

PURIFICATION OF LIQUID VEGETABLE OILS USING ELECTROPHYSICAL FIELDS

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Abstract

Biological completeness and ecological safety of food, in particular fatty, products - the most important task in their production. In the production of vegetable oils, ecological purity is achieved by technological treatments that lead to the removal of unwanted compounds and impurities.

Keywords: vegetable oil, requirements, purification, electrophysical field, acids

INTRODUCTION

Vegetable oils are widely used in various sectors of the economy. Their extremely high nutritional value is that they are easily absorbed by the human body and are a high-energy product.

The oil is used directly in food, baking, confectionery, it is used to produce drying oil, detergents, varnishes and paints [1]. Technical vegetable fats are used in the production of plastics, linoleum, oilcloth materials.

Figure 1 shows the consumption of vegetable oils in the world.

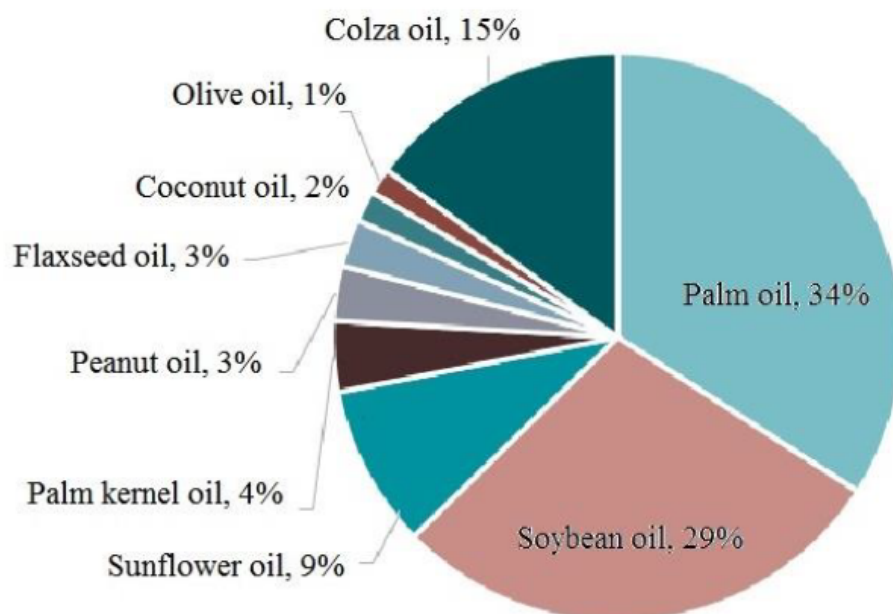


Figure. 1 The structure of consumption of oil and fat products in the world

Ukraine is a world leader in the production of vegetable oils, namely sunflower. Figure 2 shows the production volumes of sunflower oil from the world's leading producers.

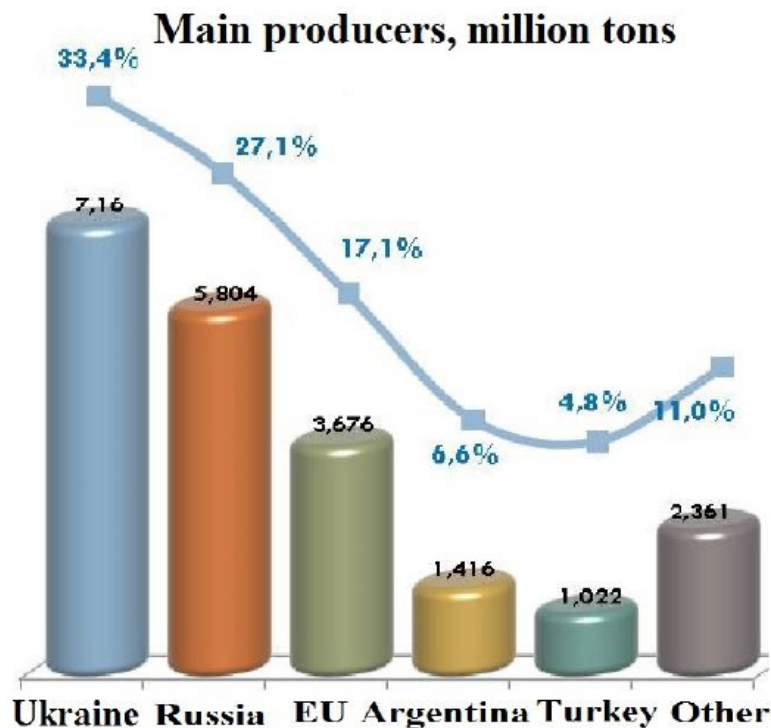


Figure.2 World production of sunflower oil

Biological completeness and ecological safety of food, in particular fatty, products - the most important task in their production. In the production of vegetable oils, ecological purity is achieved by technological treatments that lead to the removal of unwanted compounds and impurities (pesticides, toxic elements, carcinogens, etc.) [2].

It is known that the physiological properties of vegetable oils depend on the composition and ratio of fatty acids in them and their position in the triglycerides of the oil, the presence of biologically active compounds (phospholipids, sterols, tocopherols, carotenoids, etc.) [3]. However, natural fats and oils in their composition are not perfectly physiologically complete product, because almost every one of them has a deficiency or excess of one or more components. At the same time, they are a valuable source of antisclerotic and biologically active substances.

Materials and methods

All vegetable oils due to their composition of fatty acids, the absence of cholesterol have the ability to reduce the risk of cardiovascular disease. The degree of their effect on the body depends on the ratio of

fatty acids in a particular oil. The role of tocopherols, phytosterols, carotenoids, which are present in oils, is also important.

It should be noted that all types of vegetable oils, regardless of their place of production are inspected for compliance with hygienic requirements for safety and nutritional value. The content of heavy metals (lead, arsenic, cadmium, mercury), aflatoxins B₁, pesticides, radionuclides is controlled [3].

In order to create full-fledged fatty products use both a mixture of different properties of oils, and the production of products with specified properties, which is carried out by improving the purification process.

In addition to concomitant substances, in the process of obtaining oils in crude oil and impurities. By their nature, they can be organic (seed coats, parts of leaves and stems) and mineral (earth, stones, sand). Oil impurities also include pesticides, gasoline (in extraction oils), soap (in fats refined with alkali), catalyst metals (in hydrogenated fats) [3]. It should be noted that it is the concomitant substances and impurities, not triglycerides that determine the color, taste and smell of fats. In this case, some related substances (eg, phospholipids, vitamins) increase the nutritional value of fats. The presence of other substances (waxes, gossypol, etc.), on the contrary, degrades the quality of fats and complicates their technological processing.

The process of purification of vegetable oils from unwanted impurities is complex and energy-intensive, it consists of two main stages: the primary purification from suspended particles, which are in the oil after its receipt and secondary purification is more complex, called refining. chemical reagents and catalysts that ultimately negatively affect the quality of the oil, namely the environmental hazard of the finished product and require additional energy consumption. The purification of vegetable oils, the efficiency of mixing with reagents, the accuracy of reagent dosing, the accuracy of maintaining the process temperature, the efficiency of phase separation (in the field of centrifugal forces, gravitational forces or filtration), creating a deep vacuum during deodorization are technically difficult tasks.

The main difficulty is the choice of reagents, the calculation of their quantity in accordance with the quality of the treated oil, the choice of technological modes (temperature, pressure, hydrodynamics in reactors, etc.). The set of the above parameters should ensure maximum excretion of concomitant lipids, meet environmental safety requirements, contribute to the preservation of the necessary biologically active properties of raw materials in obtaining final products with high consumer properties and ensuring high economic and ergonomic production. In the refining process, the two main by-products that are harmful to the environment are the co-paste formed during chemical refining and the phosphatide emulsion formed during hydration.

Our proposed technology of obtaining vegetable oil of the highest grade by using physical fields (acoustic, electric, electromagnetic), Figure 3 [4, 5], during its primary and secondary purification, allows to remove chemical reagents from the composition of soapstock, which is obtained as a by-product.

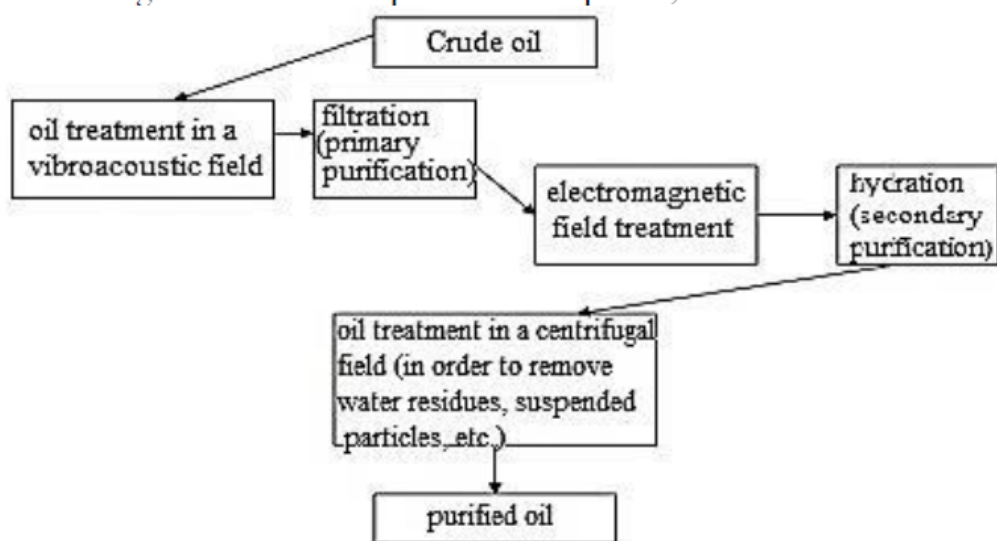


Figure.3 Innovative scheme of purification of liquid vegetable oils.

Conclusion

Due to which significantly reduce the toxicity of wastewater and thus reduce the harmful effects on the environment. Also due to the exclusion from the technological process of chemical reagents, an environmentally friendly product is obtained. While maintaining the required biologically active properties and, accordingly, high consumer qualities. This allows us to say that using the proposed technology reduces the impact of harmful factors, both on the environment and on human health when using the obtained vegetable oils.

References

1. Fats and oils. Production, composition and properties, application. / R. O' Brian: trans. with English 2nd ed. V.D. Shirokova, D.A. Babeikenoy, N.S. Selivanova, N.V. Magly - St. Petersburg: Profession, 2007. - 752 p.
2. DSTU 4492: 2005 Sunflower oil. Specifications.
3. Belinskaya A.P., Krychkovskaya L.V., Zekunova T.I. Development of technological regimes for refining oil solutions of carotene. // Scientific works of the Odessa National Academy of Food Technologies. - Odessa: ONAHT. - 2010. - Vip. 38. - Tom. 2. - P. 89–92.
4. Osadchuk P.I., Markevich T.V. The benefits of physical fields for the purification of sunflower oil. // Agrarian Bulletin of the Black Sea region, Technical Sciences - Odessa, 2016 - № 80 - P.117-121.

5. P.I. Osadchuk, D.P. Domuschi, Y.I. Enakiev, S.N. Peretiaka, A.P. Lipin Study of the effect of ultrasonic field in purifying sunflower oil. *Bulgarian Journal of Agricultural Science*, 26 (No 2) 2020, 486–491.