

The influence of walnut flour quantity on the quality of wheat bread

Rosen Chochkov¹, Valentina Chonova, Grozdan Karadzhev, Ralica Nedelcheva
University of Food Technologies – Plovdiv, Bulgaria
rosen4o4kov@abv.bg¹

Abstract— in the present study influence of addition walnut flour at different concentration (1, 3, 5, 7, 10, and 15 %) to the wheat bread was studied and the quality of bread was investigated. Based on investigation results it is found that, with the addition of walnut flour to the wheat flour at concentrations 1, 3 and 5 % favorable results were achieved, represented by good specific volume of produced bread while, in the other hand, addition of higher percentages (7, 10 and 15 %) lead to reduction in bread volumes. Following a sensory analysis, it is found that the addition of walnut flour in concentrations 1, 3 and 5 % achieved best results compared to the control sample. There is improving in the porosity of bread. For all samples, the characteristic odor was rated as strong. Addition of high concentrations of walnut flour increased intensity of bread crust.

Key words— breadmaking, walnut flour, wheat bread, bread quality, sensory analysis.

1 INTRODUCTION

Walnut flour is a good source of proteins, polyunsaturated acids, minerals and flavonoids. It contains high quantity of fibers, low quantity of carbohydrates and good source of insoluble proteins [8, 11, and 12]. There is growing interest on walnut flour as a healthy food provoked by the fact that regular consumption will reduce the risk of coronary heart disease [5].

When adding walnut flour to the wheat flour, this will improve the nutritional bread value. Addition of walnut flour produces high quality products [7, 8, and 9].

Addition of walnut flour to wheat flour leads to reduced water absorption properties and specific volume of bread increased with addition of walnut flour up to 20 % [4].

Increasing the quantity of walnut flour decreased their strength and water absorption, as opposed to the development time and stability of dough, which will increase, and this optimal quantity of added walnut flour to wheat flour is between 5 and 10 % [6].

Addition of 5 % walnut flour, achieved the best index of bread quality. This added quantity is obtained bread with good sensory profile and improved nutritional value [9].

Bread storage time with the addition of walnut flour is comparatively higher than those of the control samples [8]. As regards the quality of bread, walnut flour added leads to increased gas retain properties of dough and bread specific volume. At the same time, bread has a high nutritional value and good taste [8].

The general objective of this study is to determine the influence of walnut flour concentration when added to the wheat flour, through measurements the quality of wheat bread. your paper.

2 MATERIALS AND METHODOLOGY

2.1 Materials of experiments

• Five components were prepared to formulate dough of wheat bread that contained walnut flour; wheat flour with moisture content (10.6 %), acidity (2.2 °H) and ash content (0.5

% in d.b.); walnut flour “from Ecobul Product” with moisture content (11.05 %), acidity (1.60 °H) and ash content (2.90 % in d.b.);

- Water, EN 806-1:2003 [2];
- Yeast (BDS 483 – 90);
- Salt (PMS № 23/ 2001) [3].

2.2 Methods

Bread dough was prepared in UFT according to the *Baking method* mentioned by Plovdiv (1993) [1]. The dough prepared at temperature (29 - 30 °C), resting time (20 min), bread formation, final fermentation (35 °C), and baking temperature (220 – 230 °C). Mass of the dough weighted in grams and its volume measured in (c.c) according to (BSS 3412-79= Non understandable abbreviation). Index (H/D) of bread was measured (the ratio of height to diameter of bread). Specific volume was measured in (cc/ g) which are the ratio of volume to the mass of bread. Sensory analysis of the bread was made according to ISO 8586-2:2008 with the next indicators: volume, odor, crust color, crumb color, mastication, porosity, atypical flavor, residual flavor (fig. 5).

Before the analysis, degustators were prepared by the test procedure. Each degustator applied to the tasting map (scale for the intensity of indicators) and values characterizing the strength of perceptions of each property were reported. The arithmetic results are graphically shape on coordinate system. Each property receives a value, which forms the sensory evaluation of bread [10].

Twenty four students selected and trained according to ISO 8586-1 (third year students of Faculty of Food Technology, UFT), participated in the evaluation of bread samples. The students received encoded samples and questionnaires as well as instructions for evaluation of samples.

Table 1. Tasting Card: Determination the index intensity of bread sample

№	INDEX	INDEX INTENSITY								
		1	2	3	4	5	6	7	8	9
1	Volume									
2	Odor									
3	Crust color									
4	Crumb color									
5	Mastication									
6	Porosity									
7	Atypical flavor									
8	Residual flavor									

Information contained on the sensory performs was indicated as:

Legend:

1 – extremely dislike;	6 – slightly like;
2 – very much dislike;	7 – moderately like;
3 – moderately dislike;	8 – very much like;
4 – slightly dislike;	9 – extremely like.
5 – neither like nor dislike;	

Table 2 shows the quantity used walnut flour to produce 100 % combination of walnut and wheat flour. The results of the control sample (100 % wheat flour) in the section „Results and discussion” is described with K.

Table 2. Quantity of walnut flour added to the wheat flour dough

SAMPLE	QUANTITY, %							
	Symbol	K	A	B	C	D	E	F
Walnut flour		0	1	3	5	7	10	15
Wheat flour		100	99	97	95	93	90	85

3. EXPERIMENTS AND DISCUSSION:

Based on the method mentioned by Plovdiv, UFT, the comprehensive baking assessment of bread is made using baking laboratory test. Thus, describing standard indicators of both types of bread can be obtained by evaluation the influence of walnut flour on the bread quality.

Following baking laboratory test, there is evaluation of masse and volume of bread (Table 3).

Table 3. Evaluation the volume and masse of floor bread after addition the walnut flour

Sample	Masse, g	Volume, cm ³
K	210	610
A	209	600
B	209	572
C	208	566
D	206	550
E	205	530
F	209	510

From results in table 3, addition of walnut flour decreased values of volume and mass of floor bread. Test samples A, B and C achieved the best indicators similar to those of the control sample. By increase the percent of walnut flour for samples D, E and F respectively and values were decreased. Results obtained for the highest added walnut flour – sample F, showed a decrease in volume with 100 cm³ (16.4 %), compared to the control sample.

Figure 1 shows the specific volume of the control and experimental samples of floor bread.

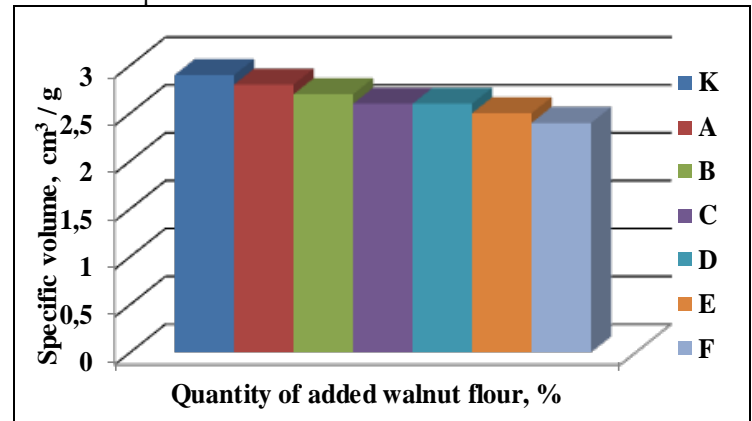


Figure 1. Specific volume of floor bread

Diagram on the specific volume of flour breads confirmed results described in table 3, from which it is clear that, there are reduction in the specific volume, respectively by increasing the quantity of added walnut flour. The highest specific volume is 2.90 cm³ to the control sample. Results of sample A are most close to the control sample (2.87 cm³). The difference between values of the control sample K and sample F expressed as (17.2 %).

The index H/D is determined by the ratio between the height and the diameter of the bread after baking. Figure 2 showed the index H/D of the control and test samples of floor bread.

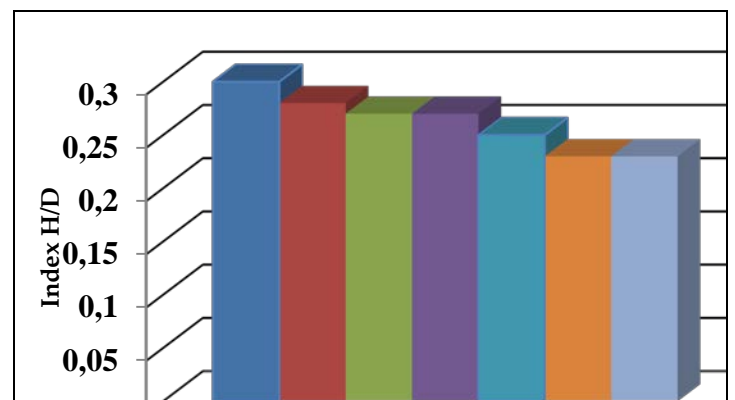


Figure 2. Index H/ D of floor bread

Results of figure 2 showed that control sample of bread have the highest index H/D (0.30). With increasing the quantity of added walnut flour, index H/D decreased compared to the control sample. In other indicators, best results were obtained in sample A (0.28), sample B and C (0.27). Other test samples showed lower values for H/D.

After baking laboratory test of formed bread are obtained, results for masse and volume were described in table 4.

Table 4. Evaluation masse and volume of formed bread with walnut flour

Sample	Masse (g)	Volume (cm ³)
K	415	1090
A	409	1085
B	406	1075
C	400	1070
D	397	1060
E	397	900
F	385	850

Results of formed bread are similar to those of floor bread. Samples A, B and C are achieved best values for mass, similar to those of the control sample. It is shown that these indicators decreased in the other test samples – D, E, and F.

The specific volume of formed bread is described in figure 3.

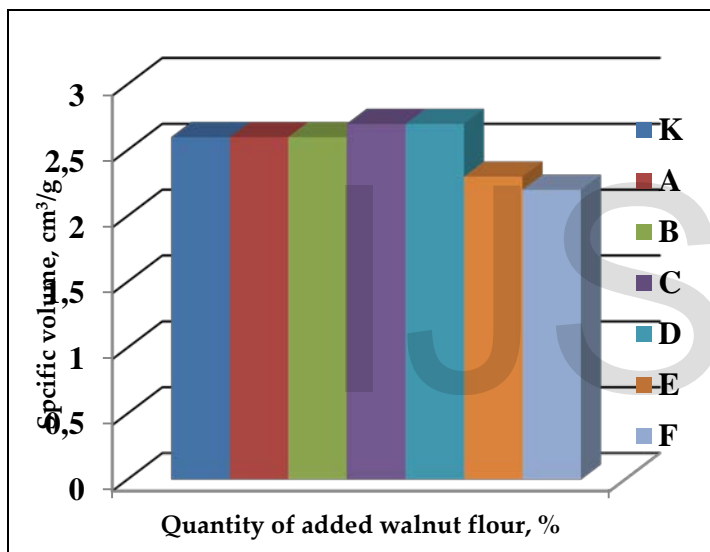


Figure 3. Determination of the specific volume of the formed bread

Addition of walnut flour reducing the specific volume of formed bread. It might be due to decrease in gluten network in dough and less ability of the dough to rise. Small deviations are noted in both samples – C and D, but they are practically insignificant (0.1 cm³). The best values were obtained in test samples A, B and C.

From results, it can be concluded that addition of walnut flour affects his volume. Floor bread, which is obtained from a smaller mass of dough, will be optimal in masse and form due to addition of walnut flour.

After baking laboratory test of floor bread is made, a sensory profile based on visual characteristics of bread was accomplished and the control sample K was used for comparison.

Bread was evaluated by seven independent analysts, that familiar with the methodology of the study. Results obtained were presented in Figures 4.

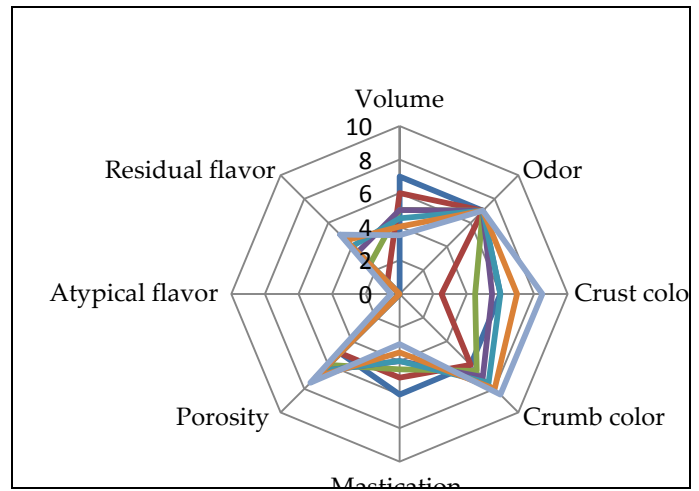


Figure 4. Sensory profile of floor bread – comparison between control samples and bread formed samples

Results in the diagram (figure 4) showed that sample A, has lower volume compared to the control. Three analysts were of differences in crumb color between samples K and A. But both were described as mild or moderate perceptible. Analysis of sample B values of odor and atypical flavor of bread are similar to those of control sample.

There is an increase in the intensity of crust color. Porosity is improved as compared to control sample. The porosity for sample B is one unit higher than control sample, expressed as a percentage (20 %). The crumb color is more intense than that of the control sample. The residual flavor is mild to moderate capture, according to the 4 of 7 analysts.

The analysts detected in sample C decrease in volume, compared to the control sample. Points of crust color and crumb color are 5.5 and 7.0 respectively. The feeling of atypical flavor, residual flavor and mastication has changes in their values. According to a greater percentage of analysts for mastication is impaired. The residual flavor is defined as an average to perceive as subtle and atypical flavor as average audible.

Volume of samples D, E and F shall be reduced to 3.5 units compared with K, and the difference is 50 %. The odor and atypical flavor remained unchanged. Crust color and crumb color is growing in from of very to extremely strong. Porosity improved significantly, according to the analysts. The differences between control sample and experimental sample F, expressed in percentage as 33.3 %. Residual taste is reinforced, which could be due to increasing the quantity of fat dough.

4. CONCLUSIONS:

Based on results obtained , it was found that with addition of walnut flour at percentages 1, 3 and 5 %, good results were achieved for specific volume of bread, while addition of other quantities (7, 10 and 15 %) lead to reduce it.

After sensory analysis, with the addition of walnut flour in quantities 1, 3 and 5 % best results were achieved compared to the control sample.

There is an improvement in bread porosity, for all samples, and the characteristic odor was rated as strong. With addition of larger quantities of walnut flour, an increase in the intensity

of the bread crust coloration was observed. In all test samples there were no unusual taste with the exception of sample F which has a slight increase, but the values are in the category of "subtle".

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