CONTRIBUTIONS REGARDING THE USE OF BRAN IN OBTAINING A BAKERY PRODUCT – FERMENTATION CONDITION

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ABSTRACT: One of the solutions regarding environment cleaning refers to valorising bran, a by-product from the operation of wheat grinding, in obtaining baking products.
The research programme is conceived in the centred system, rotary compound of the second degree with four independent variables, using wheat bran in the first technological phase for obtaining dough.
An addition of maximum 12% bran could be considered sufficient for achieving the baking products with optimum quality conditions.

KEYWORDS: bran, vegetal by-products used in obtaining baking products**.**

1.INTRODUCTION

Bran represents a secondary product obtained in cereal grinding at the final passage of reduction and grinding.

From a dimensional point of view, bran is characterized by dimensional forms variable from 10 to 15 microns, but it could reach up to 3000 microns.
It is noted that using a flat and short grind brings about obtaining bran with dimensions of over 15 microns [2, 3, 7].
The composition of bran pointed out a flour content of up to 2%, with positive effects, the content of ash that varies up to 5.8 %. The minimum content of proteins is 10.8%. [5, 3, 6, 1].

From a chemical point of view it is characterized by a high content of cellulose, being considered a product without nutritional capacity.

Using bran in the recipes of baking products has a positive role, accounted for by the cellulose content, with effect on digestion by eliminating the alimentary bolus [5, 2].

It is interesting to see the capacity of bran of vitamin supplement for the bread product by its content in the vitamins B1, B2, PP, E and the content of mineral substances that can reach a maximum of 10%. [6, 7].
Taking into account the positive role, but limited of the bran, in the product of human nutrition, it was considered the development of a research that should reveal the technological conditions specific to the bread product by using bran.

2.MATERIALS AND METHODS

The research developed in this stage aimed at determining the technological conditions of obtaining dough with bran addition.

The research programme was developed in a rotary centred system of the second degree, using notions of statistical mathematics.

The research conditions took into account the influence of the independent variables on the fermentation process. There were chosen as dominant independent variables:

- The bran addition
- The NaCl content
- The period of fermentation
- The temperature of fermentation

Table 1

The values of independent variables

Independent variables	**Xi**	-2	-1	0	1	1	X
Bran, %	**X1**	0	3	6	9	12	3
NaCl, %	**X2**	0.75	1.50	2.25	3	3.75	0.75
Duration, minutes	**X3**	31	33	35	37	39	2
Temperature, ^{o}C	**X4**	30	35	40	45	50	5

The raw materials used were:

- Semi-white flour type 800
- The water quantity maintained constant at 50 ml
- The baking yeast quantity of 5% with 40% protein content
- Kneading duration of 10 minutes.

In the programme of the 31 experiments there was followed the variation of the independent parameters, based on which the optimum conditions of the fermentation process will be concluded.

3.RESULTS AND DISCUSIONS

For the appreciation of the simultaneous variation of independent variables on the fermentation process and the quality of dough there were used the regression equations, particular from the general equation:

$$Y=b_0+bi\ Xi+bij\ Xij+bii\ Xi^2 \quad (1)$$

The execution preciseness of the research programme appreciates the value of the normal deviation $\sigma = 0.1418$, by excluding the insignificant quota by using the Students test, and the dependent variables which can characterize the processes were acidity and dough deformation, which represent the development of the fermentation process.

Interpreting the research results was made by using the graphic method for acidity in the figures 1, 2, 3, 4.
Analyzing the graphic representations, the figure 1,2 and 3 with the influence of solution of NaCL concentration, about viscosity to the substratum consisted a growth of viscosity, when the concentration is 15 M and an easy decrease when the concentration in NaCL is 20 M.

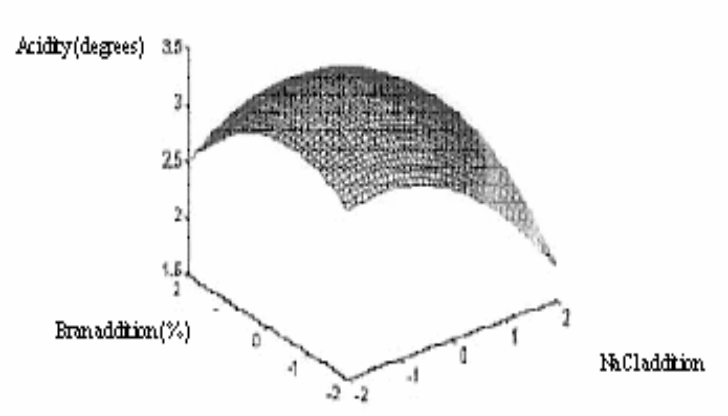

Fig. no. 1. Acidity variation for the dough with bran addition, subject to fermentation, depending on the bran content (%) and the NaCl quantity (%)

The graphic representations regarding the way the dough develops by determining acidity, formed of the initial acidity of the raw material and the acidity of the biochemical reactions, have pointed out an optimum development of the dough in the conditions of a bran addition of 6% and of NaCl addition of 2%.

It is interesting and real to see the situation when the dough leavening in maximum conditions was achieved in a normal manner in the conditions of using 100% wheat flour, without any bran addition and with 0.75 NaCl. This situation can be explained by the low gluten content of the bran, but possible as existing in the flour content of the bran and of the bran addition in 3-6% limits.

As a positive effect it is to be noted the influence of the fermentation period and of temperature, as in figures 2, 3, 4.

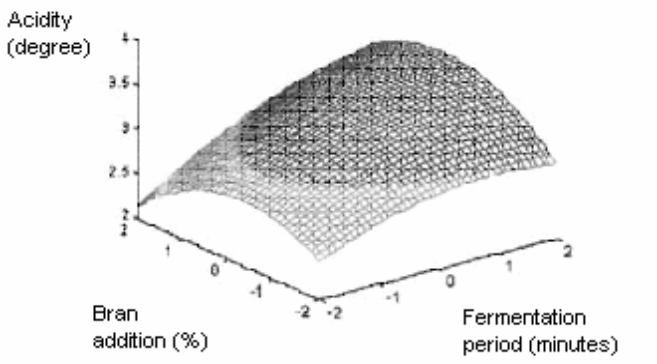

Fig. no. 2. Acidity variation for the dough with bran addition, subject to fermentation, depending on the bran content (%) and duration (minutes)

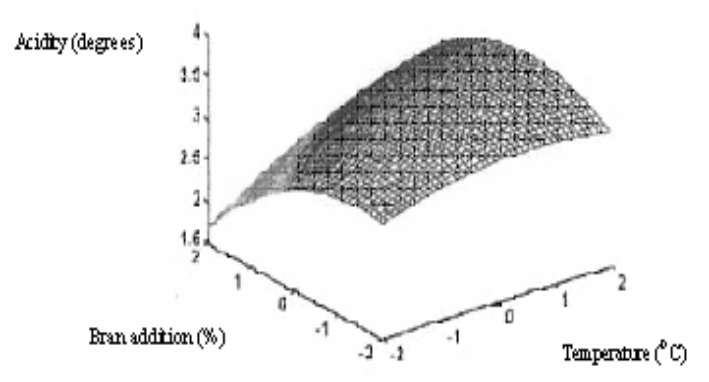

Fig. no. 3. Acidity variation for the dough with bran addition, subject to fermentation, depending on the bran content (%) and temperature (^{0}C)

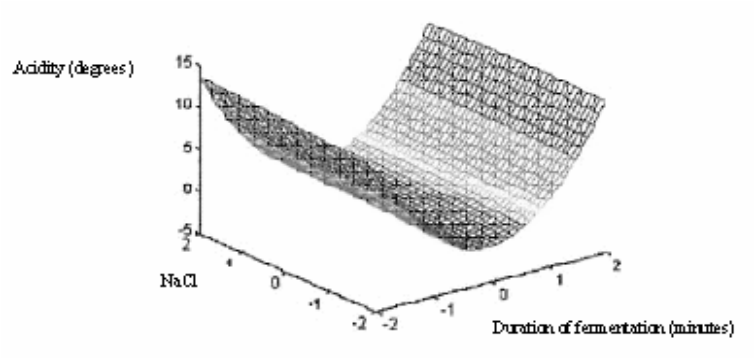

Fig. no. 4. Acidity variation for the dough with bran addition, subject to fermentation, depending on the salt quantity added (%) and the duration of fermentation (minutes)

The way the dough developed, expressed by the dough deformation, presents the following conclusions: the maximum deformation is achieved when the bran content is in 3-6% limits, the temperature and the duration of fermentation having a positive role in this situation. Fig.[5, 6, 7, 8].

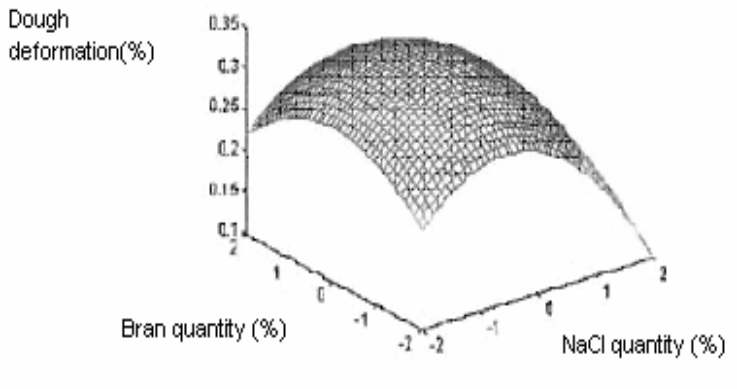

Fig. no. 5. Deformation variation for the dough with bran addition, subject to fermentation, depending on the bran quantity added (%) and the NaCl quantity (%)

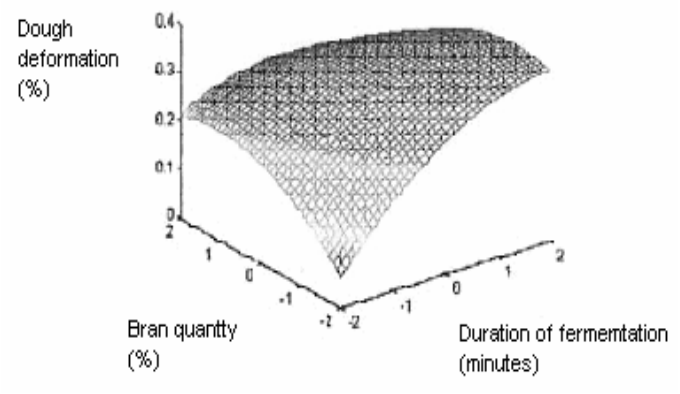

Fig. no. 6. Deformation variation for the dough with bran addition, subject to fermentation, depending on the bran quantity added (%) and the process duration (minutes)

The dough deformations represented by the ratio between the initial and final dimensions:

D=(Df-Di) x 100/Di, where:

Df= the dough diameter after fermentation

Di= the dough diameter before fermentation.

As a negative effect we find the excess of NaCl beyond the limit of the centred domain.

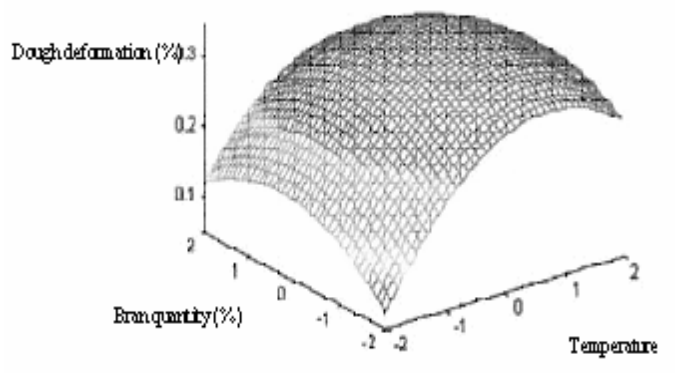

Fig. no. 7. Deformation variation for the dough with bran addition, subject to fermentation, depending on the bran quantity added (%) and the temperature (^{0}C)

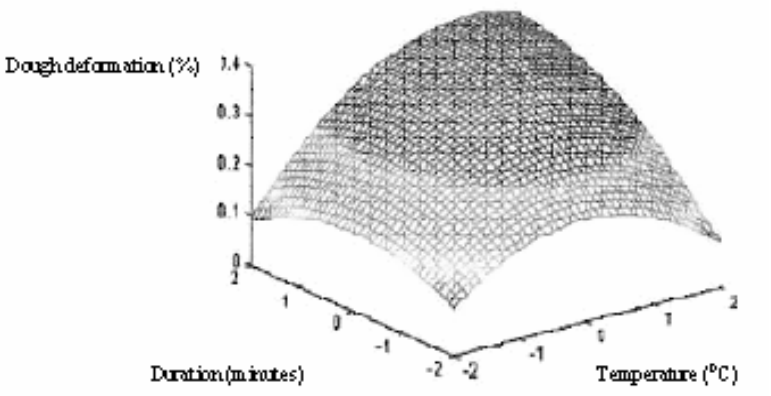

Fig. no. 8. Deformation variation for the dough with bran addition, subject to fermentation, depending on the process duration (minutes) and the temperature (^{0}C)

4. CONCLUSIONS

Using bran in dough forming in the bread making process presents two positive aspects:

- Valorising the by-products in optimum conditions, bran in particular, with a character of environment protection;
- The positive effect of the bran consists of facilitating digestion by eliminating the alimentary bolus due to lack of water at the intestine level.

The optimum technological conditions for obtaining baking products, bread respectively, are represented in the limits:

> the content of bran of 3%
> the content of NaCl of 2.25%
> duration of fermentation of 35 minutes
> temperature of fermentation of 35-45^{o}C.

5. BIBLIOGRAPHY

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