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Research Article

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The study of pharmacotechnological parameters of burdock (*Arctium lappa*) leaves

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ABSTRACT

For more efficient extraction process, forecasting and regulation of the quality of the extract of burdock as a result of researches the technological properties of the leaves of burdock: bulk density – 0,23 g/cm^3 filling ratio of dry material – 3,42 cm^3/g; the filling ratio of the swollen material – 1,92 cm^3/g; displacement ratio of raw material – 1,04 cm^3/g; the absorption coefficient – 2,76 cm^3/g; the coefficient of Education internal juice – 3,06 cm ^{3}/g; ratio increased by dissolving extractives – 0,56 cm^3/g.

Key words: Arctium lappa, pharmacotechnological parameters, specific gravity, bulk weight

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INTRODUCTION

Arctium lappa – A stout handsome plant, with large, wavy leaves and round heads of purple flowers.It is enclosed in a globular involucre of long stiff scales with hooked tips, the scales being also often interwoven with a white, cottony substance.

The whole plant is a dull, pale green, the stem about 3 to 4 feet and branched, rising from a biennial root.The lower leaves are very large, on long, solid foot-stalks, furrowed above, frequently more than a foot long heart-shaped and of a grey colour on their under surfaces from the mass of fine down with which they are covered. The upper leaves are much smaller, more egg-shaped in form and not so densely clothed beneath with the grey down.

The plant varies considerably in appearance, and by some botanists various subspecies, or even separate species, have been described, the variations being according to the size of the flower-heads and of the whole plant, the abundance of the whitish cottonlike substance that is sometimes found on the involucres, or the absence of it, the length of the flower-stalks, etc [2, 4].

The flower-heads are found expanded during the latter part of the summer and well into the autumn: all the florets are tubular, the stamens dark purple and the styles whitish. The plant owes its dissemination greatly to the little hooked prickles of its involucre, which adhere to everything with which they come in contact, and by attaching themselves to coats of animals are often carried to a distance.

Medicinal Action and Uses – Alterative, diuretic and diaphoretic.One of the best blood purifiers. In all skin diseases, it is a certain remedy and has effected a cure in many cases of eczema, either taken alone or combined with other remedies, such as Yellow Dock and Sarsaparilla.

The anti-scorbutic properties of the root make the decoction very useful for boils, scurvy and rheumatic affections, and by many it is considered superior to Sarsaparilla, on account of its mucilaginous, demulcent nature; it has in addition been recommended for external use as a wash for ulcers and scaly skin disorders.

When applied externally as a poultice, the leaves are highly resolvent for tumours and gouty swellings, and relieve bruises and inflamed surfaces generally. The bruised leaves have been applied by the peasantry in many countries as cataplasms to the feet and as a remedy for hysterical disorders.

From the seeds, both a medicinal tincture and a fluid extract are prepared, of benefit in chronic skin diseases.Americans use the seeds only, considering them more efficacious and prompt in their action than the other parts of the plant. They are relaxant and demulcent, with a limited amount of tonic property. Their influence upon the skin is due largely to their being of such an oily nature: they affect both the sebaceous and sudoriferous glands, and probably owing to their oily nature restore that smoothness to the skin which is a sign of normal healthy action.

The infusion or decoction of the seeds is employed in dropsical complaints, more especially in cases where there is co-existing derangement of the nervous system, and is considered by many to be a specific for all affections of the kidneys, for which it may with advantage be taken several times a day, before meals.

In medicine, burdock root is used as a diuretic, anti-inflammatory agent. In folk medicine, the first year leaves are widely used as an anti-inflammatory, antitumor, externally – regenerating remedy[3, 6, 7, 8].

It has been found that the leaves of burdock contain polysaccharides, tannins, flavonoids, ascorbic acid, sum of alkaloids, the sum of lipophilic substances [5].

We plan to develop a technology for producing an extract of burdock leaves . For more efficient extraction process, forecasting and regulation of the quality of the extract it is necessary to determine the technological parameters of medicinal plants.

The aim of this work is the determination of the technological parameters of burdock leaves .

The objects of study were the leaves of burdock collected in the flowering period in 2014-2015.

EXPERIMENTAL SECTION

Previously held determination of moisture and extractives content in leaves of burdock on techniques SPU [1].

Technological parameters such as: specific, volume and bulk density, porosity, fractional void volume, free volume layer, filling ratio, the absorption ratio, volume increase coefficient at dissolving extractives, the coefficient of internal juice formation.

Determination of the specific gravity

About 5.0 grams (accurately weighed) of crushed material was placed in 100 ml Pycnometer poured purified water up to 2/3 of the volume and incubated in a boiling water bath for 1,5-2 hours, stirring occasionally to remove any air from the raw material.After this, the pycnometer cooled to 20 °C and diluted to volume with purified water.Thus determine the mass of the pycnometer with the raw materials and purified water.Previously determine the mass of the pycnometer with water.

The specific gravity is calculated by the formula:

$$d_y = \frac{P \times d_y}{P + G\text{-}F}, \text{ g/cm}^3,$$

P – the mass of absolutely dry crushed material, g;
G – weight of pycnometer with water, g;
F – weight of the pycnometer with water and raw material, g;
dy – the specific gravity of water, g/cm^3 (d_w = 0.9982 g/cm^3).

Determination of volume weight
About 10 grams (accurately weighed) of grinded raw quickly immerse in a graduated cylinder with water purified and determined the amount. By the difference in the volumes in the graduated cylinder determine the volume occupied by the raw material.

Volume weight is calculated by the formula:

$$d_0 = \frac{P_0}{V_0}, \text{ g/cm}^3,$$

P_0 – mass of unmilled raw material at a certain humidity, g;
V_0 – the volume occupied by raw material, cm^3.

Determination of bulk weight.
In a measuring cylinder loaded grinded raw, shaking slightly to align the raw material and determine the total volume that it occupies.After this, raw material is weighed.

Bulk weight is calculated as follows:

$$d = \frac{P_н}{V_н}, \text{ g/cm}^3,$$

P_H – mass of unmilled feedstock at a certain humidity, g;
V_H – volume occupied by the feedstock cm3.

The porosity of the raw material is calculated as follows:

$$P_c = \frac{d_V - d_0}{d_V},$$

d_y – the specific gravity of raw materials g / cm 3;
d_o – the volume weight of raw material, g / cm 3.

The fractional void volume of the layer is calculated using the formula:

$$P_V = \frac{d_0 - d_1}{d_0},$$

d_0– the volume weight of raw material g / cm 3;
d_1 – bulk weight of raw material g / cm 3.

The free volume of the layer is calculated by formula :

$$V = \frac{d_y - d_H}{d_y},$$

dy – the specific gravity of raw material g/cm^3;
d_H – bulk weight of raw material g/cm^3.

The volume and bulk weights should be considered to determine the volume occupied by the dry and swollen raw material, external juice, which allow to set the ratio of raw material and the extractant, change in the volume of

external and internal juices at raw swerlling, the concentration of substances in the internal and external juices at changing their volumes.Bulk weight is a measure of volume occupied by a unit weight of the crushed raw material.

The filling ratio of the raw material is the amount of liquid required to fill the interstices between the particles of unit mass of dry, compacted material.Displacement ratio of raw material is the volume of fluid displaced by immersion therein of a unit mass of dry material [5].These indicators of the technological properties of raw materialsare determined simultaneously.

Approximately 50,0 g of raw material placed in a stoppered cylinder of capacity 500 cm^3 and compacted until the termination of volume change, fixed volume, and poured into cylinder 400 cm^3 of extractant.The contents of the cylinder stirred for 2 minutes to remove air bubbles from the surface of the particles of raw material, by the level of liquid in the cylinder fixed total volume of the extractant and raw material, then stoppered and allowed to stand for 24 hours to swell.The raw was then pressed by lattice, taking to the initial volume, poured extraction fixing the volume [5].

The absorption coefficient of the raw material is the volume of extractant absorbed by a unit mass of the raw material at its swelling.Internal juice formation factor- the volume of the internal juice, formed in a unit mass of raw materials, when dissolved in the extractant absorbed capillary moisture and extractives.Magnification volume by dissolving extractives – increase in the extractant by dissolving it in a unit mass of extractives.

100,0 g of chopped burdock leaves were placed in pre-weighted cone. The raw material is compacted and weighed. After removing the plug when the valve is closed, the raw material is poured extractant to form a liquid layer on the surface of the raw material 5 cm.Is pressed against the surface of the grate raw close diffuser cap and weighed.Maceration is carried out for 24 hours, stirring occasionally. Then poured into a pre-weighed extraction cylinder fixed volume cylinder with extraction weighed. 25 ml of the filtered extract was placed in a preweighed weighing bottle and weighed.Extraction was evaporated to dryness, adjusted to a constant weight at 100 °C for 3 hours [5].

RESULTS AND DISCUSSION

The table shows the results of determination of technological parameters: bulk weight, filling ratio and the displacement coefficient, absorption coefficient, the coefficient of internal education and juice ratio increased by dissolving extractives of leaves of burdock.A five replicates and statistical processing of data [1].

The results will be used in research on the development of technology and production schemes extract of the leaves of burdock.

Table: The results of determination of technological parameters of leaves of burdock

Index	Value
Specific gravity, g/cm^3	1,4181±0,0005
Bulk weight, g/cm^3	0,523±0,009
Bulk weight, g/cm^3	0,2293±0,0009
The porosity of the raw materials	0,6310±0,0100
The porosity of the layer	0,5630±0,0108
Free bed volume	0,8387±0,0010
Filling ratio of dry material, cm^3/g	3,42±0,02
Displacement ratio of raw materials, cm^3/g	1,04±0,01
The filling ratio of the swollen raw cm^3/g	1,92±0,01
The absorption coefficient raw cm^3/g	2,76±0,02
The coefficient of Education internal juice cm^3/g	3,06±0,03
The coefficient increased by dissolving extractives, cm^3/g	0,56±0,02

CONCLUSION

For more efficient extraction process, forecasting and regulation of the quality of the extract of burdock as a result of researches the technological properties of the leaves of burdock: bulk density – 0,23 g/cm^3 filling ratio of dry material – 3,42 cm^3/g; the filling ratio of the swollen material – 1,92 cm^3/g; displacement ratio of raw material –

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