

# OVERVIEW OF ALTERNATIVE WAYS SUPPLY OF FOODSTUFFS

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## METHODS OF PROCESSING NUTS AND OBTAINING HIGH QUALITY PRODUCTS

*Polishchuk Andriy*

*Polishchuk Roman*

Topicality. Research and review articles on the use of nuts so far have been devoted mainly to biochemical characteristics and its composition, prospects for the use of products from them for medical, nutritional and technical purposes. At the same time, the technological aspects of the production of such products are insufficiently covered in the scientific literature.

Nuts occupy a special niche among balanced foods. The chemical composition of nuts varies considerably depending on the place and conditions of cultivation, processing technology, harvest time, drying methods, storage conditions and botanical varieties.

In particular, during the processing of nuts into kernels, oil derivatives, production waste, a product such as shell is obtained, which averages 51-59% by weight of raw materials. Therefore, the urgency of creating a comprehensive technology focused on obtaining purified nut kernels and the formation of fuel cells from its shell, due to the following reasons:

- kernels and shells make up the bulk of seeds, and obtaining their marketable products makes the processing of nuts virtually waste-free;
- the main part of nuts' proteins, fats and carbohydrates is concentrated in its kernels, which have a stable market as food, raw materials for oil production, use in confectionery, etc .;
- nut shell is a promising raw material for fuel cells.

This article is devoted to the main technological aspects of complex processing of nuts. Since the commercial kernels of nuts must meet the requirements for environmentally friendly food products, in the process of their processing it is undesirable to use any chemical reagents, high temperatures and

other influences that can lead to partial destruction of the protein-vitamin complex of nuts.

For this reason, the mechanical method of peeling was chosen from all possible ones. Traditional mechanical methods of seed processing are relatively simple and usually involve crushing between rollers or rotating millstones. Tests have shown that the disadvantage of this method is the low yield of the finished product. With an average seed weight of 43%, the yield was less than half of this figure. But the existing and the second method of splitting, it resembles the principle of manual methods, namely the compression of the nut until the destruction of its protective shell. Eliminating losses and succeeded in using this method of processing, in which the collapse of the nut shell occurs at the time of contact with surfaces.

The technique is used on an industrial scale and has high productivity. For this method, a whole set of equipment is used as a peeling machine, calibrator, vibrating screen and aspiration column, and separately using a peeling machine with subsequent manual processing.

The K 100 walnut peeling machine is an industrial walnut processing equipment. Due to the conical principle of splitting the equipment provides clear operation with the maximum yield of the whole core and is suitable for processing walnuts of any size [3].

Appointment of a calibrator for sorting unpeeled nuts into fractions of a certain size from small to large for further high-quality and cost-effective processing of nuts on industrial devices that require pre-calibration of the nut.

The complete scheme of complex processing of nuts, which is expected to be implemented in the future, includes the stage of obtaining from the shell of extractive

The fractional composition of seeds and mechanical properties of the nut, which come in large batches for processing, vary greatly depending on the

regional and climatic characteristics of the area of its harvesting, as well as the technology of harvesting and primary processing.

The large run on physical characteristics forces to pay special attention to the first stage of technological process. Primary screening and calibration allow to identify nuts with underdeveloped kernels and debris. The amount of primary waste can range from 3 to 15% of the total weight of raw materials. Much more important is the moisture content of the seeds coming for processing, which can vary from 10 to 30%. High humidity of kernels during peeling leads to their destruction and loss. Low humidity of the shell increases its hardness and relative volume of the nuclei, which prevents both peeling and subsequent separation of the nuclei from the shell. Therefore, when working out the industrial process of peeling nuts, a sequence of operations was recommended, including convective drying of nuts with warm air to a humidity of ~ 10% and their subsequent moisturizing short-term for 2-8 hours.

In this way it is possible to achieve at relatively low humidity of the nuclei higher humidity of the shell, which reduces its strength and increase the relative size. As a result, the separation rates of the finished product are significantly improved. For several years, in semi-industrial conditions, the jet decorifier was tested, which works as follows. Walnut seeds through the nozzle enters the accelerator tube, where the flow of air acquires a speed of ~ 40 m / s and then when hitting the wall is destroyed. The force of impact depending on the strength and elasticity of the shell varies with the change in air flow rate. This minimizes the loss of nuclei during impact.

The disadvantages of this method include the relatively low productivity and low efficiency, because of the low efficiency of air compression. In addition, there is a need to clean the compressed air from vapors of compressor oil, which may otherwise get into the food product.

Therefore, for industrial installations use another device that is free from the above disadvantages - a multi-channel centrifugal decorifier. It works this

way. The nut from the hopper is fed by a dispenser to a disk of radius  $R$ , rotating with an adjustable angular velocity  $\omega$ , where under the action of centrifugal force is distributed over  $n$  radial channels. Due to the friction of the walls of the seed channels acquire at the output of a linear velocity close to  $\omega R$  and then in contact with the target collapse. The target is a specially profiled powerful steel ring, the impact of which changes the direction of movement of the seeds by 90 degrees. The radius of curvature of the walls satisfies the equation of the logarithmic spiral. Due to profiling, the angular scatter in the meridional plane of the seed flying out of the disc channels does not affect the force of impact on the target.

This force is determined by the normal to the target component of the seed pulse and the time of collision. Instead, the collision time depends on the elasticity of the seed shell, ie. from its humidity and orientation at the time of collision. The above profiling and the size of the accelerating channels allowed to reduce the impact scatter, thereby reducing losses and increasing productivity. The yield of the finished product when using dried healthy seeds was raised to 30-33%, and the productivity of the disintegrant - up to 150-200 kg of raw materials processed per hour.

The mixture of kernels, uncrushed seeds and shells from the centrifugal decorifier enters the drum separators, where they are separated from each other. The seeds are returned to the cycle, and the kernels are pre-dried. The fertile film is removed from the dried kernels, and they are subjected to bulkheads, in the process of which rancid and whole kernels are separated. Such nuclei, as practice shows, are collected depending on the conditions of collection, processing, storage and peeling of seeds from 5 to 20-25%. After that, the commercial cores are sent to the sink and the final drying to a humidity of less than 3%.

Conclusions. A technological scheme of complex nut processing has been developed, which includes the production of peeled nuts and obtaining energy products from nut shells. It is shown that the optimal conditions for peeling nuts

are achieved after drying and short-term further moistening. During semi-industrial tests, it was found that among the tested types of devices for peeling nuts, the best results are achieved when using a multi-channel centrifugal decorifier.

## **PRODUCTION OF VEGETABLE PROTEIN AS A SUBSTITUTE FOR MEAT NUTRITION**

*Volynets Andriy*

One way to reduce the pressure on the environment is to use vegetable proteins in the form of meat. Choosing in favor of vegetable meat is taking care of your health and reducing environmental risks. Vegetable protein is well absorbed by the body. To get a kilogram of animal protein you need to spend almost 10 times more vegetable protein in the form of food that animals eat. Pollutant emissions from the livestock industry in terms of quantity and impact on the environment are comparable to emissions from the oil and gas industry.

Vegetable meat is a product rich in vegetable protein, which mimics the look, taste, color, smell and texture of traditional meat and fish counterparts in a wide range - from various minced products - meat and fish cutlets, meatballs, heifers, as well as sausages, frankfurters, hams, jellies, etc., to natural steaks, fillets, goulash and schnitzels with different flavors. The basis for all these products are vegetable proteins, and especially soy protein, wheat gluten and pea protein. The production of these three types of proteins in the form of low-fat flour, concentrates and isolates was mastered by the food industry in the second half of the 20th century. First of all, they are used as additives - which improve the quality of traditional meat, dairy and confectionery products.

Vegetable proteins are used both in the form of powdered products and in a textured form - after a special technological treatment by cooking extrusion. The essence of the method is that the mixture of protein powder and water can be processed in special devices - extruders, in which the protein mass is pushed at high temperature and pressure through holes of small diameter, followed by rapid cooling. This method of cooking extrusion produces a fibrous product that mimics the texture of meat. The resulting mass is then crushed and dried. Depending on the size of the grinding of the plant texture in the production process, the porous pieces can have different shapes and sizes, for example: minced meat, flakes, goulash, chops, cubic pieces or any other shape.

These products can be used for food by a large part of the population who do not eat natural meat.

## **ADVANTAGES AND DISADVANTAGES OF SOILLESS SYSTEMS FOR GROWING PLANTS**

*Bogdanov Denis*

If we talk about theories, it is possible to grow any plant, including trees and shrubs, by hydroponics. But in practice, the method is used only for growing some vegetables and greens. Most often, hydroponics is used in the cultivation of: cucumbers, tomatoes, legumes, radishes, greens (onions, basil, lettuce, dill, parsley), etc.

Potatoes, carrots, beets are not grown on hydroponics. In theory, this is possible, as mentioned above, but very difficult, as to obtain a full-fledged root plant still needs soil.

There are many reasons why you should grow products on hydroponics:

- Much less water, fertilizer and plant protection products are used.
- Significantly less impact on the environment.
- Soil diseases and field conditions no longer affect production.

For these reasons, hydroponic cultivation systems provide more controlled and uniform growth, which leads to a product with higher yields. In addition, consumers prefer hydroponically grown vegetables because it is a cleaner product and, if sold with roots, has a better shelf life.

In comparison with classical cultivation of plants hydroponic technology allows to accelerate growth sharply, to increase productivity, to provide ecological purity and high quality of agricultural production.

Advantages of using the method:

1. When using this method significantly increases the yield of fruit plants;
2. Intense flowering of ornamental plants also proves the positive effect of hydroponics on their growth;
3. Helps to provide the plant with all the necessary nutrients. It grows strong and healthy, moreover, much faster than in the soil;
4. The plant does not accumulate harmful elements contained in the soil, which have a detrimental effect on the human body. This is especially true for fruit plants. After all, when using the method of hydroponics, plants receive only nutrients;
5. Plants do not need daily watering. And water consumption in hydroponics is much easier to control;
6. With the use of the method of hydroponics, drying of plants is absolutely excluded;
7. It is easier to transplant plants;
8. Hydroponics can prevent problems such as pests and various types of fungi and diseases that occur in plants grown in the soil;

9. There is no need to use new soil, which significantly reduces the cost of growing houseplants;
10. Such plants are easier to care for, there is no dirt from the ground, no foreign odors, pests that can get into the soil, and then spread indoors.

Soilless systems can be used both on a domestic scale and in powerful hydroponic systems close to industrial production.

## **PROSPECTS FOR THE DEVELOPMENT OF ARTIFICIAL MEAT PRODUCTION TO REDUCE THE PRESSURE ON THE ENVIRONMENT**

*Furtsov Svyatoslav*

The new course announced by the world's leading countries to decarbonize the economy, combat climate change, and reduce greenhouse gas emissions will inevitably affect agricultural production technologies. Livestock, as an important component of this production, is one of the largest sources of gases (methane), pollution of surface water bodies, depletion of pastures.

New ways of producing livestock products using modern biotechnological achievements are becoming more and more popular. One such method is the cultivation of artificial or cultured meat, which is grown in the laboratory from animal cells.

Technologies for obtaining such products belong to the field of tissue engineering, which is also engaged in the cultivation of organs for transplantation. Potentially muscle tissue of any living being can be grown in vitro. The output is a consumer-friendly product that mimics natural meat. It can now be sold not just under the guise of solving environmental problems or ethical issues related to the slaughter of animals, but also as a way to deal with veterinary problems,

problems with the use of antibiotics in production, storage and distribution, waste or by-products.

In addition, every meat producer dreams that the carcass of an animal or poultry has the maximum yield of the most expensive parts (chicken breast or beef tenderloin) and the minimum - waste (offal, blood, bones). And the technology of growing meat will allow, for example, to make only steaks in summer, and in winter - meat on the bone for jelly for the New Year.

In early December 2020, the Singapore Food Agency issued Eat Just the world's first permit to sell meat grown in a laboratory from individual cells. This is an artificial chicken that Singaporean restaurants will use primarily to produce nuggets under the local brand GOOD Meat. Such special meat will initially be more expensive than usual, but the company promises to make it cheaper as soon as it goes on sale and appears on store shelves.

As expected in Eat Just, this should stimulate the development of the industry and accelerate the abandonment of the usual meat.

## **NEGATIVE IMPACT OF ANIMAL HUSBANDRY ON THE ENVIRONMENT**

*Volynets Andriy,  
Furtsov Sviatoslav*

The question of the use of new technologies in agriculture arose against the background of the breakdown of economic policies of the world's leading countries regarding the impact on the environment. The new course will focus on decarbonisation, the so-called green transition of the economy to significantly

reduce the consumption of carbon fuels, reduce greenhouse gas emissions, address climate change.

Industrial livestock is a source of three greenhouse gases: methane, nitrogen dioxide and carbon dioxide. According to Chatham House, livestock emits 39% of all methane and 65% of nitrogen dioxide. Methane is formed during digestion in animals and due to the large amount of manure that accumulates on farms. This sector is the reason for the increase in carbon dioxide emissions, as the tropical forests of Brazil and Southeast Asia are being destroyed for new pastures. Forests are also being cut down for animal feed fields.

Greenhouse gas emissions are extremely high: the world's 20 largest meat and dairy companies generate more greenhouse gases than the rest of Germany. Livestock industrial facilities cause significant damage to the environment. Their emissions lead to the formation of atmospheric aerosols and acid rain, increasing the concentration of greenhouse gases.

As for our continent, greenhouse gas emissions from livestock in the European Union account for 17% of total emissions in the EU and cause more climate damage than all cars in circulation. This is stated in a study by Greenpeace, according to "European Truth" with reference to RTBF.

The collected data show that emissions from livestock increased by 39 million tons of CO<sub>2</sub> (+ 6%) in the period from 2007 to 2018. This is equivalent to an increase of 8.4 million cars on European roads, compares Greenpeace. Animals on European farms produce 502 million tons of CO<sub>2</sub> per year. Taking into account indirect emissions, such as emissions from meat production, crops, deforestation, etc., these are emissions of 704 million tons of CO<sub>2</sub>.

A quarter of industrial water is used annually for livestock needs, which makes the agro-industrial complex the largest consumer of water in the world. The vast majority of this water due to the lack of treatment plants is returned to the natural environment in the form of liquid manure, suspensions and wastewater.

Livestock accounts for almost 50 percent of all antibiotics produced in the world. Their use leads to the emergence and spread of antibiotic-resistant viruses and bacteria that can be transmitted to humans.

Given these factors, the question arises of the use of alternative, less harmful to the environment technologies in animal husbandry, which include the production of both vegetable meat (vegan) and artificial or so-called laboratory meat.

## **HYDROPONICS AS AN ALTERNATIVE TO SOIL AGRICULTURE**

*Bogdanov Denis*

Providing a person's diet with fresh herbs is confirmed by all doctors - nutritionists. Due to the peculiarities of the climatic conditions of Ukraine in the autumn-winter period, fresh, vitamin-rich plant products are either completely unavailable or have an unacceptable price for the majority of the population.

Modern methods of plant cultivation and electronic systems available for use allow to solve such problems in any conditions and scales. Household systems based on hydroponics can be quite affordable and inexpensive to operate, which will allow to provide an important part of the diet of a person or a small family at minimal cost.

Hydroponics is the cultivation of various crops without soil. For its implementation special constructions, designs of the big and small sizes become - depending on for what quantity of cultures they are used and where. Hydroponics is aimed at accelerating the growth and improving the quality of crops.

The basis of hydroponics (water culture) is a method of cultivation in which the plant is rooted in a thin layer of organic substrate (peat, moss, etc.), laid on a mesh base, lowered into a tray with nutrient solution.

The roots of the plants through the substrate and the holes of the base are lowered into the solution, feeding the plant. With the hydroponic method of growing plants, the difficulty is the aeration of the roots, as the oxygen contained in the nutrient solution of the plant is not enough, and therefore the root system of the plant can not be completely immersed in the solution. To ensure the respiration of the roots between the solution and the base leave an air space for young plants 3 cm, for adults - 6 cm. It is necessary to take care of maintaining high humidity in this space, otherwise the roots will dry quickly. The nutrient solution is replaced at regular intervals.

Modern technologies allow to develop small fully automated systems with minimal human intervention for its maintenance. this will provide a person or a small family with fresh vitamin products all year round.

## **ENERGY VALUE OF NUTS**

*Polishchuk Andriy*

*Polishchuk Roman*

Topicality. Nuts in terms of nutrient content can be attributed to natural bioconcentrates. Nuts have a unique complex of micro- and macronutrients due to their low moisture content. It is believed that nuts stimulate mental and physical activity, promote longevity, provide energy balance to the human body. The results

of the latest research on the benefits of nuts, obtained from the world's leading scientists, helps to increase the use of nuts.

Experts on healthy eating have concluded that walnuts are the most useful. Researchers have found that walnuts have the highest content of polyunsaturated fatty acids compared to other types of nuts, walnuts also contain a large number of antioxidants, polyphenols and other biologically active substances.

Epidemiological studies have shown that the presence of nuts in the diet provides protection against coronary heart disease. Walnut kernels are considered to be special scientists. Studies show that eating walnuts significantly affects the change in lipoprotein profile and lowers blood cholesterol.

Nuts contain sucrose, fructose, glucose, raffinose, stachyose and inositol. Nuts can also contain organic acids, namely, malic, citric, lactic and acetic acids. The fatty acid composition of walnuts is represented by the vast majority of non-polar lipids.

The largest mass fraction of fat is found in macadamia nuts, pecans, Brazil nuts and walnuts. At the same time, the protein content is highest in almonds, cashews, pistachios and peanuts. The leaders in moisture content are almonds, pecans and peanuts.

According to the physiological needs of nutrients, daily consumption of 100 g of walnuts can meet human needs for fat by 70-100%, protein by 20%, vitamin E by 15%, magnesium and phosphorus by 40%, potassium by 40%. 15%. Thus, an important condition for providing the body with substances necessary for life is the daily consumption of nuts.

For example, the composition of hazelnuts as a varietal plant includes:

Glycerides of stearic, oleic and palmitic acids. Normalize cholesterol levels and prevents excessive accumulation in the body;

B vitamins stimulate favorable conditions for the tone of all muscles, including the heart;

Hazelnuts also contain calcium, potassium, magnesium, zinc, iron, iodine, sodium, copper. These trace elements must be present for the normal functioning of the muscular, nervous and skeletal systems, and maintaining the appropriate level of substances in the body ensures the full functioning of the reproductive and hormonal systems;

Walnut kernels contain such a substance as paclitaxel, the main properties - preventing the development of cancer cells. Anticancer properties are inherent in vitamin E contained in hazelnuts.

When oil is obtained from nuts, they are pre-dried, split and similar. The nut mass, the so-called "buttermilk", is diluted with water and heated. Water vapor ruptures the cells, releasing oil, and the heated oil becomes liquid and easier to separate. The heated nut mass is squeezed out with the help of a press, substituting a suitable container for collecting oil.

In folk medicine, hazel is used to treat kidney stones, its oil - from worms, dried petals - for diarrhea, bark - from feverfew, leaves - are a good antiseptic.

Recent studies show that the main factor influencing the change in the content of natural antioxidants in nuts is the storage temperature. As an example, when stored for six months nuts in the freezer at  $-18^{\circ}\text{C}$ , the antioxidant content does not actually change, while storage under refrigeration at  $2-4^{\circ}\text{C}$  reduces the antioxidant content to 10-15% of their content in absolutely fresh products, and storage at a temperature of  $20^{\circ}\text{C}$  there is a decrease in the content of antioxidants in 2-4 times during the above period.

Conclusions. The above data confirm that nuts are a source of complete protein, fats, vitamins and minerals. Of the many nuts, walnuts have the highest content of fat and polyunsaturated fatty acids, and also contain the optimal ratio of

omega-6 and omega-3 fatty acids. Therefore, the mechanization of processing and cleaning of nuts today is quite relevant.

