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CALCULATION OF THE ECONOMIC EFFICIENCY OF THE TECHNOLOGY WHEN OBTAINING SAFFLOWER OIL

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Annotation
The article discusses the results of economic indicators in the production of non-traditional vegetable safflower oil from local raw materials of the Republic of Uzbekistan.

Keywords: safflower oil, cake, economic calculation.

Introduction

Significant differences in the structure and substance content of safflower seeds from cotton seeds, which are traditional for oil and fat enterprises of the country, do not allow the use of the known technology of processing the latter without appropriate changes, which entails significant irretrievable losses of valuable safflower oil and its useful accompanying components.

Consequently, improving the technology of extraction of extraction oil from oilcakes obtained from collapsed and unbroken safflower seeds is considered an urgent scientific and practical task.

Here, it is important to choose the most effective extractor (immersion, multiple irrigation, etc.) and optimal conditions for the process of extracting oil from oilcakes obtained from collapsed and unbroken safflower seeds.

For an objective assessment of the intensity of extraction of oils from cakes obtained from collapsed and unbroken safflower seeds, it is necessary to choose a rational methodology and a formula for calculating it on a computer.

Earlier it was proposed to determine the conditional extraction intensity J by the mass of the oil extracted from 1 m3 volume of the extractor according to the formula:

$$J = \frac{[(Co + C^2 n) - C^1(\tau) \cdot Vn]}{Ve}; \qquad (1.1)$$

where C_o, C_2n and C_1 (τ) are the oil content in the cake, the pores of the extracted material when impregnated with miscella and meal, respectively, t/m³;

Ve and Vn are the volumes of the extractor and pores contained in 100 tons of dry and fat-free substance, m^3.

This equation includes such parameters [C_{2H}, $C_1(\tau)$, etc.], which are almost difficult to estimate accurately because it is associated with the processing of a large amount of extracted material.

More simple, we consider the use of the following formulas (2) and (3) to assess the intensity of extraction of oils from cakes [184; 15-19c.]:

$$J = \frac{(Mo - Ms)Q}{100\ Ve}; \quad (4.2) \quad \text{или} \quad Jm = \frac{(Mo - Ms)Q}{100\ V\text{м}}; \quad (1.3)$$

where: J_m is an indicator of the intensity of the extraction process for the processed material; M_o is the oil content of the extracted material, %; M_s is the oil residue in the meal relative to the original extracted material, %; Q is the productivity of the extractor, t/h; Ve and Vm are the volumes of the extractor and the extracted material, respectively, m^3;

At the same time, energy consumption in extractors can be calculated using the following formulas:

$$j = \frac{J}{N}; \quad (4.4) \quad \text{или} \quad j\text{м} = \frac{Jm}{N}; \quad (1.5)$$

where: j and jm are energy intensity indicators characterizing the removal of oil from 1 m^3 of the volume of the extractor or extracted cake in 1 hour, per 1 kW of installed power of electric drives N.

Currently, more than 30 extractors are used at oil extraction plants in Uzbekistan, which, according to the principle of operation, are classified into devices operating by immersion (for example, ND-1250M) and multiple irrigation (T1MEM-400).

Therefore, for the processing of cakes obtained from collapsed and unbroken safflower seeds, it is necessary to identify from them a more efficient one in terms of the intensity of their extraction process and energy intensity when they are carried out in these extractors.

Taking this into account, we carried out a comparative assessment of the extraction of cakes obtained from collapsed and unbroken safflower seeds, taking into account the design features of the above extractors (Table 1).

Table 1 Indicators of the intensity and energy intensity of the extraction processes of cakes obtained from collapsed and unbroken seeds

Name of the extraction method	Type of processed material	Intensity indicators		Energy intensity	
		J, $t/m^3 \cdot h$	J_M, $t/m^3 \cdot h$	j, $t/m^3 \cdot h \cdot kW$	j_M, $t/m^3 \cdot h \cdot kW$
By immersion of cake in solvent*)	Cake obtained from crushed safflower seeds	0,038	0,041	0,0035	0,0037
By the method of immersion of cake in a solvent	Cake obtained from unbroken safflower seeds	0,029	0,033	0,0041	0,0043
By the method of multiple irrigation of cake with solvent**)	Cake obtained from crushed safflower seeds	0,046	0,051	0,0028	0,0031
By the method of multiple irrigation of cake with solvent	Cake obtained from unbroken safflower seeds	0,039	0,045	0,0031	0,0034

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Note: Technical and economic data were used in the calculations: * - for the ND-1250M extractor; ** - for the T1-MEM-400 extractor

From Table 1 it can be seen that more intensive oil extraction takes place when extracting the extracted cake from the collapsed safflower seeds than from the unbroken ones. So, for example, in 1 m^3 of flour obtained from collapsed safflower seeds, the oil extraction intensity is 0.041 t/(m^3·h), and from unbroken - 0.033 t /(m^3·h). At the same time, the energy intensity of processing of cake obtained from collapsed safflower seeds is less [0.0037 t/(m^3 · h·kW)] than from unbroken [0.0031 t/(m^3·h·kW)].
As can be seen, the presence of a large (more than 40% of the total mass) the amount of husk in the cake obtained from unbroken safflower seeds reduces the intensity of the oil extraction process by about 15% compared to the processing of cake obtained from collapsed safflower seeds. This is primarily due to the complex structure of the cake obtained from unbroken safflower seeds and the difficulties of access of the hydrocarbon solvent to its internal zones.
Of the extraction methods studied, the most effective was the method of multiple irrigation of cake with a solvent, which, when extracting oil from cake obtained from both collapsed and unbroken safflower seeds, showed the highest intensity [0.051 and 0.045 t/(m^3·h), respectively] and the lowest energy intensity [0.0031 and 0.0034 (t/m^3.h.kW), respectively].
Of course, with a change in the performance of extractors, both the intensity (J_M) and the electrical capacity (j_m) of the process of extracting oil from cakes obtained from collapsed and unbroken safflower seeds change.
We have studied the effect of the extractors' performance on the above-studied indicators in the processing of cakes obtained from collapsed and unbroken safflower seeds (Fig. 4.1).

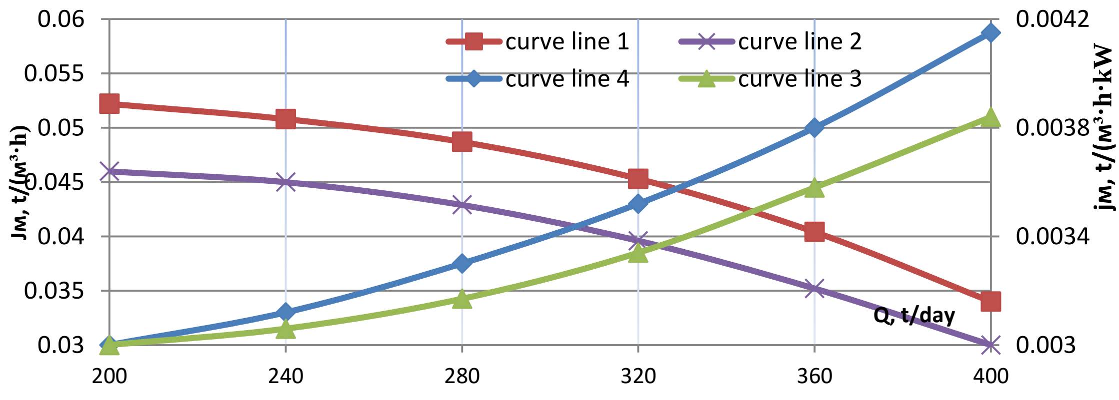

Fig. 1. Change in intensity (J_m) and energy intensity (j_m) of the extraction process of cakes obtained from collapsed and unbroken safflower seeds depending on the performance of mass transfer devices

From 1 it is seen that the intensity (J_m) of the extraction process of cakes obtained from collapsed (curve 1) and unbroken (curve 2) safflower seeds with an increase in the productivity of the extractor (from 200 to 400 t/day) decrease exponentially. At the same time, the best values are observed when processing the cake obtained from the collapsed (curve 1) safflower seeds.

On the contrary, with an increase in the productivity of the extractor, the energy intensity of processing cakes obtained from both collapsed (curve 3) and unbroken (curve 4) safflower seeds increases. At the same time, the greatest energy consumption is observed during the processing of cake obtained from unbroken safflower seeds.

The research conducted in chapter II of this dissertation showed that the extraction of high-grade safflower cake proceeds at a low rate, there are irretrievable losses of valuable oil in the meal and significant material and energy costs. Comparison of indicators of immersion extractors and multiple irrigation shows that the latter extracts vegetable oils more intensively from oil-containing materials. However, this efficiency certainly depends on the structure and content of the husk in the extracted material.

References

1. Арутюнян Н.С. Перспективные решения в области интенсификации технологических процессов масложировой промышленности, – 1992 – №4/5 – с.127-134.
2. Азимов У.Н., Абдурахимов С.А., Ашуров Ф.Б. Совершенствование технологии рафинации сафлорового масла// Материалы научно технической конференции: «Умидли кимёгарлар-2008».-Ташкент,2008. С.5-8.
3. Азимов У.Н. Совершенствование технологии получения высококачественного пищевого масла из местных сортов семян сафлора. //Автореф.канд.техн. наук, Ташкент, ТашХТИ, 2009-24 с.
4. Технология производства растительных масел. (В.М. Копейковский, С.И. Данильчук. Г.И. Гарбузова и др.): под. ред. В.М. Копейковского-М.: Легкая и пищевая промышленность. 1982. – 105-152 с., 161-172с., 191-209с., 216-235с., 302-331 с., 342-351с.