QUALITY EVALUATION OF BREAD WITH ADDITION OF SUNFLOWER SEEDS, OLIVES AND TURMERIC

ORIGINAL SCIENTIFIC PAPER

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ABSTRACT:
This paper will show that adding some spices and other raw materials can increase the nutritional value of bread and provide a product that will be acceptable for consumption. Sunflower seeds, olives or turmeric are added in amounts up to 10 %, relative to the total amount of flour. Nutritional value of bread was determined, the sensory analysis was performed and the durability or preservation of freshness was monitored.

KEYWORDS: bread with addition of sunflower seeds, olives or turmeric; quality; enriching white bread

INTRODUCTION

White wheat flour bread was considered as the highest quality bread product for a long time due to its large volume, shape and color. This is all due to the quantity and properties of gluten. However, this bread is poor in vitamins and minerals because during milling in the production of white flour, peel wheat parts and germs are removed. Those parts contain high value ingredients. For this reason, the use of black, integral, whole wheat flour and other cereal grains, which were mainly mixed with wheat flour has begun. Another way of enriching white wheat flour is to add the variety of raw materials that will increase its nutritional value [4].

The bakery industry is one of the branches of the food industry. The first bread was baked back in the Neolithic, almost 12,000 years ago, most likely from coarse-grained grains mixed with water. By the time of ancient Rome, milling and baking had already developed to an almost industrial level [1]. Bakery products mean a very wide range of bread and pastries. Most of the pastries differ from bread mainly by weight and very little by raw material composition. Flour products form the basis of nutrition, especially in lower-standard countries. In some countries, over 60% of the total energy is consumed with these products. With the rise in living standards, consumption of cereal products is declining, and they are being replaced by fat, sugar and animal products, which are much more expensive [2].

In many high-standard countries, cereal consumption has fallen below the limit, which is a physiological minimum, which has had a serious impact on the health of the population [2]. Cereal replacement products are generally poor in ballast [3]. A large number of medical tests indicate the benefits of darker types of bread [2]. This bread provides significant amounts of vitamins and minerals as well as ballast that are essential in the diet. The consumption of grain is influenced not only by living standards but also by other factors, most notably the habits of the local population. In most countries, the production of bread and pastries as essential foodstuffs is regulated by law and quality regulations [4].

A large number of raw materials are used in the bakery. These are raw materials of plant and animal origin and some of the raw materials are from other sources.

Raw materials in bakery are divided into:

1. Basic raw materials - flour and water.
2. Additional raw materials - yeast and salt.
3. Auxiliary raw materials - sugar, sweeteners, milk and milk products, fats, margarine, chocolate, cocoa powder, fruits and fruit products, spices, additives, emulsifiers, nutritional or technological quality enhancers, etc [5].

Nutritionally valuable foods were used as additional raw materials for the production of bread with additives: sunflower seeds, turmeric and olives. In laboratory conditions it is possible to define precisely the best recipe to be used in production. Trial baking

is the most relevant criterion for evaluating the baking properties of flour and cannot be completely replaced by any instrumental method [3].

Sunflower seeds are rich in vitamins E, B1, B3, B6, folic acid and minerals such as copper, manganese, selenium, phosphorus and magnesium. At the same time, they have a high calorie value (584 kcal in 100 g).

Olives are distinguished by their high content of single unsaturated fatty acids (as high as 75%), with a beneficial effect on health. They are also a good source of vitamin E, a powerful antioxidant essential in the daily fight against harmful free radicals. In addition, olives are a good source of iron and copper minerals and dietary fiber. In addition to vitamin E, the antioxidant properties of olives are also enhanced by active phytochemicals such as polyphenols and flavonoids.

Turmeric is medicinal herb and has been in use for over 5000 years. It is rich in vitamins B complex, contains vitamin C as well as minerals. The active ingredient in turmeric is curcumin, which, even at very low concentrations, has a curative effect. First of all it is known for its very powerful antioxidant, anti-inflammatory and antibacterial properties [4].

EXPERIMENTAL

Bread without additives control samples is made according to the following recipe: 300 g flour, humidity of 14%,

Sugar solution: 5 g of sugar dissolved in 95 g of water, 5.4 g of dry yeast suspended in 21.6 g of sugar solution, 4.5 g of table salt, 5.58 g of sugar, 210 ml of water.

The process of making the other three breads differs only in the addition of additional raw materials in quantities of 10%: turmeric, sunflower seeds, olives. The process of making all the samples is exactly the same.

MATERIALS

The following raw materials were used to make the bread without additives:

1. flour: ("Ljubače type 500")
2. baker's yeast: ("Di-Go")
3. salt: ("Tuzlanska so")
4. sugar: ("Bingo Šećer")
5. water: ("Voda Kristal)
6. vegetable oil: ("Bimal")

For the preparation of bread samples fortified with the additives, in addition to the basic raw materials, in each bread sample were added one of the following additives (in amount of 10%):

- turmeric powder,
- olives,
- sunflower seeds.

For the bread making followed materials were used:

- plastic containers,
- fermentation chamber (30 ° C and 85% humidity, water bath),
- kneading board,
- dough roller,
- baking mold,
- oven with temperature control.

METHODS

Bread samples were obtained after a trial baking according to a following recipe:

300 g of flour is poured into a pan, added the prepared yeast solution, salt, sugar, and stirred. After the dough of the desired structure is obtained, it is transferred to a suitable container and placed under fermentation for 30 minutes, at a temperature of 30 ± 1 ° C and a relative humidity of 85%. When fermentation is complete, stirring takes 2-3 minutes to achieve better structure and quality of the finished product. Then a second fermentation was carried out, 50 minutes at 30 ± 1 ° C. The dough was placed in an oven heated to 230 ± 10 ° C. After 5 minutes the temperature was reduced to 200 ° C and after 15 minutes (from the beginning of baking) to 175 ° C. Total baking time is 30 ± 3 minutes. After this time, bread is left for 1 h to cool. To obtain the data used to calculate the losses, the bread must be weighed after 1 h of cooling and after 24 h.

Sensory evaluation:

After the trial baking, an organoleptic or sensory evaluation of the finished products was performed. Organoleptic evaluation involves monitoring and evaluating the following factors: volume, outer appearance, apperance of the bread crumb, flavour of bread crumb and crust, taste of bread crumb and crust. For each bread sample, 10 evaluators participated in the evaluation. Each evaluator received a certain amount of bread sample that he consumed and then entered his grades into a rating sheet.

Determination of water content (dry matter) in bread was made by drying method:

The proportion of water (dry matter) in bread was determined by drying the weighed sample (3 g) at 130 ° C (± 1 ° C) to constant weight. The water or

dry matter content was calculated as the difference in weight of the sample before and after drying.

$$\%dry\ matter = \frac{M-m}{M}\cdot 100 \quad \text{.....(1)}$$

$$\%water = 100 - \%\ dry\ matter \quad \text{.....(2)}$$

where is:
M- mass of bread sample before drying,
m- mass of bread sample after drying.

The acidity of the bread crumb was determined by the titration method:

6 g of the bread crumb of the bread sample is measured, moistened it in a porcelain dish with 5 ml of neutral acetone and then homogenized it with 100 ml of freshly boiled and cooled water. To the mixture was added 1 ml ethanol solution of phenolphthalein and immediately titrated with 0.1 mol (NaOH) / l to a reddish color, which should last at least 15 seconds.

The acidity was expressed as an acidic degree, denoting the number of milliliters of a 1- molar alkali solution required to neutralize the total acids in 100 g of the bread crumb, and was calculated by the following formula:

$$acid\ \deg ree = \frac{a\cdot 10}{b} \quad \text{.....(3)}$$

where is:
a - spent milliliters of 0.1 mol (NaOH) / l to neutralize total acids,
b - sample weight.

The determination of the amount of ash (mineral matter) in bread is determined by burning and annealing:

2 g of the sample is weighed and dried according to the procedure for determining the water in bakery products. From the homogenized sample, the required amount of sample is measured and combusted it on the grid until complete carbonation. As soon as the contents of the vessel are charcoal-coated, the vessel is carefully inserted into the muffle furnace. The annealing was carried out at 800 ºC. When the combustion was completed, the pan was removed from the oven and cooled for 1 min. Then the contents of the pan are weighed.

The amount of ash is expressed as a percentage by mass relative to the dry matter and is calculated by the following formula:

$$Ash\ amount(\%) = m_1 \cdot \frac{100}{m_0}\cdot\frac{100}{100-V} \quad \text{.....(4)}$$

where is:
m_0 - mass of test sample, in grams,
m_1 - mass of the remainder, in grams,
V - the amount of water, expressed as a percentage, in the sample to be tested.

Determination of fat content in bread (Soxlet method):

5 g (m_0) of the sample is weighed and transferred to a paper sleeve. The sleeve is inserted into the Soxhlet extractor so that the height of the sleeve is less than the edge of the solvent siphon tube. The extractor is then combined with a flask of known mass. Petroleum ether was poured over the bushing so that its volume is at least 1.5 volumes of the extractor and at the same time not more than ¾ the volume of the flask. The extractor is then combined with the reflux through which the water flows. A heater is placed under the flask. The extraction takes 4 to 6 hours, depending on the type of sample. After extraction was complete, the distillation was stopped as soon as the solvent was poured into the flask. The appliance was removed from the heating body, removed the sleeve, then reassembled the appliance, and the solvent was pre-distilled into the extractor. The fat flask was separated from the extractor and dried in an oven at 105 ° C for about 1 hour or until constant mass. The flask is cooled and weighed (m_1). The difference in the mass of the flask after drying and the empty flask represents the amount of extracted fat in the sample. The calculation of the amount of crude fat is expressed as a percentage and is calculated by the following formula:

$$Fat\ content(\%) = \frac{m_1}{m_0} - \frac{m_2}{m_0}\cdot 100 \quad \text{.....(5)}$$

where is:
m_0 - measured quantity of sample, in grams,
m_1 - mass of the flask with extract (fat), in grams,
m_2 - mass of empty flask, in grams,
V - moisture content of the sample (%).

Determination of protein in bread (Kjeldahl method):

The method is based on the destruction of organic matter by sulfuric acid, the nitrogen compounds are converted into ammonia, which forms ammonium sulfate with acid. From such a solution, ammonia is

displaced by NaOH and its amount after distillation is determined by titration with standard acid. On the basis of the amount of acid consumed, the nitrogen content of the sample is calculated and converted to proteins by multiplying by the appropriate factor. This factor for flour is 6.25.

RESULTS AND DISCUSSION

Based on the analysis we have obtained the following results.

Figures 1 and 2 show the appearance of the bread samples after the trial baking.

Figure 1. Bread without additives (right), bread with sunflower seeds (left).

Figure 2. Bread with olives (right), bread with turmeric (left).

Table 1. Results of trial baking.

Sample	Bread without additives	Bread with sunflower seeds	Bread with turmeric	Bread with olives
Mass of dough (g)	531.45	540.81	543.34	539.87
Mass of bread after 1h (g)	454.55	470.74	473.41	465.19
Mass of bread after 24 h (g)	476.86	489.65	490.75	486.42
Yield of dough	1.77	1.80	1.81	1.79
Yield of bread (1 h)	1.51	1.57	1.58	1.55
Yield of bread (24 h)	1.59	1.63	1.64	1.62
Total losses %	24.73	22.41	22.55	23.73
Losses by roasting %	14.46	12.95	12.87	13.83
Losses by drying %	10.27	9.46	9.68	9.9

Table 2. Results of sensory evaluation of bread.

	Bread without additives	Bread with sunflower seeds	Bread with turmeric	Bread with olives
Volume	20	20	20	20
Outer appearance	15	15	15	15
Apperance of the bread crumb	25	24.375	25	25
Flavour of bread crumb and crust	14.625	14.625	14.667	15
Taste of bread crumb and crust	24.375	24.375	23.889	25
TOTAL (max 100)	99	98.375	98.556	100

Table 3. Results of nutritional composition of bread.

Sample	Water content (%)	Dry matter content (%)	Ash content (%)	Fat content (%)	Protein content (%)	Acid degree
Bread without additives	40.6	59.4	0.64	1.12	5.3	2.61
Bread with sunflower seeds	38.7	61.2	0.96	2.22	8.2	2.61
Bread with turmeric	38.91	61.08	0.80	0.66	5.4	1.72
Bread with olives	41.87	58.13	1.08	1.72	7.1	2.42

Table 4. Nutrients composition of bread samples.

Sample	Fat content (%)	Protein content (%)	Carbohydrate content (%)	Energy (kcal)
Bread without additives	1.12	5.3	52.34	240.64
Bread with sunflower seeds	2.22	8.2	49.82	252.06
Bread with turmeric	0.66	5.4	54.22	244.42
Bread with olives	1.72	7.1	48.23	236.80

From figure 1. it can be concluded that the dough of bread without additives has a lighter color. The volume achieved is of satisfactory quality. The bark looks uniform and crack-free with a characteristic brown color. The bread crumb is soft with pores that are evenly spaced. For the bread with addition of sunflower seeds we can conclude that the color is much darker due to the presence of sunflower seeds. Sunflower seeds give this sample its characteristic aroma and taste. The volume is satisfactory and the bread crumb looks porous. Most pores contain fragments of sunflower seeds.

From figure 2. it can be concluded that the bread with addition of turmeric have a characteristic yellow - orange hue that comes from turmeric. The aroma and taste are characteristic of turmeric but not too pronounced. The volume is of adequate quality and the medium is porous. The color is uniform throughout the cross-section. The bread with addition of olives has a characteristic green hue due to the presence of olives. The crust of the bread has the same color as the sample without additives, but the bread crumb has a pale green hue. The volume achieved is appropriate and the bread crumb contains fragments of olives that give this bread its characteristic aroma and taste.

From table 1. it can be concluded that the dough weight of bread with additive of sunflower seeds, olives or turmeric is higher compared to the dough of bread without additives. From the above it can be concluded that doughs of bread with additives have stronger ability to bind water. Also the total losses by roasting and drying are less value for bread with the addition of sunflower seeds, olives or turmeric.

From table 2. it can be concluded that all breads received very high marks for all five sensor categories that were evaluated.

From table 3. it can be concluded that the bread with additives contain more minerals (ash) and protein, except for bread with turmeric containing almost the same protein content as bread without additives. Bread with sunflower seeds and olives contain more fat than bread without additives, while turmeric bread contains less fat than bread without additives. The acidic degree of bread with additives is very similar to that of bread without additives, except for bread with the addition of turmeric, whose acidic level is lower.

From table 4. it can be concluded that bread with addition of sunflower seeds, olives or turmeric have characteristic energy values and carbohydrate content for bread samples.

CONCLUSION

Based on the analyzes performed and the experimental part, the following can be concluded:

Breads with addition of sunflower seeds, olives or turmeric have proven to be a nutritionally very affordable alternative to white bread and are more economically viable for production due to lower production losses. The addition of sunflower seeds, turmeric or olives to bread improves its organoleptic properties. The additives give the bread a fuller flavor, aroma and taste. Trial baking has proven to be a

very good criterion for evaluating the baking properties of flour, and for reconciling the recipe and production parameters. By using these breads in our diet we increase the possibility to provide our body with vitamins, antioxidants and ballast substances, which are very important substances for maintaining health.

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