DRY FRUIT PROCESSING PROCESS MATHEMATICAL AND STATISTICAL PROCESSING OF RESEARCH RESULTS

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Annotation. The article focused on the mathematical and statistical processing of the results of the study of the process of processing dry fruits, the author tried to highlight the essence of the scientific issue through them, giving the main focus to the regression equations.

Keywords: based on the results, Boxing-Wilson, algorithm, factors, output according, structured as follows.

The main regulatory technological indicator for the production of oil from wheat murtaks is the release of oil, which depends on many factors. Studies have found that the release of oil will largely depend on the temperature at which the raw material is heated, its moisture content, and the duration of the separation of the oil.

A study planning method was used to determine the extent of the effect of heating temperature (x_1) and oil separation duration (x_2) on oil leakage (Y). Based on the results of the study, the level of factors (x_1, x_2) and their adjustment intervals that provide the highest oil output (Y) are presented in Table 1.

Table 1.

The degree of factors and the intervals between their volatility

Code value of factors	Unit of measurement	X_1	X_2
Basic level X=0	°C; time	52,5	90
Volatility range	**	7,5	30
High level X=+1	**	60	120
Lower level X= -1	**	45	60

The implementation of the experiments was carried out according to the full-factor planning Matrix ПФЕ-22, which is presented in Table 2.

Based on the results of the study, a regression equation was derived, according to which the effect of Inter-pair factor interaction was used, in addition to linear members:

$$Y=13,906 - 0,44X_1 + 0,159X_2 + 0,129X_1X_2 \quad (1)$$

Table 2.

Experiment transfer Matrix

Experiment №	X_1	X_2	$X_1 X_2$	Y_1	Y_2	Y_3	$\overline{Y}_u$	$\hat{Y}_u$
1	-	-	+	14.420	14.410	14.480	14.420	14.420
2	-	+	-	14.400	14.560	14.480	14.480	14.480
3	+	-	-	13.030	13.100	13.095	13.075	13.075
4	+	+	+	13.640	13.660	13.650	13.650	13.650

$\overline{Y}_u$ – average value of oil output in conducted experiments

$\hat{Y}_u$ – the value of the oil output calculated by the regression equation is

An initial assessment of the Equation indicates that the output of the oil depends on factors of the two orders under study.

An alternative program was compiled based on a aligned equation to determine the degree of effect of the temperature and duration of oil extraction from wheat murtaks by the extraction method, which provides an opportunity to ensure an alternative output of the product. The calculation of the program was carried out according to the Boxing-Wilson algorithm.

Table 3.

Program for the alternation of factors under study

Designation	**Factors**	
	X_1	**X_2**
δ_1	-0,544	0,159
λ_1	7,5	30
$\delta_1\lambda_1$	-4,08	4,77
R_i	1	1,17
S_i	-9	-10,53

A heating temperature (x_1) equal to -9°C range was adopted as the main alternative factor. The underlying factor is described by the sign of its coefficient in the regression equation.

The obtained results of the implementation of an alternative program for the release of fat from mortars are presented in Table 3.

δ_1 - coefficients in variable values of factors according to the regression equation:

λ_1 - variable ranges of factors.

Determination of steps (S_i) in another factor is carried out using the following formula:

$$S_i = R_i S_i \qquad (2)$$

$$R_i = \frac{\delta_i \lambda_i}{\delta_1 \lambda_1} \qquad (3)$$

As can be seen from the cited data, the greatest release of oil from the mortar was observed when it was heated to 43.5°C and at a duration of 79.5 minutes of the extraction process.

Table 4.

Dependence of vegetable oil output on variable factors

Volatile factors		Oil output, %
X_1	X_2	
52,5	90	14,417
43,5	79,5	14,610
36,5	69	14,211

Thus, the extraction method created the most alternative conditions that ensure an increase in product output according to the results of an alternative to the technological factors of obtaining oil from mortars.

Mathematical evaluation, planning and statistical processing of research results was carried out in order to reduce research costs due to the alternative Organization of research and minimization of the number of experiments.

Table 5.

The degree of factors and their variability ranges

Factors	Unit of measurement	Main indicator (In the case of 0)	Unit of volatility	Bottom pointer	High pointer
x_1	%	12,5	0,5	12,0	13,0
x_2	°C	70	5,0	65	75
x_3	min	150	30	120	180
x_4	%	12,0	1,5	10,5	14,0

The level of factors and their variability intervals were carried out using the methods presented in tables 5 and 6. Equations of regression of the results of studies were established.

Table 6.

Experimental research matrix (ПФЭ-2^{n-1})

№	x_0	x_1	x_2	x_3	x_4	$x_1x_2 = x_3 x_4$	$x_1x_2 = x_3 x_4$	$x_1 x_2 = x_3 x_4$	y_1	y_2	$\overline{y}_{o'r}$	$\hat{y}_{ko'p}$
1									65,4	65,6	65,5	65,6
2									58,1	57,9	58,0	58,1
3									69,7	69,6	69,6	69,6
4									74,4	74,5	74,5	74,5
5									85,7	85,8	85,7	85,7
6	+	-	-	+	+	+	-	-	80,6	81,0	80,8	80,7
7	+	+	-	+	-	-	+	-	72,3	72,1	72,2	77,1
8	+	-	+	+	-	-	-	+	75,4	75,3	75,4	75,5
v						-0,30	+0,65	+2,16			74,1	

x_1 – raw material moisture, %

x_2 – heating temperature, °C

x_3 – pressing duration, time

x_4 – oiliness of raw materials, %

The main task of planning technological research has been to ensure the progress of technological processes and the alternation and control of the quality of products.

In studies, the output of vegetable oil from the mortar was calculated as the alternative parameters (Y). As factors affecting this indicator (X_1, x_2,.....x_{12}), technological parameters and conditions were selected that ensure a high release of murtak oil.

Based on numerical solutions, the regression equation was structured as follows:

$$У=0,03B_0+24,5B_1X_1+13,1B_2X_2+0,87+B_3X_3+B_{1,2}X_{1,2}+1,0B_{1,3}X_1X_30,93 \quad (4)$$

Significant factors were defined in regression equations:

- temperature;
- oiliness
- pressing duration;
- raw material moisture.

In Summary, statistical processing of laboratory research made it possible to determine the importance of factors in the studied parameters of technological processes and determine the conditions for the implementation of the recommended technological processes in production conditions. The technological conditions established on the basis of the data obtained as a result of statistical processing – the armed forces were recommended for introduction into the food industry and the supply of the rear of the front.

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