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Plant Grain Creation of Electrical Technology That Reduces Humidity

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Abstract: The analysis of the results of the use of steaming (boiling), thermal neutralization, drying, frying, micronization, extruding, types and methods of processing in electrical technology with the help of heat to reduce production costs and reduce moisture content for the development of techniques and technologies of preliminary processing of agricultural products is presented. A primary goal is to reduce the moisture content of the produced product to the optimum moisture content, that is, after reducing the moisture content of the product, it should be below the critical moisture content, and regardless of which oilseed is dried, the main task is to reduce the moisture content of the product to the desired amount and at the same time not to lose its quality. consists of For this, the temperature of the drying agent should not be too high, or the time of the product being dried in the hot environment should be as short as possible. Otherwise, due to the long-term exposure to high temperature, the necessary fatty substances in the raw material will be oxidized and the quality of the product obtained will be damaged in the future.

Keywords: moisture reduction, storage, quality improvement, steaming (boiling), thermal neutralization, drying, frying, micronization, extrusion, heat, electrotechnology.

According to the latest statistics provided by the Food and Agriculture Organization of the United Nations (FAO), the financial situation of families in 54 countries of the world has decreased, the average life expectancy of the population has decreased in 12 countries, 26 countries or 815 million people worldwide are suffering from malnutrition and hunger. The daily diet of 2.5 billion people lacks macro and micronutrients and 1.5 billion people are at risk of starvation. That's why a lot of attention is

paid to the issues of ensuring food safety all over the world [5, 6]. In order to satisfy the population's demand for cheap food products rich in proteins and vitamins, a number of pressing issues are solved by planting leguminous crops: leguminous crops contain protein, environmentally friendly products, and the possibility of maintaining and increasing soil fertility increases.

Resolution No. 259 of the Cabinet of Ministers of the Republic of Uzbekistan dated March 29, 2019 "On rational placement of agricultural crops and forecast volumes of production for the 2019 harvest" was adopted. According to this decision, it is planned to replant 824350 hectares or 75.5% of the 1091630 ha of winter wheat as the main crop .

According to the use of legumes in the national economy, there are four:

- food (mash, soybeans, beans, green peas, chickpeas);

- fodder (peas, peas, vetch, lupine, etc.);

- universal (corn, lentils);

- divided into groups planted for green manure (alkaloid-free lupine).

Legumes are plants that accumulate nitrogen in their roots. It has been determined that 50-100 kg of nitrogen accumulates from the air per hectare of land. The root of lupine can absorb phosphorus compounds that are difficult to dissolve [1].

Legume grain contains 21-50% protein, straw contains 8-14% protein, carbohydrates, vitamins of group A, RR, E, V, and amino acids.

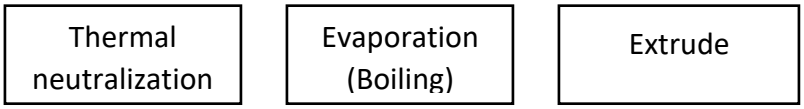
Mosh cereal in the composition protein , nitrogen-free substances , vitamins , iron , potassium, phosphorus, magnesium, calcium , selenium and less There is a lot of sodium . Mosh of grain nutritional value : protein - 23.5 g , fat - 2 g , carbohydrates - 46-60 g. Calorie content of cereal about 300 kcal.

Heat treatment is of great importance in agricultural production. Today, approximately 15% of the energy consumed in the agro-industrial complex of developed countries is spent on processing agricultural materials. Therefore, reducing energy consumption in this process is relevant worldwide [1].

During heat treatment, the structure, i.e., mechanical, physico-chemical and organoleptic properties, which determine the final quality indicators of the products, change.

Many heat processes for processing grains are carried out using feed evaporator units. Heating in feed preparation devices with the help of heat is carried out with the help of fire and electricity [2,3,].

There are different technological processes of heat treatment and processing of grains, and these methods are shown in Figure 2.



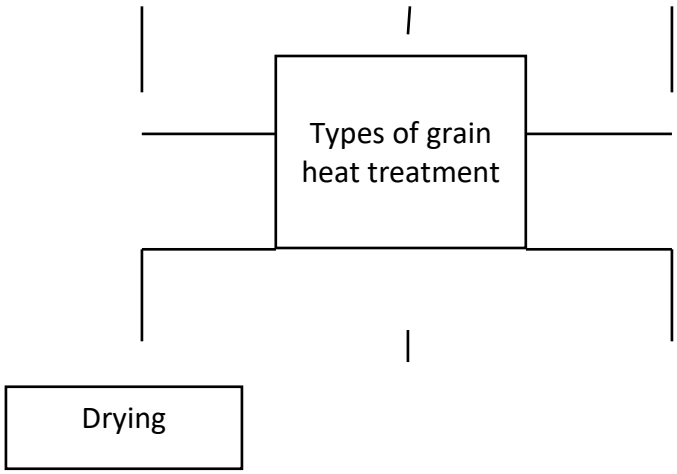


Figure 1. Methods of heat treatment of grains.

Roasting of grain is carried out due to exposure to it with hot air or direct processing of grain on a heated surface.

This method of heat treatment is also used in the food industry as part of technological equipment for extracting sunflower oil. In this case, the humidity of sunflower drops from 9-15% to 2-7%, and the temperature is around 50 ^{0} C [4,5].

Micronization is treatment of grains with the help of infrared rays or ultra-high frequency (UHF) energy . During the process, wet grain is exposed to infrared rays or IR energy during its movement on the conveyor . KGI-220-1000 quartz halogen lamps or wave transmitters are used for this . Relative energy consumption for micronization is on average 0.2...0.25kWh / kg [6,7].

Extrusion is a method of grain processing under the combined effect of high pressure and temperature. PEK-125X8, PE-KMZ and E series brand "VRONTO" press-extruder are used for this purpose [4].

For extrusion, the moisture content of the grain is reduced to 12-16%, it is ground and transferred to the extruder, it is exposed to a pressure of 3.5-5 MPA with the help of screws and heated to 120-180 ^{0} C. Pathogenic microflora and mold fungi are completely destroyed under high temperature and pressure. However, this process leads to high energy consumption (0.1-0.3 kWh/kg) [4,5].

Drying is the most common heat treatment method and the process consumes a large amount of energy [4].

Grain processing In order to obtain a high-quality product during processing, it is necessary to dry the rice grain to a moisture content of 12-14%. It is recommended to select the operating mode of dryers depending on the initial moisture content of the rice grain and the required moisture gain (Table 1). But these regimes also have disadvantages, which do not take into account the type of grain of legumes, the variety of legumes, and the type of moisture.

Table 1.

Effect of moisture separation on drying agent temperature

Primary humidity , %	**Moisture absorption , %**	**Drying agent temperature , ^{0} C**
8-9	1-2	90-100
10 -13	2-4	140-150
1 5 -1 9	4-6	150-170

It is known from practice that leguminous grain comes out of the dryer with 2-5% moisture, before the mill this moisture is much higher than after drying. The construction process continues in cleaners and other technological machines in the preparation equipment for the separation process [8,9].

One of the main scientific and technical problems of heat treatment of essential products is the lack of perfect technical means suitable for the type of product and processing method, with low energy consumption and maintaining product quality.

One of the promising directions is the direct transfer of heat to the product, minimizing heat loss, that is, ensuring that the transferred energy is fully spent on processing (heating and evaporation of moisture). In this case, the method of electric contact heating can be used to reduce the moisture content of leguminous plants [10,11]. In this case, the grain comes into direct contact with the heat on the heated surface and heats up. The proposed method does not require an external heat source.

of rice, mash, and wheat in the processing plants of leguminous plants, the humidity of the grain obtained from the 2nd and 3rd types of grain is high, and it is difficult to store the grains. In order to solve this problem, in order to reduce the humidity of grains by introducing an electric heater into the technological process, the following analyzes are presented in this article.

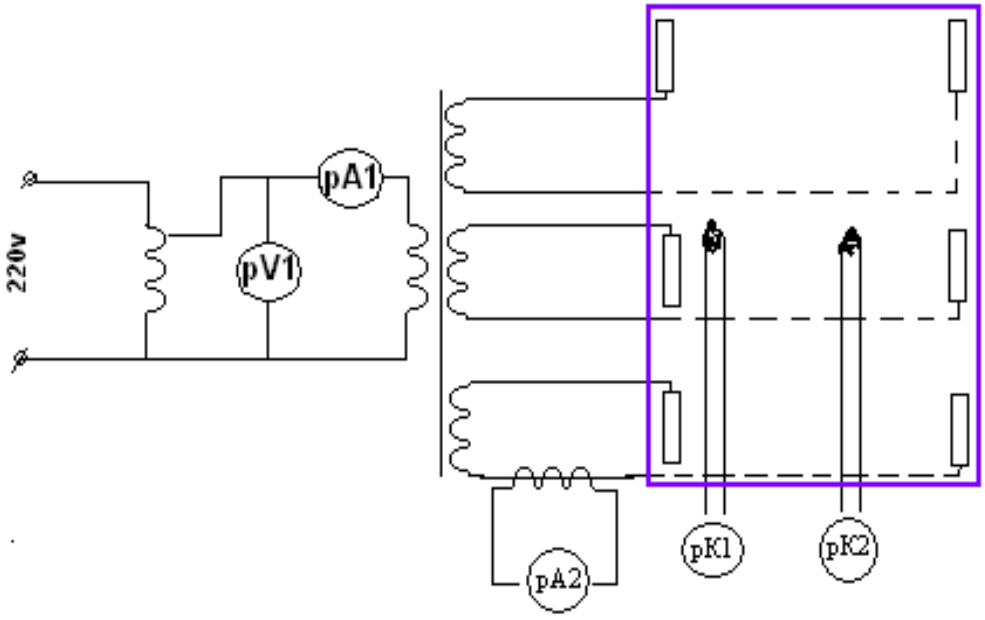
the grain layer of leguminous plants, as there is a large amount of air layer, their heat and temperature conductivity is extremely low. On the one hand, it is very good, because the raw material keeps its temperature and humidity for a long time due to the low heat and temperature transfer when storing raw materials once cooled or dried. On the other hand, this is bad, because if a part of the product composition undergoes a spontaneous heating due to high humidity, it is difficult to notice this process. The heat or high temperature from the heated part spreads very slowly to the surroundings, and as a result, the phenomenon of self-heating of the raw material is intensified.

As a result of the intensification of physiological and biochemical processes when the grain of leguminous plants is affected by thermal energy, spontaneous heating may occur in the grain mass. Self-heating of grains is conditionally divided into four stages. First, the temperature of the grains increases, their color begins to change, then the dispersion disappears, and a moldy or unpleasant smell appears. As the acidity of the oil increases, the temperature rises sharply at the end of self-heating. Exceeding the temperature of 65-75 ^{0} C and heating causes burning of grain mass [5].

of leguminous plants are as follows:

1. of leguminous grain before its production and storage (syrevaya ochistka). The main purpose of the method is to reduce the moisture content of the manufactured product to the optimal moisture content required to maintain it, that is, after the moisture reduction of the product, it should be below the critical moisture content.

2. A method of reducing moisture on an industrial scale (proizvodstvennaya sushka) before processing the grain of leguminous plants . The purpose of using the method is to bring the moisture content of the raw material up to the moisture level required by the next technological process.



2 - picture. The principle scheme of the device for reducing the grain moisture of leguminous plants.

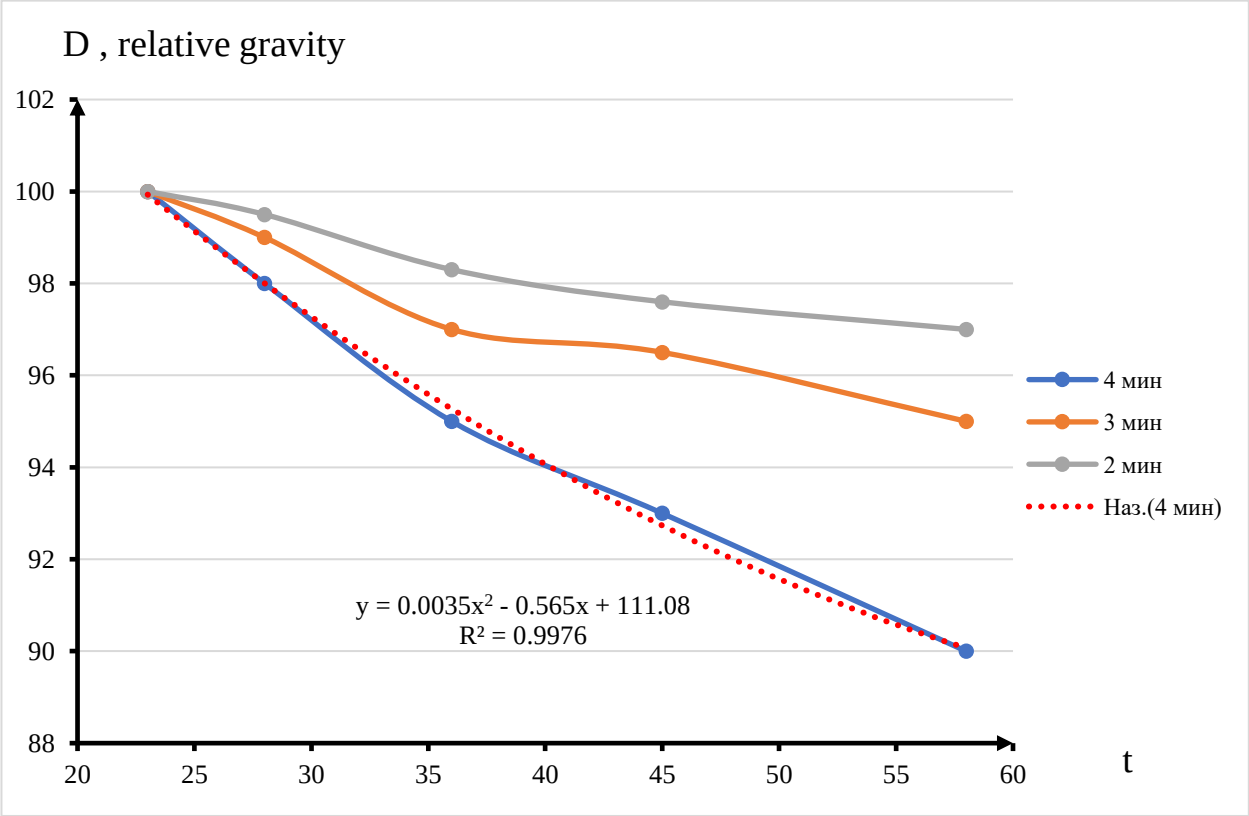
Table 2

Voltage changes in the primary and secondary windings of the transformer

He is $_1$	70	80	90	100	110	120	130	140	150
He is $_2$	0.266	0.304	0.342	0.38	0.41	0.456	0.494	0.532	0.57

We know that as moisture increases, so does mass, but from a legume grain perspective, wet grain can cause additional brittleness, quality degradation, and unexpected mold growth. Therefore, it is necessary to reduce the humidity within the standard requirements.

that the permissible moisture level for leguminous plant grain should not be less than 12%, the time of movement of the screw conveyor should be 4 minutes, and the temperature of leguminous plant grain should not exceed 65-70 ^{0} C. The results of the research based on this condition are presented in Figure 4.



4 - picture. Grain of legumes Dependence of relative gravity on temperature.

short , the higher the temperature of the drying agent, the closer the temperature of the product to be dried to the permitted temperature, and the shorter the drying time, the higher the expected result and product quality. Basically, regardless of which oilseed is dried, the main task is to reduce the moisture content of the product to the required amount and at the same time not to lose its quality. For this, the temperature of the drying agent should not be too high, or the time of the product being dried in the hot environment should be as short as possible. Otherwise, due to long-term high temperature, essential fatty substances in the raw material will be oxidized due to heating and the quality of the product obtained in the future will be damaged. Because of this, the product coming out of the drying ovens must be cooled before processing. Cooled of the product ambient temperature temperature should not exceed 50 C.

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