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THE EFFECTS OF ELECTROMAGNETIC RADIATION ON THE INULIN EXTRACTION PROCESS

The release of biologically active substances (BAS) of plants is one of the important stages of obtaining drugs. The effectiveness, completeness of extraction of biologically active substances, technology of isolation depends on the degree of purity of the product, quality of raw materials, the cost of medicines. In this regard, the analysis of modern and effective methods for the extraction of biologically active substances for pharmaceutical industry, is of great theoretical and practical interest [1].

The main source of biologically active substances is a raw material of plant origin. Such plants include, for example, the dandelion (*Taraxacum officinale* Wigg.). The roots of the dandelion contain a bitter substance taraxacin (10 %), triterpene compounds (taraxerol, taraxasterol, androstenol and others), sterols (β -sitosterol, stigmasterol), flavonoids (cosmos, luteolin-7-glucoside), nicotinic acid, inulin (up to 40 %), rubber (3%), fatty oil, mucus, etc. The most valuable product, which is contained in dandelion roots is inulin [2].

Extraction of biologically active substances in the dandelion raw material was carried out as follows: in a 25 ml test tube, 1 gm of crushed raw material was added (the degree of crushing 2-3 mm), 20 ml of distilled water was added, followed by an irradiation process. The source of alternating electromagnetic radiation (EMV) of extremely high frequencies (60 GHz) was the device "Oratorium-IV". The procedure for irradiation of dandelion extract was performed under standard conditions. Extraction of EMF was carried out at a frequency of 60 GHz during 5, 10, 15, 20, 25, 30 minutes. Control samples were exposed under the same conditions without irradiation. Each irradiated test tube and control were held in a water bath at a

temperature of 60 C° for 30 minutes. After cooling the extracts to room temperature, achieved substance was filtered and the optical density was determined according to the procedure. Determination of the content of inulin is carried out in the process of the oxidation of the Feling reagent, with the formation of a sediment of red-brown precipitate. 5 ml of each of the extracts was added to 4 ml of Feleng reagent and adjusted to 15 ml with water. The solutions were thoroughly mixed. One of the test tubes was left as the control solution, and the other (the test solution) was kept in a boiling water bath for 10 minutes. The contents of the test tube were quickly cooled and centrifuged at 4000 rpm for 10 minutes to eliminate the precipitate. Then, the optical density of the control solution was measured at a wavelength of 670 nm in a 10 mm thick cell. The amount of inulin in percent, calculated as fructose, containing raw dandelion herbs (X1), was determined by the following formula:

$$X_1 = \frac{P * 250 * 100 * 100}{m_{mp} * 5 * (100 - W)} = \frac{P * 5000000}{m_{mp} * (100 - W)},$$

where P is the amount of fructose contained in 5 ml of extract taken for analysis (in mg), found according to the calibration graph; m_{pr} - weight of raw material taken for the manufacture of the extract (in mg); W-moisture in raw materials,%.

This study shows that it is possible to improve the extraction process for the maximum release of biologically active substances of medicinal plant material.

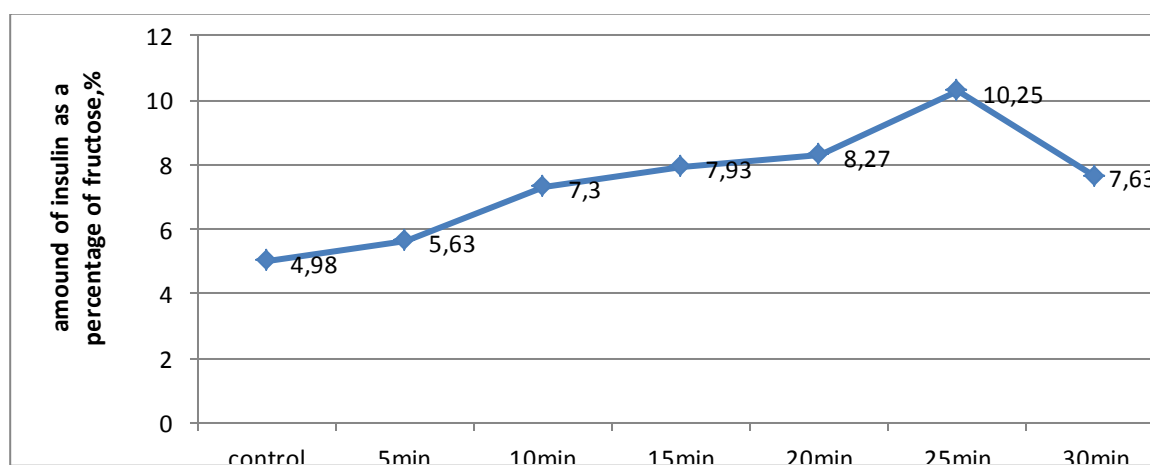


Fig. 1. Effect of an extremely high frequency EMF (60 GHz) on the inulin extraction from the dandelion root of the medicinal

Applying electromagnetic radiation of extremely high frequency to an inulin extract taken from a dandelion showed (Fig. 1) that the amount of inulin was increased by 11.05% in comparison with the control, when the ultrasound frequency of the extremely high frequencies (60 GHz) was processed for 5 minutes. With a 10-minute treatment, the amount of inulin increased by 14.06%, with 15-minute – 15.92%, with 20-minute-16.61%. At 25-minute irradiation, the amount of inulin reached a maximum and reached an increase of 20.05% compared with control. Within 30-minutes treatment, the amount of inulin increased by only 15.32% compared with control.

Thus, we can conclude the following:

1. The influence of electromagnetic radiation of extremely high frequency (60 GHz) on the efficiency of extraction of inulin from the root of medicinal dandelion is undisputable.

2. The amount of inulin in the extract increased with irradiation with electromagnetic radiation for a duration of 5 to 30 minutes.

3. It was found that the 25-minute exposure to extracts by a variable frequency electromagnetic field of extremely high frequency (60 GHz) is most effective in extracting inulin from the dandelion roots. The amount of inulin in this mode increased by 20.05% compared with the control.

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