring with aniline sulfate (x100); B - conducting beam (x400); G - paint with aniline sulfate (x400). Designations: 1 - bast fibers;
2 - exocarp; 3 - meso parenchyma; 4 - endocarp sclereids; 5 - fibers endo sclerenchyma; 6 - xylem element; 7 - phloem.

2. Anatomical and histological examination of bean peduncles In cross-section, the stalks are oval. The core is weakly expressed and is represented by oval-shaped cells with significantly thickened sclerified membranes. The central cylinder is represented by a xylem ring surrounded by a phloem layer of less pronounced thickness. To the outside of the phloem, there is a layer of the primary cortex filled with the main parenchyma with large living cells with a noticeably thickened cellulose membrane (Fig. 5, 6). In the parenchyma of the primary cortex, closer to the epidermis, sclerenchymal fibers of pericyclic origin can be found. Above the primary cortex, there is a layer of angular-lamellar collenchyma up to 4–5 cells thick. The size of collenchyma cells varies and increases from the periphery to the center. Outside, the peduncle is covered with epidermis, devoid of pubescence.

3. Anatomical and histological examination of the seed of the bean senna of

Alexandria Bean seeds are symmetrical. Their shape is angular, ovoid, almost triangular, the surface is folded. The seed peel (spermoderm) of Alexandrian senna is shiny, dense in consistency, waterproof. Seed color varies from golden yellow to light green with a dark brown spot (scar) on one side in the chalase part of the seed (Fig. 7) [10].

Chalaza - the basal part of the ovule, morphologically located in

top of the seed. At the same time, the nucleus and integuments are connected in it, in the same area the vascular bundle coming from the funicular ends [2].

The study of the chalase part of the Senna Alexandria seed revealed the peculiarities of the location of the micropillary trace, the scar, as well as the scar ridge. In addition, scar pigmentation was revealed (Fig. 7). The seeds of Alexandria senna also have a suture, the so-called rafe, formed by the attached tissues of the vascular bundle and its surrounding cells to the tissues of the seed. The rafe is located between the scar and the chalaza (Fig. 7) [11].



Rice. 5. Bean stalk. Cross section (x40). A - before staining; B - coloring aniline sulfate. Designations: 1 - epidermis; 2 - parenchyma of the cortex primary; 3 - phloem; 4 - xylem; 5 - core.



Rice. 6. The bark of the bean stalk. Cross section (xone hundred). A - fragment before coloring; B - staining with aniline sulfate. Designations: 1 - epidermis; 2 parenchyma of the cortex; 3 - sclerenchyma; 4 - phloem; 5 - xylem; 6 - core; 7 druze.



Rice. 7. Features of the structure of the zone of the cassia long-leaved seed scar. A seed, side view (x20); B - fragment of the scar zone (x40). Designations: 1 - micropillary trace; 2 - hem; 3 - ribbed ridge; 4 - folded spermoderm; 5 - rafe.

Pleurogram - a groove in the palisade layer of the spermoderm on the lateral (lateral) sides of the seed in the form of a groove is a feature of legume seeds. Spermoderm cells cover the entire seed, except for the area around the scar and has a membranous character, the surface of which easily breaks and bursts. The palisade layer in cross section is represented by elongated, thick-walled cells, also called malpighian cells [9]. The cavity of the malpighian cells is relatively narrow and widens downward (Fig. 8-10).

Under the spermoderm is the hypodermal layer, which is formed by sclereids with noticeably thickened walls. The cells of this layer are living, widelumen (Fig. 8-10). A feature is the nature of the thickening of the cell walls in the middle part, which gives them a certain shape in the cross section. Directly under the hypodermis there is a layer of parenchymal tissue. The thickness of the layer and the nature of its constituent cells vary depending on the location of the cut of the seed. The inner parts of the parenchymal layer are often obliterated.



Rice. 8. Halase part of the seed. Cross section. A - fragment with micropillary followed (x40); B - fragment with a spine (x100). Legend: 1 - spermoderm; 2.6 parenchyma; 3 - a layer of large lumen cells; 4 - endosperm; 5 - cavity; 7 root; 8 - sclerenchyma; 9 - antiraphe.



Rice. 9. Conductive seed bundles. Cross section (xone hundred). A - a fragment of a seed with rafe; B - a fragment of a seed with anti-theraphe. Designations: 1 - endosperm; 2 - a number of large lumen cells; 3 - a bunch of rafe; 4 - cuticle; 5 - palisade cells; 6 -

anti-refractory beam; 7 - parenchyma; 8 - etiolated cells of the parenchyma.



Rice. 10. Seed coat. Cross section. Treatment5% alkali solution. A
- a fragment of the shell (x100); B - a fragment of spermoderm (x400). Designations:
1 - cuticle; 2 - palisade cells; 3 - hypodermis; 4 - a layer of large lumen cells;
5 - parenchyma; 6 - endosperm; 7 - seed cavity.

conclusions

one. Carried out study morphological, anatomical, histological signs of the fruits of the Alexandrian senna.

2. Highlighted the distinctive anatomical features of the structure of the bean pod, seeds and stalks that can be used to diagnose this type of raw material.

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