

SOME ASPECTS OF OBTAINING AND USE OF GERMINATED WHEAT SEEDS

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Abstract: Investigation results of the influence of sodium chloride solutions and treatment conditions on wheat seeds germination efficiency are presented in the article. It was established that the studied have the maximal amount of water-soluble antioxidants and sugars on the fourth day. There are no antioxidants and water-soluble sugars in non-germinated wheat seeds. An assortment of products with the addition of germinated seeds, their nutritional and caloric values are presented.

Keywords: germinated seeds, antioxidants, nutrition value, culinary products.

The following Diderot's saying has been preserved in history: "Doctors keep on working at our health maintenance, cooks — at its undermining; however, the latter are more confident in their success". But each epoch has its own enlightenments and misconceptions. In the 60's of the XXth century, academician A.M. Uglov formulated the theoretical principles of trophology — the science of adequate nutrition [1, 2]. The terms functional and prophylactic foodstuffs, live food, biogenic products, superfood, producements have become fixed in our mind for the last two decades. Undoubtedly, this applies to various plant seedlings.

The tradition of eating seedlings dates back to ancient centuries. Wheat was first cultivated in ancient Egypt and its seeds were always germinated before eating. Germinated rye and wheat were also known to ancient Slavic tribes.

Germinated seeds can be referred to functional foodstuffs capable of therapeutic effect for both gastrointestinal tract and the whole human organism. Including seedlings in the menu replenishes human organism first with three

groups of important substances: enzymes and polysaccharides which are necessary to normalize substances circulation and for age defiance. Hydrolytic enzymes which decompose spare compounds into simple substances are actively synthesized in germinating seeds. Human is supplied with natural antioxidants mainly through plant food. The average daily antioxidants consumption amount is about 400 mg. Such quantity of water-soluble antioxidants can be found in 100 g of some berry fruits: current-berry, cherry, huckleberry, also in 100 g of the majority of cereal crops seedlings [2, 3].

Various cereal and leguminous crops, also wild plants, are currently used for prophylactic and medicinal nutrition. But wheat remains the most popular crop for obtaining seedlings.

We studied certain wheat seedlings parameters which allowed us to make some conclusions about the processes proceeding at the initial seeds germination period during 1-4 days controlling the result with several simple methods.

Our investigations showed that seed germination and seedlings growth strongly

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depend on incubation time. Wheat seedlings on the fourth day at the time of incubation in water for 6 hours are shown in Fig. 1, and on the third day at the incubation time for 24 hours - in Fig. 2.



Fig. 1. *Wheat seedling on the fourth day (incubation — 6 hours)*



Fig. 2. *Barley seedlings on the third day (incubation – 24 hours)*

A change of seedlings mass before the start of biosynthesis may depend on two processes: proteins and polysaccharides hydrolysis which are to lead to a mass growth compared to the initial one and the saccharides consumption process to be accompanied by a mass loss.

Herein, accelerated development of a germinated seed should be provided by easily available water-soluble sugars. True, our investigations showed that seedlings mass is becoming significantly decreased during four days. Seedling sugar concentration growth as a result of hydrolysis during the same time was confirmed with the refractometrical method. The increase of seedlings antioxidant status was proved by direct determination of water extracts

antioxidant activity measured using the amperometrical method assisted by device «Цвет Язык-АА» (i.e. "Yauza Color" device) (Fig. 3). Antioxidant activity of the water extract obtained from seedlings is measured in mgs per 1 g. of plant material.

We studied the use of various substances, including growth stimulants, for wheat seed germination. The carried out investigations demonstrated the thing that sodium chloride is the most efficient preparation for this purpose. Thereat, one soaking in the agent solution at concentration 0.1 mol/l during 1 hour is sufficient to accelerate the germination process. The effect from this wheat treatment is brightly expressed in seedlings mass growth and water-solubles concentrations have maximum carbohydrates, whereas, herein, there is a notably smaller change of antioxidant activity observed. As a result of our researchwork, it was established that the obtained seedlings have the maximal amount of water-soluble antioxidants and water-soluble sugars on the fourth day.

In non-germinated wheat seeds there are no antioxidants and water-soluble sugars determined on the same methods.

Antioxidants preservability is an important factor for foodstuffs. The content of water soluble antioxidants decreased only by 20% in two months of preservation at room temperature in dried and milled seedlings. Based on the carried out investigations, a germination technology of seeds, which then were made part of culinary products ingredients, was developed.

As we believe, all the useful properties of germinated seeds can be used most completely when made part of culinary products ingredients, being not subjected to thermal treatment an hving limited validity terms 1/2 — 2 h.), of public catering enterprises. Similar research activities were realized by the authors of [4] that developed a number of recipes for various salads with partial replacement of some ingredients for fresh soya sprouts measured 10...20% from the mass of replaced ingredients. Recipes of jellied dishes with the addition of soya sprouts were also developed: jellied beef, fruit and berry jellies, fresh fruit and berry jellies — lemon, orange mandarin, jelly of fruit or berry extracts. It was established that 15, 30 and even 50% replacement of one of ingredients for soya considerably increases the products nutrition value without a decrease of organoleptic indices (taste, smell and composition).

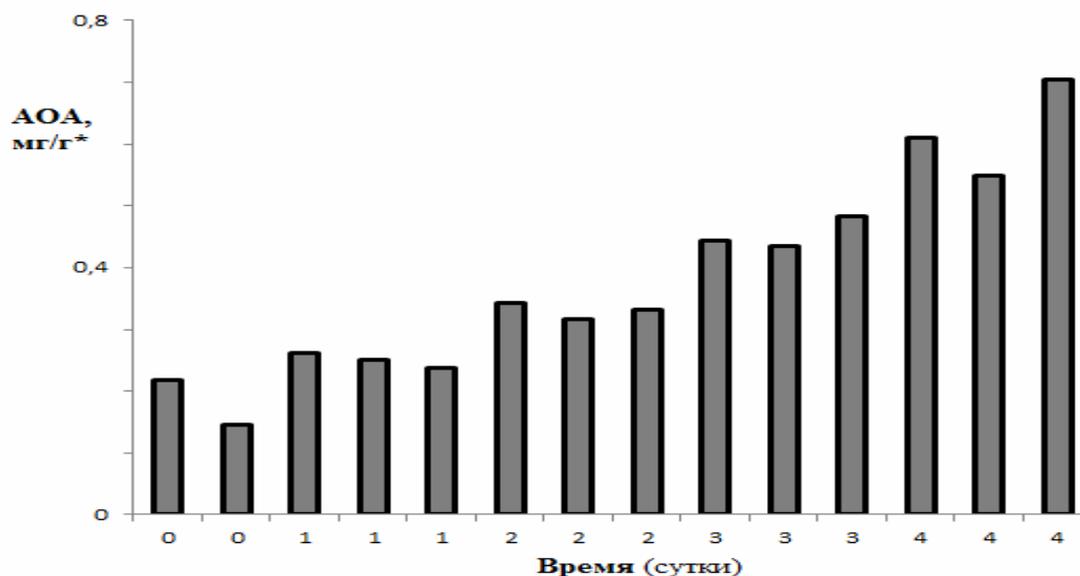


Fig. 3. Change of antioxidant activity in germinated seed extracts

Seedlings are well combined with mushrooms and any vegetables: zucchini, Bulgarian pepper, cauliflower and other cabbage, all kinds of salad, tomatoes, cucumbers. The piquant taste can be added with garlic, onion, pepper, nuts. More Asian touches of taste can be added to dishes with germinated beans with soya sauce and ginger; more traditional will be the taste added with sunflower oil, lemon juice, and mayonnaise dressing [5].

When choosing groups of culinary products in which composition one can use seedlings, we were guided by preservation of maximum nutrients — flavonoids, vitamins, mineral substances, etc. — whose sources are seedlings.

In this connection, we chose the groups in which dishes were not subjected to thermal treatment: namely, cold dishes and snacks (h'odeouvres), sweet dishes and beverages.

The assortment of the developed products, content of main food ingredients and caloric value of dishes with germinated wheat seeds are presented in the table above. The chemical composition and caloric value of the developed products changes within a considerable range, which is determined by their recipes. However, anyway, introduction of germinated seeds in dishes recipes enriches them by proteins and digestible carbohydrates.

Table
Content of main food ingredients and caloric value of dishes with germinated wheat seeds.

Dish	Content, g			Caloric value, kcal
	proteins	lipids	carbohydrates	
Stuffed tomatoes with germinated seeds	8,69	14,98	4,59	188
"Marine miracle" salad	10,75	11,79	7,17	178
"Home-made" salad	9,55	8,57	7,42	145
Spring salad with germinated seeds	1,98	6,92	9,41	108
"Rice paradise" porridge	4,63	3,31	13,76	103
"Fruit fantasy" salad	2,79	0,87	12,75	70
"Banana caprice" mousse	2,17	15,12	36,28	290
"Cottage-cheese volcano" dessert	10,78	7,49	27,29	219
Milk shake with germinated seeds	3,56	5,51	12,36	113
"Tenderness" smoothies	2,73	0,86	17,99	90

Seedling-enriched products should be introduced in public catering enterprises with collective services for groups of people (schools, student canteens, sanatoriums, etc.), also in sports

bars and other enterprises where healthy lifestyle is practised in healthy eating habits for their visitors.

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