ANALYSIS OF THE METHODS OF IMPROVING THE FRYING PROCESS IN THE PRODUCTION OF VEGETABLE OILS

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Abstract. *This article describes the findings of a study on the enhancement of pipeline process equipment for vegetable oil manufacturing. Dry and moist roasting methods. Water, heat, and steam have an impact on the roasting process. Specialized equipment and aggregates are used to carry out procedures. Gas boilers and humidifying-evaporating screws are used for this purpose. Also explored are methods for improving the efficiency of frying foods in a cooking pot. In estimating food processing regimens, physicochemical qualities of the product are crucial.*

Keywords: *pipe, dry, wet, heat, process, solution, moisture elasticity, vaporizer, enzyme, steam, open steam, seed, and screw.*

The government of our country has devoted significant attention to the expansion of the oil sector in recent years. The technology for the cultivation and processing of indigenous non-traditional oil plants, such as sunflower, flax, sesame, and fruit, has progressed, although slowly. The manufacture of oils began. The activity of oil sector businesses is highly dependent on the leadership and management expertise of its executives. Today, the "Digital Uzbekistan-2030" program was implemented in our nation, and the "On Measures for the Widespread Introduction of Digital Economy and Electronic Government" decision was approved. According to him, the digital economy's part of the country's gross domestic product would be quadrupled by 2023. In the manufacture of vegetable oils, a thin layer of oil is deposited on top of the pulp particles. The oil coating on the particle's surface is maintained by the attraction between oil and solid molecules. To mitigate these pressures, the fluid is hydrated and the product is heated. When oil is hydrated and subjected to heat, the physico-chemical characteristics of the oil gel portion and the fat components inside it alter, and as a consequence, the potential of extracting the greatest quantity of oil arises. Important are the processes of wetting and heat treatment. These operations are conducted using specialized machinery and aggregates. Gas boilers and humidifying-evaporating screws are used for this purpose. Meat that has been dried and cooked is called mezga. The production roasting procedure consists of two phases:

The first step of roasting involves a humidifying-evaporating screw. At this step, the solution is saturated with a combination of water and steam and heated with technical steam. In the second step of the roasting procedure, the moistened-steamed meat is continuing to be heated, i.e., the product is brought to a condition in which its moisture and temperature meet the technical criteria and the roast is made ready for pressing. If undesirable chemical and biological reactions occur in the process of moistening, steaming, and roasting the seeds, then these oilseeds are produced by "dry roasting." The procedure of wetting-steaming and heat-processing the oil is carried out under circumstances suited to the various oilseed varieties. In addition, while processing the same oil, it is cooked under several circumstances, depending on the objective of producing oil from it: initial pressing, full pressing, and oil extraction.

The oil in the crushed product is known to exist in two states:

The thin coating of oil atop a particle is referred to as free oil.

The oil inside the inner cells that has not been completely or partly digested is referred to as bound oil.

Intermolecular forces of attraction are always present between oil molecules and the solid particle's surface, regardless of whether the two kinds of oil are on the particle's surface or inside it. In addition, capillary forces bind the oil inside the intact cells much more tightly. Due to this, it is extremely difficult to extract oil from the resulting pulp by direct pressing. Therefore, in order to reduce the force of attraction between solid particles and oil molecules, the product is fried with water and heat prior to pressing, and the resulting product is known as mezga, which means fried. We refer to this as the roasting procedure and split it into two phases: First, the material is saturated with water and evaporated using steam (vlagoteplovaya obrabotka).

The second stage consists of direct frying, while the first period consists of heating the product with high humidity using technical steam, i.e., continuing the frying process while raising the product's temperature and decreasing its humidity. A portion of the additional water and steam forms a hydrate, or a water shell, between the solid particles and the oil layer. This lowers the intermolecular interaction between particles and oil molecules significantly. In this instance, the product becomes less elastic and more plastic. Despite the fact that oil molecules are kept in this product with minimal effort, the pressing process cannot extract the required quantity of oil owing to the product's flexibility. It is important to lower the product's moisture content once again in order to impart elasticity. In order to do this, the water supply to the product is cut off, and heating with technical steam, or frying, is maintained. Due to the rise in the product's temperature, surplus water is evaporated, and the product's moisture content is lowered to the appropriate level. While the product is being fried and its humidity is being lowered, the released water vapor permeates the whole layer of the product, giving the impression that it is being cooked in its own steam. This is known as cooking in one's own steam. The product acquires the appropriate porosity and flexibility as a result of being roasted in its own steam. Using the pressing procedure, such a product is ready to receive oil, and the finished item is known as fried. According to the preceding considerations, during the frying process, not only does the aggregate state of the fatty product change, but also very complicated biochemical reactions occur. All oil seeds are known to contain the physiologically active enzyme lipase. This enzyme breaks down triglycerides in a moderately and somewhat heated environment due to its catalytic activity. When the temperature exceeds 80-85°C, the catalytic activity of lipases essentially vanishes, as lipases enter the protein complex, denature, and lose their activity at high temperatures. In addition to lipases, there are chemicals and enzymes unique to each oilseed that enhance their activity during the soaking and steaming process and generate compounds with a detrimental impact on the product that are astringent, bitter, mildly or severely poisonous. can do. For instance, rapeseed and mustard (mustard) seeds contain thioglucosides, which, when exposed to the physiologically active enzymes myrosinase, thioglucosidase, etc., produce extremely fine allyl-mustard or crotonyl-mustard oils. Therefore, during the first period of roasting, these seeds are crushed without the addition of water, and at the beginning of the second period, after the activity of the enzyme system has decreased, if required by technological requirements, water is added to the product or the second period of direct frying commences. This approach is known in technology as dry roasting. It is not feasible to achieve the desired quantity of oil by pressing when the dry roasting technique is utilized for other oilseeds in the business; thus, wet roasting is the method of choice for current technology. The number of oxidizing chemicals rises with heating. Therefore, it is suggested not to elevate the temperature of

the product over 105°C during the frying process in order to decrease the contact between the meat and oil with oxygen in the air and avoid the reaction. At high temperatures, protein compounds undergo denaturation, which is significantly affected by moisture.

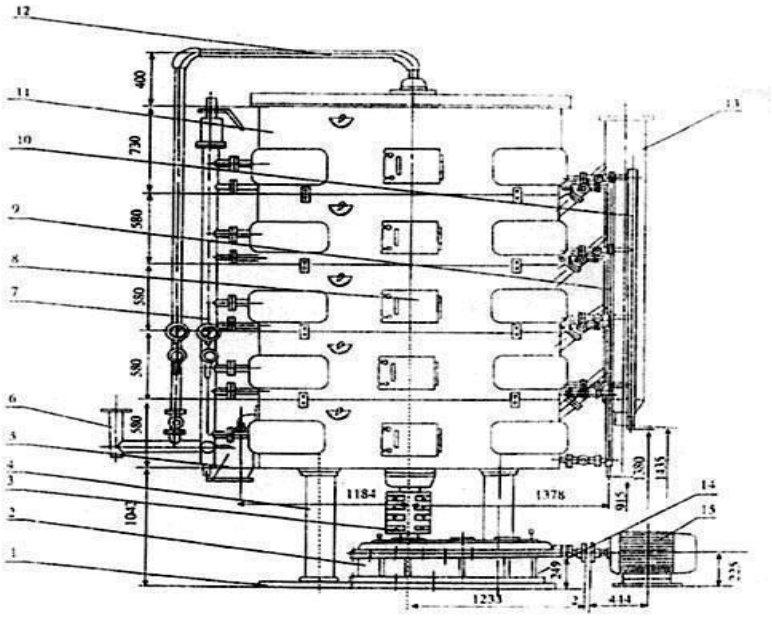
Steam transports both heat and moisture. If open steam is used during the frying process, the steam initially contacts the product at a low temperature and condenses into water. In the solution, condensed steam is equally distributed. As the temperature of the liquid reaches that of the steam, the steam starts to dry and heat the product without condensing into water. Instead of the surface of the cauldron, the open steam swiftly and evenly warms the material. In the process of soaking and heating the solution, biochemical changes occur. During the roasting process, the activity of enzymes rises with the increase of temperature and humidity; when a specific temperature and humidity are achieved, this activity reaches its peak, then it diminishes, and ultimately it disappears. Enzyme activity is diminished by an environment that promotes protein denaturation.

At the same time, it is feasible to limit the activity of enzymes or eliminate them entirely at temperatures between 80 and 85 degrees Celsius by adding water to the extract and rapidly heating it. Before the frying pans, such an atmosphere might be established in the steaming screws. Different families of oilseeds include unique enzymes, therefore "optimal" conditions are specified for each. Between 20 and 70 degrees Celsius, water-insoluble phosphatides are generated during the processing of pistachio nuts. If the decrease of activity is accomplished rapidly and vigorously, that is, phospholipase activity is eliminated, the creation of such phosphatides is diminished. The transformation of gossypol is the most critical step in the roasting of seed pulp. In its natural, or "native," condition, gossypol is exceedingly poisonous. If native gossypol is found in oil, kunjara, and flour, the quality of these items degrades significantly. In addition, gossypol has a detrimental impact on the oil purification process and darkens the color of the oil. Under the influence of heat, gossypol combines with oxygen, moisture, free amino acids, proteins, and phosphatides during the frying of greasy foods. Currently, our experts have devised methods for entirely converting gossypol to oil or fusing it with the solution's gel component.

Depending on the model, the diameter of the grill's inside varies (see table). 1500, 1800, 2100, 2400, 2500, 2800, 3000 or 3600 mm. Each bowl of the grill is fitted with scrapers for consistent mixing of minced meat, which are operated by the gearbox-connected main shaft. Under and rotating with the scrapers is a mechanism for injecting live steam; this assures consistent evaporation of the mint. A mechanism is fitted in the steam boiler to eliminate surplus moisture produced by the oilseed during steaming. A live steamer is situated underneath the grater and rotates with it, ensuring that the mint is uniformly steamed. A mechanism is fitted in the steam boiler to eliminate surplus moisture produced by the oilseed during steaming. Each container is equipped with its own bypass valve to regulate the mint supply, an internal material supply level sensor, and an exterior slider to show the layer height. The apparatus for unloading is placed at the base of the lower tank. Detailed explanation of the heating system (see drawing) The functioning organs of the grill are the side walls and bottom of each container.

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 the substances contained in the core 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 seed pulp is moistened with saturated steam and condensate in a moistening auger installed above the boiler to 11.5-13.5% for 1-3 types of seeds, and to 13.5-15.5% for 4 types of seeds. it is moistened, the temperature should be 70-80°C for 1-3 varieties, and 60-70°C for 4 varieties. 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 110-1200C. 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.



When the engine is heated, the temperature of the oil in it rises, which accelerates the movement of the oil. This leads to a reduction in viscosity. However, the viscosity decreases slightly until the temperature reaches 50-600C. And then the decline slows downThus, the effect of heat is that it reduces the connection between the gel part and the oil, and allows the oil to separate and flow easily. However, the amount of oxidizing substances increases during heating.

Therefore, it is better not to increase the temperature above 1050C, to prevent the frying and oil from reacting with oxygen in the air. When heated, protein substances are denatured, moisture also has a significant effect. Reheat transports moisture and heat. In this instance, steam condenses into water and is evenly dispersed throughout the liquid. The steam's temperature then begins to dry and heat the powder. The product is heated more quickly and uniformly by steam than by the surface of the boiler. In most cases, steam is more advantageous than water and heat.

During roasting, as the temperature and humidity rise, the activity of enzymes rises; when a specific temperature and humidity are achieved, this activity reaches its peak, then drops, and ultimately ceases. Conditions that result in protein denaturation diminish the activity of enzymes. In addition, it is feasible to limit the activity of enzymes at temperatures between 80 and 850 degrees Celsius by moistening the liquid and rapidly heating it. It is transported through the evaporator screws before to roasting. Various families of oilseeds have their own enzymes, therefore their circumstances are "ideal." The texture of the roast should be plastic and rubbery. The extraction of oil from roasted seeds using screw presses is based on the notion of progressive compression. Due to the reduction in the pitch of the screw's winding and the increased compression of the screw's walls, the screw separates from the oil. In addition to external pressures, the resistance of the compounds inside the core to external influences also plays a significant role in oil leakage. To aid this procedure, it is crucial that the roasted coffee be in a plastic form. During the frying process, the consistent functioning of the stirrers, the distribution of steam, and the thickness of the roast assure the roast's plasticity and consistency.

At a temperature of 1000°C, water-soluble protein is resistant to heat and converts into insoluble nitrogen. If the heating is maintained without the addition of moisture, and the temperature hits 1100 degrees Celsius, salt-soluble proteins become alkali-insoluble proteins. Therefore, the maximum temperature for roasting the product should be 1100C, and the relative humidity should range from 6.9% to 17.5%. (Rjexin).

After being subjected to hydrothermal impacts, the product ripens. The roast emerges from the pot with a distinct texture. The orange-colored, talc-like roast that emerges from the bottom of the boiler must have a moisture content of no more than 3.5% and a temperature of 108-1100C.

The data shown in the table was derived from locally cultivated seeds at the Gulistan extract oil JSC firm in the Syrdarya area.

In conclusion, it can be said that when the liquid is moistened and subjected to heat, the physico-chemical characteristics of the liquid gel portion and the fatty components inside it change, and as a consequence, the greatest quantity of oil may be extracted. When meat is cooked, the temperature of the oil inside it rises, accelerating the oil's mobility. It is known that the creation of non-hydratable phosphatides is caused mostly by their hydrolysis during the meat-frying process.

REFERENCES

1. Y.Q. Kadirov, M.N. Rakhimov "Oil processing technology" Textbook, Tashkent "ECONOMY-FINANCE" 2013
2. Y.Q. Kadirov, D.A. Ravshanov, A.T. Ruziboyev. "Technology of production of vegetable oils" publishing house named after Cholpon, Tashkent-2014

3. Саттаров, К., & Жанкоразов, А. (2021). ИССЛЕДОВАНИЕ ВАЖНЕЙШИХ ХАРАКТЕРИСТИК КАТАЛИЗАТОРОВ ГИДРОГЕНИЗАЦИИ. Збірник наукових праць ΛΌГОΣ.
4. Саттаров, К., & Жанкоразов, А. (2021). ИССЛЕДОВАНИЕ ВАЖНЕЙШИХ ХАРАКТЕРИСТИК КАТАЛИЗАТОРОВ ГИДРОГЕНИЗАЦИИ. Збірник наукових праць ΛΌГОΣ.
5. Decree No. PF-6079 of the President of the Republic of Uzbekistan "On approval of the Digital Uzbekistan - 2030" strategy and measures for its effective implementation. 05.10.2020 https://lex.uz/docs/5030957
6. Decree of the President of the Republic of Uzbekistan dated February 7, 2017 No. PF-4947 "On the Strategy of Actions for Further Development of the Republic of Uzbekistan". https://lex.uz/docs/3107036
7. Karshievich, S. K., & Uli, K. J. Z. (2021). Dependence of the Content of Trans-Isomerized Fatty Acids on Hydrogenate Indicators. CENTRAL ASIAN JOURNAL OF THEORETICAL & APPLIED SCIENCES, 2(10), 27-30.