



METHODS OF IMPROVING THE FRYING PROCESS IN THE PRODUCTION OF SOY OIL

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ABSTRACT

The article presents the results of research on improving the pipeline process equipment in soybean oil production. "Dry" and "wet" frying of soybean oil is entering the ranks of developing products in the soybean oil production industry. Influence of water, heat and steam on the roasting process. Processes are carried out in special equipment and aggregates. To do this, moisturizing-evaporating screws, gas boilers are used. Also analyzed are ways to increase the efficiency of frying products in a digester. The physicochemical properties of products are important when calculating soybean processing modes.

Introduction: Amendment to the decision PO-2832 of the President of the Republic of Uzbekistan dated March 14, 2017 "On measures to organize soybean planting in the republic in 2017-2021 and increase the cultivation of soybean crops" and the decision to make additions. Ensuring the further increase in the volume of planting and cultivation of soybean crops, more fully meeting the population's need for vegetable oil, livestock and poultry farms for nutritious feed, and the production of processing enterprises in order to use their capacities effectively provides the opportunity to ensure the gradual allocation of advance funds in the amount of 40% of the total value of the expected soybean harvest purchased from farms.

In recent years, the government of our republic paid great attention to the development of the oil industry. The technology of cultivation and processing of local non-traditional oil plants has developed, albeit slowly, and the production of soybean, sunflower, linseed, sesame and fruit oils has been launched. The activity of oil industry enterprises largely depends on the leaders and their professional skills in the field of management.

Today, the "Digital Uzbekistan-2030" program has been implemented in our country, and the decision PO-4699 "On measures for the wide implementation of the digital economy and electronic government" has been adopted. According to him, by 2023, the share of the digital economy in the country's gross domestic product is planned to be doubled. In the production of soybean oil, a thin film, an oil film, is formed on top of the pulp particles. The oil film on the surface of the particle is held due to the mutual attraction of oil and solid



molecules. The role and importance of the agricultural sector in ensuring the food security of the population on a global scale is increasing day by day.

In our republic, great measures are being taken to increase the productivity of crops, improve their quality, especially to provide oil products in our country, in exchange for the wide implementation of scientific and technical achievements and advanced experience in the production of agricultural culture. It is an important task to fulfill the task of providing the population of the republic with food, primarily oil products. In our country, the expansion of the areas of soybean oil crops and the increase of the products made from them are important for the full satisfaction of the population's need for oil products and for the consistent development of animal husbandry. In addition, the development and supply of vegetable protein is one of the biggest problems in agriculture today.

In solving this problem, the importance of soybean from leguminous crops is great. Soybean is an annual plant belonging to the family of leguminous crops, native to Central Asia. Soybeans play an important role in the preparation of food, fodder and soil fertility.

Soybean contains 38-52% protein, 22-25% fat, oil contains various vitamins, and husk contains 4-5% protein and up to 5% fat. Soybean grain has 2.5 times more protein than wheat grain and 3.5 times more than corn grain, and soybean protein contains more than 10 amino acids. Blue mass is food for livestock. Soybean roots, like the roots of all legumes, develop nodules that can use nitrogen from the air. Thanks to the nodules formed by bacteria in the roots of the soybean plant, it accumulates up to 150-250 kilograms of pure nitrogen per hectare. Soy is a very old plant that loves light, heat and moisture. Soybean is a valuable food, fodder and a plant widely used for technical purposes, it contains 35-45% protein, 20-22% fat and 25% carbohydrates. 1 kilogram of soybeans contains 275 grams of digestible protein.

No other plant can compete with soybeans in terms of its protein content and nutritional value. One of the most important properties of soy protein is the presence of lysine amino acid in it more than butter. 100 grams of soy protein contains 6 grams of lysine. It is quickly digested in the body, biologically very similar to meat and milk protein. Great importance is attached to soy in solving the problem of eliminating protein deficiency.

The processing of oilseeds requires the following technological processes: crushing of seed husks; separation of crushed husks from the core; crushing the seeds;

roasting the ground kernel after initial soaking; sieving the fried material: extracting the remaining oil from the pan.

These technological processes can be divided into two stages. The first stage is the preparation of seeds for soaking or extraction. In this case, the core is separated from various mixtures, the shell and crushed in a special crushing machine.

In subsequent processes, the solution is moistened and the product is heated. When the oil is moistened and heat treated, the physical and chemical properties of the gel part of the oil and the fat substances in it change, as a result of these changes, the possibility of obtaining the maximum amount of oil appears.

The process of wetting and heat treatment is important. These processes are carried out in special equipment and aggregates. For this purpose, humidifying-evaporating screws, gas boilers are used.

Stage 1. Wetting and steaming the solution at the required level;



Stage 2. Roasting the soaked and steamed meat.

Stage 1 of roasting and the roast should be ready for pressing. If in the process of moistening, steaming and roasting the seeds, some additional chemical and biochemical processes occur undesirably, then such oilseeds are prepared by the method of "dry roasting". The second period consists of direct frying, and in the first period, it consists of heating the product with high humidity using technological steam, i.e. continuing frying and increasing the temperature of the product and reducing its humidity. Part of the added water and steam passes between the solid particles and the oil layer, forming a hydrate, that is, a water shell. This, in turn, greatly reduces the intermolecular attraction between particles and oil molecules. In this case, the product loses its elasticity and becomes more plastic. Despite the fact that oil molecules are held in such a product with little force, due to the plasticity of the product, the necessary amount of oil cannot be squeezed out by the pressing method. Roasting in its own steam gives the product the necessary porosity and, under its influence, the necessary elasticity. Such a product is ready to receive oil by the pressing method, and the resulting product is called fried.

According to the points given above, during the frying process, not only the aggregate state of the oily product changes, but also very complex biochemical processes take place. It is known that all oil seeds contain lipase, a biologically active enzyme. This enzyme has a catalytic property in a moderate and slightly warm state, which leads to the breakdown of triglycerides. The highly active state of lipase is manifested up to 60-65°C, and at a higher temperature, it begins to lose its activity, and when the temperature reaches 80-85°C, the catalytic activity of lipases practically disappears, because it turns out that lipases get into the protein group, denature at high temperature and lose their activity.

In addition to lipases, there are substances and enzymes characteristic of each oilseed, which increase their activity during the process of soaking and steaming, and produce astringent, bitter, slightly or highly toxic substances that have a negative effect on the product. can do. For example, rapeseed and mustard (mustard) seeds contain thioglucosides, which, under the action of biologically active enzymes myrosinase, thioglucosidase, etc., produce very fine allyl-mustard or crotonyl-mustard oils.

Therefore, in the first period of roasting, the crushing of these seeds is done only by heating, without giving water, and at the beginning of the second period, after the activity of the enzyme system decreases, if necessary, according to technological requirements, the product is given water or the second period of direct frying begins. This method is called dry roasting in technology. When dry roasting method is used for other oilseeds in the industry, it is not possible to obtain the intended amount of oil by pressing, and for modern technology, wet roasting method is used in most cases. During heating, the amount of oxidizing substances increases. Therefore, during frying, it is recommended not to increase the temperature of the product above 100°C, to reduce the contact of the meat and oil with oxygen in the air, and to prevent the reaction. At high temperature, protein substances undergo denaturation, and moisture has a great effect on it. Steam is a heat and moisture carrier. If open steam is used in the frying process, the steam first comes into contact with the product at a low temperature and turns into water. humidity also has a great effect.



Condensed steam is evenly distributed in the solution. As the liquid temperature then approaches the steam temperature, the steam begins to dry and heat the product without turning into water.

Methodology: Rather than the surface of the cauldron, the open steam heats the material quickly and evenly. Biochemical changes in the process of wetting and heating the solution. In the process of roasting, the activity of enzymes increases with the increase of temperature and humidity, when a certain temperature and humidity are reached, this activity reaches its highest level, then the activity of enzymes decreases, and finally this activity reaches its disappearance. The environment that leads to protein denaturation reduces the activity of enzymes.

Name	Those. characteristics		Name	Those. characteristics
Instrument types	classes		Heating area	25m ²
Model	TS2201001-2009		Reducer	1:30.75
Operating steam pressure	0.6 Mpa		Power	30Kw
Maximum steam pressure	0.75 Mpa		Shaft speed	32r/min
Minimum steam pressure	0.58 Mpa		Performance	60-80t/d
Heating temperature	164°C		Weight	9500Kg
Working environment	Saturated steam		Dimensions L×W×H	3130×2700×3875m m

Name	Those. characteristics		Name	Those. characteristics
Instrument types	classes		Heating area	17.9m ²
Model	TS2201001-2009		Reducer	1:30.75
Operating steam pressure	0.6 Mpa		Power	18.5Kw
Maximum steam pressure	0.75 Mpa		Shaft speed	32r/min
Minimum steam pressure	0.58 Mpa		Performance	20-35t/d
Heating temperature	164°C		Weight	5600kg
Working environment	Saturated steam		Dimensions L×W×H	2930×2543×3785mm



This kind of environment is frying. At the same time, it is possible to reduce the activity of enzymes or completely lose them when the temperature is 80-85°C. It can be formed in steaming screws before boilers. Different families of oilseeds have their own enzymes, so "optimal" conditions are defined for them. Water-insoluble phosphatides are formed during the processing of pistachio nuts at temperatures between 20°C and 70°C. If the reduction of activity is carried out intensively in a short time, that is, the activity of phosphalipases is lost, the formation of such phosphatides is reduced. Look at the model). internal diameter of the brazier (table 1500, 1800, 2100, 2400, 2500, 2800, 3000 or 3600 mm. Each container of the brazier is equipped with scrapers for uniform mixing of minced meat driven from the main shaft connected to the gearbox. A live steam injection device is located under the Karab scrapers and rotates with it, which ensures uniform steaming.

A device is installed in the steam boiler to remove excess moisture formed in the oilseed during steaming. Each container has a material supply level sensor to control product delivery, an external slider to indicate the height of the material layer.

Load the discharge device is located at the bottom of the lower tank.

Description of the heating system (see drawing) The working organs of the grill are the side walls of each container and their bottom.

Explanations to the drawing: steam from the boiler is supplied to the head 6, from it to the steam distribution pipe 7 and steam inlet pipes 12. Steam enters the bottom of each pot for jacketing and heating, as well as 12 direct steam into the roaster to equalize mint moisture. The roast should have a plastic and spreadable structure. Extraction of oil from frying is based on the principle of slowly squeezing it in screw presses. Due to the shortening of the pitch of the auger winding and the greater displacement of the auger walls relative to each other, the oil separates from the auger. Oil leakage is not only caused by external forces, but also the resistance of its components to external influences is of great importance.



The fact that the roast is in a plastic state plays a big role in facilitating this process. In order for the product to be plastic and homogeneous, it is necessary to pay good attention to the frying process, including the uniform operation of the mixers, the even distribution of steam, and the thickness of the product in the pans. Wet preparation of roast is carried out in 2 stages. In the first stage, the solution is moistened and heated with steam.

In the second stage, the wet solution is dried, that is, it is necessary to create such conditions that its humidity and temperature should be optimal according to the technology. The first stage of roasting is carried out in a moistening screw.

If a chemical and biochemical process occurs unintentionally in the process of moistening the pulp, then dry roasting of the pulp is required.

The process of wetting and heat treatment of oil is carried out under different conditions for different types of oilseeds.

In addition, when processing the same vegetable, it is fried in different conditions depending on the method of oil extraction (pre-pressing, final pressing, extraction).

Professor A.M. Goldovsky created the theoretical basis of the roasting process. He explains the physical and chemical changes that occur during roasting under the influence of moisture and heat. The sunflower pistachio pulp should be heated to 80-85°C in the upper chamber of the boiler or in a special humidifying screw and its moisture content should be brought to 8-9%.

The temperature of the product after the 1st round of roasting is 80-85°C, the moisture content is 9-11% for all oilseeds except for cottonseed, 11.5-13.5% for 1-3 types of seed. 4 varieties should be 13.5-15.5% for seeds. The process of steaming and moistening is as fast as possible equal to 15-20°C.

After the cauldron fryers, i.e. after the 2nd round of frying, the temperature of the roast should not exceed 100-105°C. For low-grade seeds, it should be 5-10°C lower than the indicated level.

If the product is prepared for pre-pressing, the moisture content should be around 5.5% without extraction, and for pressing it should be 3-4% or 2.5-3%, depending on the type of pressing machine used. The temperature of the roast prepared in this case is higher than that prepared for pressing, it is 110-120°C. At the same time, the amount of shell in the product is limited, and for sunflower seeds, the amount of shell in the roast should not exceed 8-10%, and cotton seed kernels should not exceed 15% for 1-3 varieties, and 17% for 4 varieties. should not increase. The 2nd period, i.e. the 2nd period of roasting, is on average 50-60 minutes. will be around. As the temperature and humidity increase during roasting, the activity of enzymes increases, when a certain temperature and humidity are reached, this activity reaches its highest level, and then it decreases, and finally this activity disappears.

Conditions that lead to denaturation of proteins reduce the activity of enzymes. At the same time, it is possible to reduce the activity of enzymes when the temperature is 80-85°C by moistening the liquid and heating it intensively for a short time. It is carried in the evaporator screws before roasting. Different families of oilseeds have their own enzymes, so they have "optimal" conditions. The roast should have a plastic and squishy texture. Extracting oil by crushing the roast in screw presses is based on the principle of gradually



squeezing it. As a result of the shortening of the pitch of the screw winding and the greater compression of the walls of the screw with the screw, the screw separates from the oil.

Oil leakage is not only caused by external forces, but also the resistance of the substances contained in the core to external influences plays a big role. To facilitate this process, it is important that the roast is in a plastic state. Uniform operation of mixers, distribution of steam, thickness of the roast ensures plasticity and uniformity of the roast during frying.

Soy pulp should be heated to 80-850C in the upper tank of the boiler or in a special humidifying screw, and its humidity should be brought to 8-9%. Water-soluble protein is resistant to heat and turns into insoluble nitrogen when the temperature reaches 1000C. If heating is continued, but no moisture is applied, the temperature after reaching 1100C, salt-soluble proteins turn into alkali-insoluble proteins, and if the temperature rises above C and the humidity does not exceed 6-7%, all types of (water, salt, alkali-soluble) proteins turn into insoluble nitrogen.

Therefore, when roasting the product, the maximum temperature should be 1050C, humidity should be from 6.9% to 17.8% (Rjexin).

The product ripens after being exposed to hydrothermal effects. The roast comes out of the pot with a unique structure. The roast coming out of the bottom part of the boiler is flaky, orange in color, the temperature is 100-1050C, and the moisture content must not exceed 3.5%. The information presented in the table was used from raw materials grown from local seeds at Gulistan extract oil JSC enterprise of Syrdarya region.

Conclusion: The changes in the processes of soaking and heat treatment of soybeans, including the processes from raw materials to the level of finished products, were studied. The physico-chemical properties of the soluble gel part and the fatty substances in it have changed, as a result of these changes, the possibility of obtaining the maximum amount of soybean oil appears. When the oil is heated, the temperature of the soybean oil in it increases, which accelerates the movement of the oil. It is known that during the processing of roasted soybeans, the formation of non-hydratable phosphatides mainly occurs due to their hydrolysis during the roasting process of soybean meal.

As the temperature and humidity increase during roasting, the activity of enzymes increases.

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