Abstract. The article shows the necessity of healthy foods development and introduction into population’s food ration, which are enriched with scarce micronutrients, especially with iodine, to strengthen health and prevent diseases. There is a review of Laminarium chemical composition and proved the possibility of using these algae as iodine-containing ingredient to produce foodstuffs aimed to prevent iodine deficient disorders. The correlation of iodine and selenium in Laminarium algae is unique and is (1.0 : 0.7). This is that correlation what is necessary for human’s thyroid gland to provide normal functioning and optimal producing of the most important hormones — Thyroxine (T6) and Triiodothyronin (T3). While the development of pancakes with Laminarium stuffing, it was made a number of physical and chemical indicators of the stuffings compositions: humidity, active and titrated acidity. The important criteria for the stuffing formulation development was the product organoleptic estimation. It was found the optimal correlation of the formulation’s components of the Laminarium stuffing with the degree of homogenization considering. The application of modern research methods and experimental design, the study of organoleptic, physical, and chemical indicators of Laminarium and stuffing for pancakes with it allowed us to determine the optimum additive content in the stuffing and to optimize technological parameters of pancakes production. The Laminarium algae introduction in the recipe will enrich pancakes with a large number of macro-and microelements, vitamins and organic compounds. It has been found that the new product – pancakes with Laminarium stuffing characterized by high iodine content, has a high nutritional value and good consumer’s indicators. This allows to recommend it for using in preventive nutrition.

Keywords: pancakes, stuffing, iodine deficiency, pre-cooked semi-product, Laminarium, seaweed, biological activity.
tion of the iodine deficiency. The products enrichment with Laminarium with such essential elements as selenium in an organically bound form, allows to create a product with increased iodine resistance. They can provide prophylactic and therapeutic effects on the health of persons who are suffering from various kinds of socially significant diseases, especially non-infectious.

The increase of diseases of the Ukrainian population in recent decades, experts are attributing with the ecological situation deterioration, the food products quality and an unbalanced nutrition. High-quality and safe products are one of the most important factors influencing the human health.

Nowadays, food products have become an effective remedy for improving physical and psychic health, which reduces the risk of many diseases. That’s why there is a growing need for the use of food products with a balanced chemical composition containing biologically active substances of a different action spectrum.

According to the manufacturer’s experience, the make of products a high nutritional value in recent years has increased significantly, due to the expansion of the assortment, the emergence of new products types in this market sector, and rather high interest, confidence and understanding of buyers of the functional foods importance to keep them healthy and reduce the risk of diseases [1-3].

For the food products enrichment with various functional properties, while their creation is necessary to use those micronutrients, the lack of which is actually appear.

Analysis of Literature

These days, one of the important medical and social problems for many world countries is the presence of endemic iodine deficiency – a condition when the minimum physiologically necessary amount of iodine for the human body (100 – 250 μg per day) is not reached with food and water.

The problem of iodine deficiency, according to the WHO experts, is the most common cause of a mental retardation that can be prevented by an effective iodine prophylaxis [4,5].

The best way to prevent the iodine deficiency is to use products that contain the organically bound iodine.

Iodine is currently the only known microelement involved in the hormones biosynthesis. The biological role of iodine is associated with its involvement in the thyroid gland hormones formation – triiodothyronine and thyroxine.

Unique raw materials with those composition and properties are brown algae, which are used to prepare as independent food products (salads, canned food, soups, other dishes, snacks, etc.), as well as their modified derivatives, which are used as the structure-forming components.

The most promising for this are brown algae, including Laminarium – Laminariales.

Laminarium can be confidently called the most famous representative of brown algae. There is known more than 20 species of a Laminarium algae family, also known as sea cabbage.

Seaweeds have a unique biochemical composition that can fully cover the human body needs in exogenous biologically active substances. These are micromolecules, amino acids, polysaccharides, non-saturated fatty acids, chlorophyll, carotenoids, water soluble vitamins, as well as iodine, a significant amount of which is found in brown algae in the form of organic compounds [6,7].

Laminarium is a ready, natural, perfectly balanced complex, which contains about 40 micro and macro elements, which are connected with organic substances. Specific content in iodine is 110 – 800 μg per 100 g of dry substance [8]. Mineral substances, including alkaline and ground metals, can accumulate in quantities, many times exceeding the concentration of these elements in water. Most of these elements are biogenic, that is, they are part of the vitamins, enzymes, and are necessary for the normal human body functioning. The most important of the biogenic microelements are selenium and iodine. Selenium is a major antioxidant agent, which increases the body resistance to negative environmental effects. In the sea algae it is contained in organic form. Iodine in seaweed is also in connection with amino acids of proteins (tyrosine), that explains its high bioavailability, in contrast to inorganic iodine. However, the biggest interest is that the correlation of iodine and selenium in Laminarium is unique and is equal to 1,0 : 0,7. It is this correlation which is necessary for the human thyroid gland to ensure normal function and optimal development of the most important of its hormones – thyroxine (T4) and triiodothyronine (T3) [9-14].

Excellent curative qualities of seaweed are due to the fact that its protein, fat and carbohydrate composition in its biological characteristics is favorably different from other food plants (Table 1).

Laminarium stimulates the general metabolism processes, corrects the work of the endocrine glands (particularly in thyroid gland), is used in the nerve disorders treatment, normalizes the mineral balance, provides a powerful anti-sclerotic effect, prevents the occurrence of diseases such as angina pectoris, myocardial infarction.

Laminarium contains alginates, fucoidan, mannotoil and laminarans. Fukoidan is a biologically active sulfated polysaccharide having antitumor and anticoagulant activity and inhibits the growth of a number of microorganisms. Laminarans are low molecular weight β-1,3-1,6-glucans, have a wide range of biological effects: increase the organism resistivity to bacterial, vi-
It is known that Laminarium reduces the absorption and accumulation of radionuclides of cesium and strontium in the human body [15]. More than 40 years ago, the search for safe and effective substances that could bind and remove radionuclides and heavy metals from the body began. Studies conducted in more than 10 countries have shown that alginates (from the Latin Alga - sea grass) have the highest efficiency - the alginic acid salts, which are the product of seaweed processing and contain the valuable biologically active substances.

Table 1 - Chemical composition of Laminarium [9-11]

| Index | Contents | Content |
|-------|----------|---------|
| Protein, g/100g | 0.9 | 0.25 |
| Fat, g/100g | 0.2 | 0.96 |
| Carbohydrates, g/100g | 3.0 | 2.5 |
| Food fibers, g/100g | 0.6 | 0.015 |
| Organic acids, g/100g | 2.5 | 0.0007 |
| Water, g/100g | 88.0 | 0.87 |
| Ash, g/100g | 4.1 | 0.01 |
| Calories, k/Cal | 24.9 | 9.76 |
| Minerals, mg/100g |
| Calcium | 40 | 2.5 |
| Magnesium | 170 | 0.02 |
| Sodium | 520 | 0.01 |
| Potassium | 970 | 0.0015 |
| Phosphorus | 56 | 0.0007 |
| Sulfur | 9 | 0.0007 |
| Iron | 16 | 0.0007 |
| Iodine | 0.3 | 0.0007 |
| Selenium | 0.0007 | 0.0007 |
| Vitamins, mg/100g |
| Vitamin А | 0.15 | 0.0007 |
| Vitamin В1 | 2.5 | 0.02 |
| Vitamin В2 | 0.04 | 0.0007 |
| Vitamin В6 | 0.06 | 0.0007 |
| Vitamin В9 | 0.0023 | 0.0007 |
| Vitamin В12 | 0.001 | 0.0007 |
| Vitamin С | 2.0 | 0.02 |
| Vitamin D | 0.0024 | 0.0007 |
| Vitamin РР | 0.55 | 0.0007 |
| Vitamin Е | 0.87 | 0.0007 |

The seaweed alginates and in the isolated state have the properties of food fibers and enterosorbents. They remove heavy metals, radionuclides and toxins from the body.

Soluble alginates are highly effective thickeners and formers, and now they are important nutritional supplements that improve the rheological properties of food products.

In this work, have been used standard methods for researching the organoleptic and physical-chemical properties of many theochemics of algae have become well known, scientists are paying a lot of attention to the functional food products development with additives of seaweed.

Table 2 - Chemical composition of Laminarium [9-11]

| Index | Contents | Content |
|-------|----------|---------|
| Protein, g/100g | 0.9 | 0.25 |
| Fat, g/100g | 0.2 | 0.96 |
| Carbohydrates, g/100g | 3.0 | 2.5 |
| Food fibers, g/100g | 0.6 | 0.015 |
| Organic acids, g/100g | 2.5 | 0.0007 |
| Water, g/100g | 88.0 | 0.87 |
| Ash, g/100g | 4.1 | 0.01 |
| Calories, k/Cal | 24.9 | 9.76 |
| Minerals, mg/100g |
| Calcium | 40 | 2.5 |
| Magnesium | 170 | 0.02 |
| Sodium | 520 | 0.01 |
| Potassium | 970 | 0.0015 |
| Phosphorus | 56 | 0.0007 |
| Sulfur | 9 | 0.0007 |
| Iron | 16 | 0.0007 |
| Iodine | 0.3 | 0.0007 |
| Selenium | 0.0007 | 0.0007 |
| Vitamins, mg/100g |
| Vitamin А | 0.15 | 0.0007 |
| Vitamin В1 | 2.5 | 0.02 |
| Vitamin В2 | 0.04 | 0.0007 |
| Vitamin В6 | 0.06 | 0.0007 |
| Vitamin В9 | 0.0023 | 0.0007 |
| Vitamin В12 | 0.001 | 0.0007 |
| Vitamin С | 2.0 | 0.02 |
| Vitamin D | 0.0024 | 0.0007 |
| Vitamin РР | 0.55 | 0.0007 |
| Vitamin Е | 0.87 | 0.0007 |

The system of antioxidant protection includes vitamins and provitamins which are contained in algae (vitamin C, provitamin A, provitamin E, provitamin РР, provitamin Е, traces of vegetable oils, unsaturated fatty acids). It is known that the positive influence of biologically active substances, chlorophyll, and fikoxanthine, carotenoids, mitosis-static substances, vitamins B1, B2, B12, C, D, P, F, E, F, traces of vegetable oils, unsaturated fatty acids, reduce the metabolic activity of intestinal flora and reduces the metabolic activity of intestinal flora, which is the carriers of many biologically active substances: chlorophyll, and fikoxanthine, carotenoids, mitosis-static substances, vitamins B1, B2, B12, C, D, P, F, E, F, traces of vegetable oils, unsaturated fatty acids.
properties of the product and the method for determining the biological activity of natural origin objects [24].

Based on the analysis of iodine-based raw materials, it was decided to use Laminarium as a stuffing ingredient for pancakes. Pancakes are so versatile that they can serve as a high-grade breakfast and dinner, remaining one of the most popular and traditional dishes. However, a modern life pace does not leave any time for the preparation of these delicacies. One of the promising and profitable destinations in the field of expanding the range of this group of culinary products is the production of frozen pancakes. Frozen pancakes are made with different stuffings and are one of the most popular semi-products for fast cooking. By introducing modern lines of pancakes production, it is possible to produce the most qualitative products in large quantities, but with different stuffings, including Laminarium.

For the research were chosen four samples: a control sample of pancakes stuffed with green-stuff and egg with the recipe No. 1044 [25]; stuffed pancakes with different content of Laminarium, namely: 18%; 36%; 54% to the mass of the product.

The best formulation for stuffing with Laminarium is presented in the percentage correlation in Figure 1.

![Fig. 1. The percentage correlation of stuffing ingredients for pancakes diagram](image1)

**The results of the research and their discussion**

An important criterion for the preparation of stuffing from Laminarium was the product organoleptic evaluation. As we see from Figure 2, a pancake sample with 36% of Laminarium supplementation turned out to be the best by its organoleptic indicators.

![Fig. 2. The organoleptic indicators of pancakes with Laminarium stuffing and green-stuff](image2)

It was made a number of studies of physical and chemical parameters, namely, the moisture content of stuffing, the stuffing active and titrated acidity and the biological activity (Fig. 3-6), while the technology development of Laminarium stuffing supplement for pancakes.

It is known that with the increase of the Laminarium admixture content, the stuffing moisture content increases, due to the fact that after its recovery, Laminarium absorbs a large amount of moisture (up to 93%).

The increased acidity of stuffings with the increase of the Laminarium additive content is expected. It happens due to the fact that sautéed onion in the stuffing is replacing with Laminarium additive. In turn, the sautéed onion is characterized by increased acidity than the Laminarium. Laminarium contains alginic acid, which affects on the stuffing general acidity.
The healing power of Laminarium can’t be related to the biological activity of any one component. It is due to the harmonic synergistic effect of all biologically active substances that are part of the Laminarium. According to this, a particular interest has the definition of such an indicator as a biological activity, the magnitude of which takes into account two main factors: the intermolecular interaction of the ingredients that are part of the pancake stuff and the cooperative contribution of the biologically active components to the intensity of electronic transport simulating the energy homeostasis of the organism [23].

The criterion for assessing the biological activity of vegetable origin products is based on the catalysis of the electron transport by the product in the system of reduced nicotinamide adenine dinucleotide \( \text{NADH}_2 \) – potassium ferriyanide \( \text{K}_3[\text{Fe(CN)}_6] \). The ability of various biologically active components included in stuffing, can cause a non-oximation of oxidation \( \text{NAD} \cdot \text{H}_2 \) to \( \text{NAD} \) and to simultaneously restore \( \text{Fe}^{3+} \) to \( \text{Fe}^{2+} \) shows that these substances can increase the general non-specific resistance of the organism [24].

This criterion is widely used for the food products analysis that have therapeutic and prophylactic properties (dairy products, juices, drinks, etc.) [26,27]. We made a series of experimental studies to determine the biological activity of the stuffing control sample with herbs and eggs, and stuffing with Laminarium. Experimental data of the stuffing biological activity study are presented in Fig. 6.

As can be seen from the experimental data presented in Figure 6, all prototypes are biologically active, since the transfer velocity in the system increases by their presence almost once. It should be noted that the ability of the test samples to oxidize \( \text{H NAD} \cdot \text{H}_2 \) to \( \text{NAD} \) is different, therefore the value of biological activity has a rather wide range and there is an increase in the biological activity of stuffing with the Laminarium addition.

**Conclusions**

Thus, on the basis of the received physical and chemical data, organoleptic parameters and biological activity of pancakes, it can be concluded that the introduction of an additive from the Laminarium in the formulation is expedient. The new food product - frozen half-finished pancakes with stuffing from Laminarium, is characterized by high iodine content, high nutritional value and good consumer characteristics, which allows it to be recommended for consumption in prophylactic nutrition.

**References:**

1. Murray, C. J. L. The global burden of disease. A comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020 / C. J. L. Murray, A. D. et al. – Boston, M. A., Harvard School of Public Health, 1996.
2. What Consumers Want - and Don't Want - on Food and Beverage Labels // Food technology. – 2002. – Vol. 56, Issue 4. – P. 32.
3. What Consumers Want - and Don't Want - on Food and Beverage Labels // Food technology. – 2002. – Vol. 56, Issue 6. – Р. 24.
4. Бруно Де Бенуа, Устранение дефицита йода – одна из ключевых задач здравоохранения // Международный эндокринологический журнал. – 2011. – № 6. – С. 38-39.
5. Агунова Л. В. Анализ виробництва м'яких продуктів функціонального призначення для корекції йододефіцитних станів // Східно-Європейський журнал передових технологій. – 2015. – №10(74). – С. 10. DOI: 10.15597/1729-4601.2015.39693
6. Барашков Г. К. Сравнительная биохимия водорослей. — М.: Пищ. пром-сть, 1972. — 355 с.
7. Каханин В.Д. Морские сооружения. — М.: Пищ. пром-сть, 1972. — 134 с.
8. Типична Н.Н. Мучные изделия: учеб, пособие / Красноярск. гос. аграр. ун-т. — Красноярск, 2007. — 172 с.
9. Сиренко, Л. А. Биологически активные вещества водорослей и качество воды / Л. А. Сиренко, В. Н. Козицкая. – Киев: Наукова думка, 1988. – 254 с.
10. Барашков, Г. К. Химия водорослей / Г. К. Барашков. — М.: Изд-во Академии наук СССР, 1963. — 144 с.
11. Барашков, Г. К. Сравнительная биохимия водорослей / Г. К. Барашков. — М.: «Пищевая пром-сть», 1972. — 336 с.
12. Маюрникова, Л. А. Роль алиментарного фактора в профилактике недостаточности йода и селена / Л. А. Маюрникова // Хранение и переработка сельскохозяйственных культур. — 1998. — № 3. — С. 39-40.
13. Сухаина, С. Ю. Йод и его значение в питании человека (обзор) / С. Ю. Сухаина, Г. И. Бондарев, В. М. Позняковский // Вопросы питания. — 1995. — № 3. — С. 12-15.
14. Изучение и применение лечебно-профилактических препаратов на основе природных биологически активных веществ / под ред. В. Г. Беспалова, В. В. Некрасовской. — СПб.: Экспут, — 2000. — 468 с.
15. Озерова В.М. Водоросли: здоровье морских глибин. — СПб.: ИТБ ВЕС, 2005.
16. Zygaiotton T.N., Shevchenko N.M., Chizhov A.O. etal. Water soluble polysaccharides of some far-eastern brown seaweeds. Distribution, structure and their dependence on the environmental conditions // J. Exp. Mar. Biol. Ecol. — 2003. — № 1. — P. 1-13. DOI: 10.1016/S0022-4565(03)00244-2.
17. Ion H., Noda H., Amano H. et al. Antitumour activity and immunological properties of marine algal polysaccharides, especially fucoidan, prepared from Sargassum thunbergii of Phaeophyceae // Anticancer Res. — 1993. — Vol. 13. — Р. 2045-2052.
18. Pereira M.S., Vilela-Silva A.C.E.S., Valente A.P., Mourao P.A.S. A 2-sulfated, 3-linked α-L-galactan is an anticoagulant polysaccharide // Carbohydr. Res. — 2002. — Vol. 337. — P. 2231-2238. https://doi.org/10.1016/S0008-6215(02)00215-X.
19. Роке НМА, Руло СА, Даукете ЕВ (2003) Fucoidans from the brown seaweed Alarosocystis utricularis: extraction methods, antiviral activity and structural studies. Carbohydr. Res. 338: — P. 153–165. https://doi.org/10.1016/S0008-6215(02)00403-2.
20. Сухаина, С. Ю. Приготовление блинов с морской капустой, характеризующихся повышенным содержанием йода, обладает высокой пищевой ценностью и хорошими потребительскими показателями, что позволяет рекомендовать его к употреблению в профилактическом питании. Ключевые слова: блины, фарш, йододефицит, кулинарный полуфабрикат, ламинария, морская капуста, биологическая активность.

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ЗАМОРОЖЕННЫЕ КУЛИНАРНЫЕ ПОЛУФАБРИКАТЫ С ЙОДОСОДЕРЖАЩИМИ ФАРШАМИ

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Аннотация. В статье показана необходимость разработки и внедрения в рацион питания населения блюд здорового питания, обогащенных дефицитными микронутриентами, в том числе йодом, для укрепления здоровья и профилактики заболеваний. Рассмотрены химический состав ламинарии и обоснована возможность использования ее в качестве йодсодержащего ингредиента для создания мучных кулинарных полуфабрикатов блинчиков для профилактики йододефицитных заболеваний.

Ключевые слова: блины, фарш, йододефицит, кулинарный полуфабрикат, ламинария, морская капуста, биологическая активность.
References:
1. Murray CJL et al. The global burden of disease. A comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020. Boston, Harvard School of Public Health; 1996.
2. What Consumers Want - and Don’t Want - on Food and Beverage Labels. Food technology. 2002; 56(4):32.
3. What Consumers Want - and Don’t Want - on Food and Beverage Labels. Food technology. 2002; 56(6):24.
4. Bruno De Benus, Ustrananje defisita voda – odno iz klyachevyih zadan zdravoohranieniya. Mezhdunarodnyiy endokrinologicheskiy zhurnal. 2011; 6:38-39.
5. Agunova LV. Analiz virobnistva m’yasnykh produktiv funktsionalnogo priznachennya dlya korektsIYi yododefflitsntih stanIv. Shldno-Evropyskiy zhurnal peredovih tehnologiy, 2015; 10(74):10. DOI: 10.15587/1729-4061.2015.39693
6. Barashkov GK. Sravnitel’nyiy biofinnityy vodorosley. M.: Pisch, prons-st; 1972.
7. Kazmin VD. Morskie sokrovischa. M.: Pisch, prom-st; 1972.
8. Tipsina NN. Mucheniy izdeliya: ucheb, posobie. Krasnoyarsk. gos. agrar, un-t. Krasnoyarsk. 2007; 172.
9. Sirenko LA, Kozitskaya VN. Biologicheski aktivnyie veschestva vodorosley i kachestvo vodyi. Kiev: Naukova dumka; 1988.
10. Barashkov GK. Hrannyiy vodorosley. M.: Izd-vo Akademii nauk SSSR, 1963.
11. Barashkov GK. Sravnitel’nyiy biofinnityy vodorosley. M.: «Pischevaya prom-st»; 1972.
12. Mayarnkova LA. Rol alimentarnogo faktora v profilaktike nedostatochnosti yoda i selena. Hranenie i pererabotka selhozsyirya. 1998; 3: 39-40.
13. Suhinina SYu, Bondarev GI, Poznyakovskiy M. Yod i ego znachenie v pitanii cheloveka (obzor). Voprosyi pitaniya.1995; 3: 12-15.
14. Izuchenie i primenenie lechebno-profilakticheskih preparatov na osnove prirodnih biologicheski aktivnyih veschestv. pod red. V. G. Bespalova, V. B. Nakrosavoy. - SPb.: Eskulap; 2000.
15. Ozerova VM. Vodorosli: zdorov’ya z morskih glubin. Srpb.: IG «VESH»; 2005.
16. Zvyagintseva TN, Shevechenko NM, Chizhov AO et al. Watersoluble polysaccharides of some far-eastern brown seaweeds. Distribution, structure and their dependence on the developmental conditions. J. Exp. Mar. Biol. Ecol. 2003; 1:1-13. https://doi.org/10.1016/S0022-0981(03)00244-2
17. Ion H, Noda H, Amano H et al. Antitumour activity and immunological properties of marine algal polysaccharides, especially fucoidan, prepared from Sargassum thunbergii of Phaeophyceae. Anticancer Res. 1993; 13: 2045-2052.
18. Pereira MS, Vilêda-Silva A-CES, Valente A-P, Mourao PAS A 2-sulfated, 3-linked a-L-galactan is an anticoagulant polysaccharide. Carbohydr. Res. 2002; 337: 2231-2238. https://doi.org/10.1016/S0008-6215(02)00215-X
19. Ponce NMA, Pujol CA, Damonte EB. Fucoidans from the brown seaweed Adonocystis utricularis: extraction methods, antiviral activity and structural studies. Carbohydr. Res. 2003; 338: 153-165. https://doi.org/10.1016/S0008-6215(02)00403-2
20. Zvyagintseva TN, Besednova NN, Elyakova J.A. Struktura i immunotropnoe deystvie 3,1; 1,6 R - D - glyukanov: monografiya. Vladivostok: Dalnauka; 2002.
21. Podkoryitova AV, Talahaeva SV. Polifunktionalnyie svoystva polisaharidov buryih vodorosley. Mat-lyi Mezhdunar. konf. "Morskie pribrezhnyie ekosistemyi: vodorosli, bespozvonochnyie i produktyi ih pererabotki". M.: VNIRO; 2002.
22. Podkoryitova AV, Morskie vodorosli-naftoizlivy i travyi : monografiya. M.: VNIRO; 2005.
23. Panin LE. Biomiicheskie mehanizmyi stressa. Novosibirsk: Nauka; 1983.
24. Patent na vinald 1075062 S2, MPK G 01N 33/00 (2015.01). Sposib viznachennya biologicnYi aktivnosti ob’Ekfilu prirodnogo polohykhzenia. Hornich GP, Vilik Sl, Kaprelyants LV, Oislova LA, Lozovska TS. Vlasiuk Odeska natsionalna akademiya harchovih tehnologiy. # u 201302626; zayavl. 04.03.2013; opubl. 12.01.2015, Byul. 1.
25. Zdobnov AY, Tsyhanenko VA. Zhynik retseptur strav ta kulinarymykh vyrobykh. K.: Aryi; 2013.
26. Hornich GA, Vilikal SI Biologicheskaya aktivnost yagod chemikii i produktov eYo pererabotki. Harchova nauka i technologiya. Odesa. ONAHT. 2011; 4(17): 26-29.
27. Vilikal SI. Biologichchna aktivnost roslinnoYi sirovini - IngredIenta harchovih produktiv. Harchova nauka i technologiya. Odesa. ONAHT. 2012. 4(21): 40-44.

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