



## Development Of Technology for Obtaining Natural Nutraceuticals in Solid Form

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Submitted: 06 January 2023; Accepted: 14 February 2023; Published: 15 March 2023

### ABSTRACT

This article discusses development of technology for obtaining natural nutraceuticals in solid form. Currently, a healthy lifestyle, a healthy diet and the body's resistance to external negative factors have become topical issues, especially after the outbreak of the global COVID-19 pandemic. Basically, the prevention and treatment of diseases occurs due to the replenishment of the complex of bioactive substances that the body receives from healthy food. Otherwise, if the tissues and organs do not receive the elements necessary for the normal functioning of the body, then the strength to fight the disease decreases. Here, dietary supplements, that is, nutraceuticals, play an important role, they are consumed with food and are mainly obtained from products of natural origin: vegetable, animal and bacterial.

**Keywords:** *natural nutraceuticals, solid form, COVID-19 pandemic.*

### INTRODUCTION

The composition of such nutraceuticals contains, in addition to biologically active substances, concomitant and ballast substances that increase absorption, reduce negative side effects, absorb, stimulate peristalsis, coat and protect mucous membranes [1,5,6].

An urgent issue is the production of nutraceuticals from leguminous products, thereby expanding the range of dietary supplements in solid forms (for example, capsules, tablets, lozenges, granules, pills) in appropriate packaging that allows the use of measured small amounts of the per os product, supplementing ordinary food [2,8]. Thus, it is possible to take in a concentrated form all the necessary nutrients or other beneficial

substances. As it is known, our body receives nutrients from food in the form of:

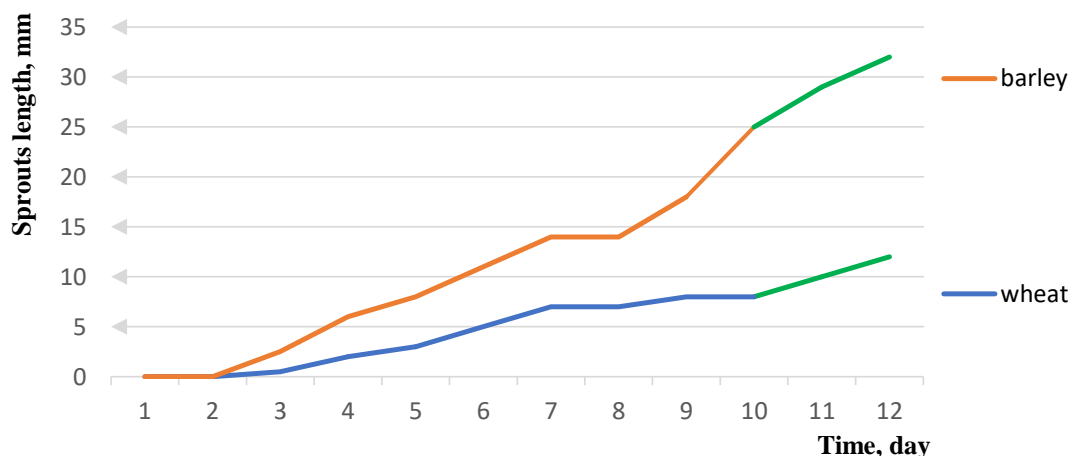
- processed under the influence of temperature;
- raw food.

When the body receives raw food, then when it is digested, maximum energy is released. This leads to the fact that the body is filled with strength and vigor, while in food cooked at temperature exposure, the enzymes that are in them are broken down. As a result, after eating such food, the body, first of all, produces the enzymes necessary for food processing. For this, the body spends a lot of internal energy, which causes heaviness after eating. Therefore, it is very important to take dietary supplements obtained without heat processing [3,7].

**RESEARCH RESULTS**

As an object for obtaining natural nutraceuticals, leguminous crops were chosen: wheat, barley, mung bean and beans. Legumes contain a number of bioactive substances useful for the body, but these substances are in a "dormant" form. If you find the necessary conditions for their germination, then bioactive substances pass from a static state to a dynamic one. Based on

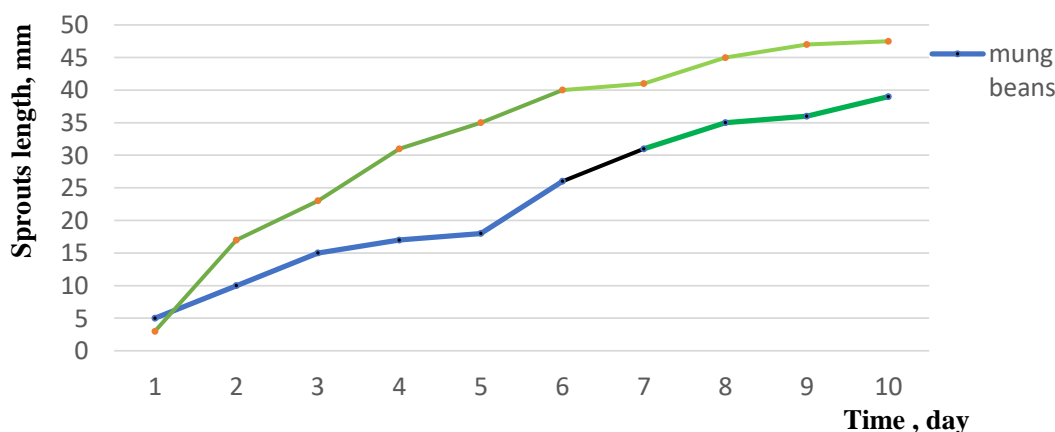
this, a method was developed for germinating grains under special conditions, subject to a number of factors such as: temperature, room illumination, atmospheric pressure, air humidity, grain layer thickness for germination and the amount of daily injected water per grain layer. Failure to comply with these conditions during the germination of legumes leads to the appearance of mold or drying of the sprouts.



**FIG 1:** Diagram of germinated grains of wheat and barley

The study was carried out in the following way: in the first variant, every day at the same time, the length of germinated grains sprouts of

leguminous crops or leguminous plants were measured, and also observed their color. The results obtained are shown in Figure 1.



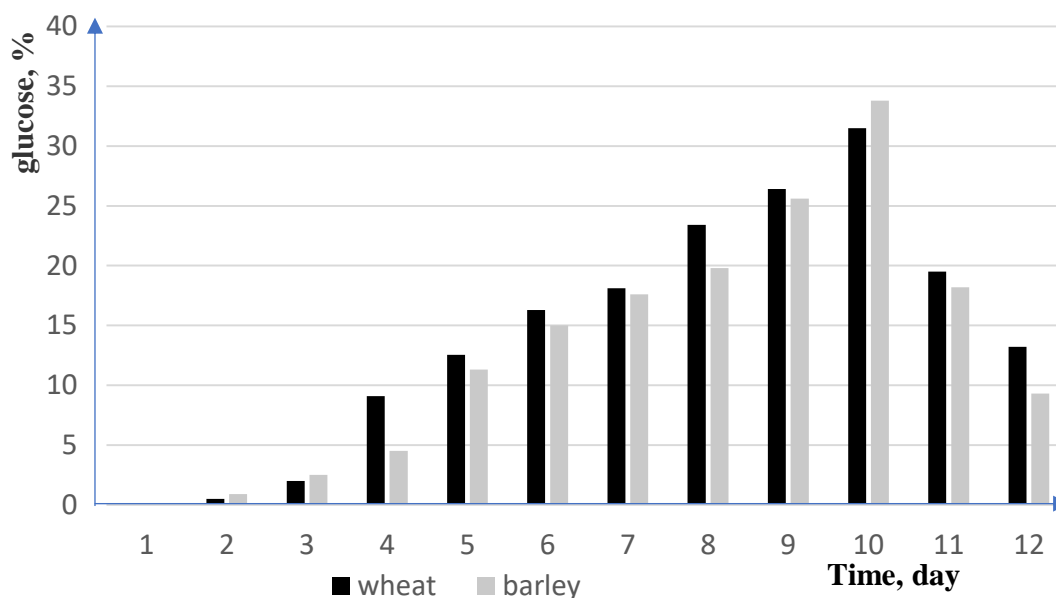
**FIG 2:** Diagram of sprouted grains of mung beans and beans

As can be seen from the data presented in Figure 1, the germination of wheat and barley grains along the length of the sprouts occurs unevenly. The color of sprouts less than 17 mm is white, and more than 17 mm is green. The maximum length of white sprouts is observed on the 10th day in wheat and barley.

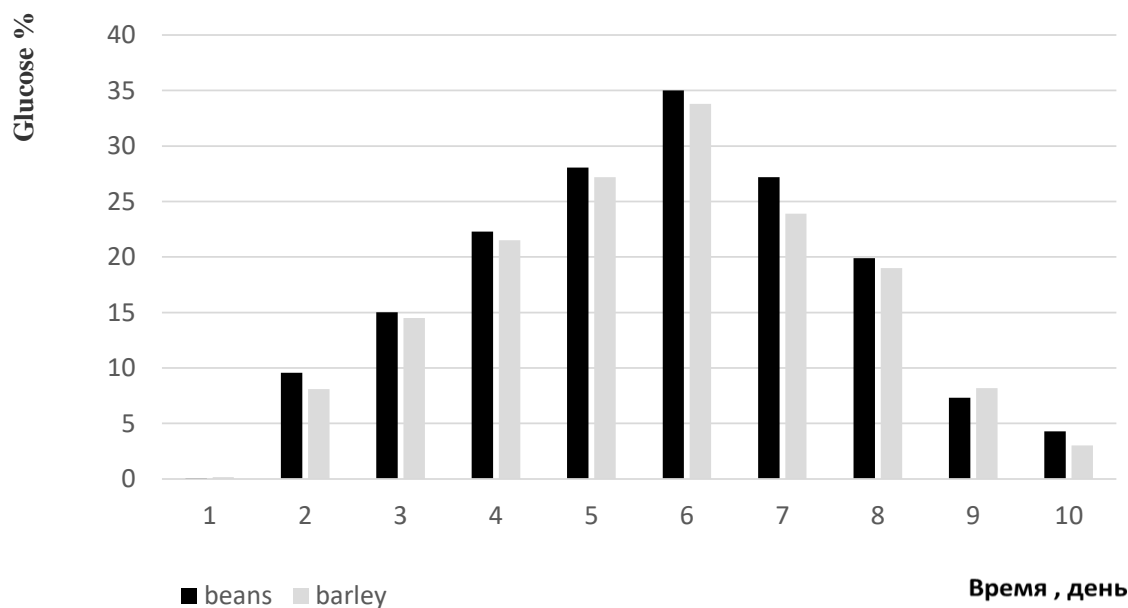
When observing the sprouts of mung bean and beans, it was found that on the 6th day the maximum size of white sprouts in mung bean and beans is reached. After that, the sprouts become green (Fig. 2).

For the second version of the research, we relied on the heritage of traditional medicine. From time immemorial, in Central Asia, in the spring, they cook their favorite food "Sumalak" from sprouted grains of wheat and barley [4]. To prepare this food, the sprouts are harvested when

they are white, that is, green sprouts are not suitable for cooking this food. In order to scientifically substantiate this phenomenon, we studied the fermentation process. For this purpose, samples were taken daily from bean sprouts and the activity of enzymes was quantitatively determined by an indirect method. Carbohydrates, which are formed during germination, are broken down by the action of enzymes into glucose. Determining its quantitative content, it is possible to give an indirect assessment of the activity of enzymes. Based on the obtained data, diagrams were constructed (Fig. 3 and 4). According to the results of the research, it was found that in wheat and barley sprouts on the 10th day, in mung bean and beans on the 6th day, a high activity of enzymes is observed.



**FIG 3:** Dynamics of enzymes during the germination of wheat and barley.



**FIG 4:** Dynamics of enzymes in the process of germination of mung beans and beans.

If we compare the obtained data with previous results, we can get the following similarity. When the size of the sprouts reaches its maximum length and the color of the sprouts is white, the enzymes show maximum activity. When the sprouts turn green, the activity of enzymes decreases sharply. That is why “Sumalak” food is prepared only from white sprouts, where enzyme activity is high and accordingly contains glucose, which gives “Sumalak” food a sweet taste [4,8].

Thus, a scientifically based technology for obtaining dietary supplements from legumes was developed. After harvesting, the grain sprouts were dried at room temperature, then sifted through a sieve with a hole diameter of 1000  $\mu\text{m}$ . The resulting powders have different colors: wheat powder - flesh-colored; barley-dark flesh-colored; mung beans - brownish-brown; beans are brown. All powders have a pleasant peculiar smell. The resulting powders were conditionally called the “Darmonal” group.

For the convenience of taking dietary supplements per os, we recommend the following forms: sachets, granules, hard gelatin capsules and globules.

To prepare sachets, the resulting crushed powders “Darmonal” were placed in bags 7 \* 9 cm in size and weighing 1.5 g.

To prepare the granules, the pre-ground powder “Darmonal” was passed through a sieve with a hole diameter of 200 microns; moistened with 5% starch paste to obtain a moderately wet mass. The mass was evenly distributed on parchment paper and dried at room temperature to a residual moisture content of 1.5%. It is then granulated using a 1000  $\mu\text{m}$  sieve.

The resulting granules are packed in 100.0 g in plastic bags, and the bags in the appropriate cardboard boxes. Technology for creating a capsule form: a dry mass, previously crushed and sifted through a sieve with a hole diameter of 1000 microns, is moistened with 5% starch paste until a homogeneous mass is obtained. The resulting mixture was dried at room temperature and granulated through a 1000  $\mu\text{m}$  sieve. The resulting mass of granules was dusted with calcium stearate. Then, using a capsulation machine, they were packed into hard gelatin capsules numbered 00. The resulting capsules were packed in glass jars of 50 pieces.

The shelf life of the dietary supplement “Darmonal” in the form of gelatin capsules, granules and sachets is determined by two methods:

1. Natural storage
2. Accelerated storage.

In the prescribed manner, the appearance, authenticity, average weight and its deviation, microbiological purity, of the studied objects were checked (table 1).

TABLE 1

№	Quality Indicators	ND Indicators	Initial indicators	Natural storage method	Accelerated storage method
				after 2 years	after 2 years
1	Appearance	The surface of the capsule is smooth, without scratches and dents.	The surface of the capsule is smooth, without scratches and dents.	The surface of the capsule is smooth, without scratches and dents.	The surface of the capsule is smooth, without scratches and dents.
2	Average mass and deviation from it	0.5g -0.475 +0.525	0.515	0.515	0.515
3	Authenticity: 1. Enzyme activity 2. Water soluble vitamins	1. activity of sucrase and lipase enzymes 2. The presence of water-soluble vitamins	Complies with ND requirements	Complies with ND requirements	Complies with ND requirements
4	Microbiological purity	According to the requirement of the SP-XI edition	Complies with the requirements of the SP-XI edition	Complies with the requirements of the SP-XI edition	Complies with the requirements of the SP-XI edition

Table 1 shows experimental data on the determination of the shelf life of dietary supplements: sachets, granules and globules have the same positive indicators and their shelf life is set to 2 years.

To obtain the expected effect and ensure the safety of dietary supplements, you must follow the instructions for their use.

The product developer is responsible for the safety of dietary supplements and their compliance with the requirements.

Given the great responsibility for the use of dietary supplements, we give the following reminder: carefully read the leaflet, which is in each package. It contains the recommended daily amount of dietary supplements for consumption, which should not be exceeded without the recommendation of a doctor. Before giving a dietary supplement to children, even if the product is specifically intended for children, always consult a doctor or pharmacist.

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