

A COMPARATIVE STUDY ON OBTAINING BAKERY PRODUCTS FROM ORDINARY AND ORGANIC WHEAT

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Abstract

This paper refers to bakery products obtained from organic wheat and from normal harvest wheat. Organic agriculture has its origin, on the one hand, in the desire to intervene in nature in accordance with its laws and, on the other hand, in the need to save the human habitat, where soil fertility and biodiversity represent key components, which must be preserved and improved.

Organic agriculture is a sector where Romania has great chances to develop and represents a viable alternative for the future.

Starting from a documentary study on the characteristics of the wheat obtained in the organic and in the old system, we have presented the main characteristics of the two types of flour obtained from processing these types of wheat.

Two baking tests have been carried out, each one dealing with the two types of flour. In the baking sample sheet, we registered the technological parameters and the results of the final product obtained, i.e. the product named "buns."

In addition to the information extracted from specialized literature, in order to achieve a better understanding of the benefits of organic products, a series of laboratory tests have been carried out on the final product and their results have been interpreted in this paper.

As a consequence of the values of the different analyzed parameters, we have reached the conclusion that the flour obtained from organic wheat should be used mainly for making specialties, while conventional wheat should be used in the case of hearth bread, toast bread

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1. INTRODUCTION

Organic agriculture (a term which is similar to organic or biological agriculture) represents a "modern" process of cultivating plants, of fattening livestock and of producing food, which differs fundamentally from conventional agriculture. The role of this agricultural system is to produce healthier food, which is more suitable for the human metabolism, but it is in full correlation with environmental conservation and development.

Organic agriculture is a sector where Romania has great chances to develop, as it also represents an important tool in nature conservation and rural revitalization.

Practicing organic agriculture in Romania is favoured by the existence of traditional agricultural systems, which are mostly extensive. This is largely due to the fact that the average use of chemical fertilizers in Romania is 8-10 times lower than in EU

countries and because plant protection products are provided at a rate of 20-25%.

The areas organically cultivated in Romania have increased over six times in the past five years, from 17,438 ha in 2000 to 110,400 ha in 2005, and in 2006 the area reached 143 000 ha. Moreover, a growth in the organically cultivated area is expected - 1.7% in 2007, about 250,000 ha, from 1.16% in 2006 and up to 400,000 ha in 2010, i.e. 2.72%.

In organic agriculture, given the technological features of this system, the base criteria for the choice of varieties should be: competition with herbs, resistance to disease and pest attacks, resistance to drought and to other potential stress factors.

As far as the choice of varieties is concerned, in hilly and mountainous areas it is recommended to use Franckenkorn (ssp spelta) and Arieşan wheat varieties for the organic production.

Despite the fact that it is a valuable variety, Kalasz variety performed less well in drought conditions.

Franckenkorn variety (ssp. spelta) is recommended for at least two reasons: it can bear extreme temperatures and drought conditions, and if it is cultivated under ecological conditions, it will lead to the highest revenues that are achieved by the difference in price (50-70% more than the other varieties).

Due to the fact that there are few means available to control the limiting factors of production, besides the selection of resistant varieties, a necessary condition in organic agriculture should strictly obey some specific agro-technical rules.

Choosing the optimum time for the execution of mechanical works and the use of an appropriate equipment ensure the goal realization. Weather conditions, especially the absence of rainfall during sowing, makes the seedbed preparation more difficult. The uneven emergence affects the obtained productions in a negative way as well.

Of all the wheat varieties mentioned so far, the Arieşan variety was the best at bearing the absence of rainfall and the inadequate preparation of the soil, whereas the variety of ssp. spelta (Franckenkorn) was the most affected by these adverse conditions.

It is preferable to wait for the right time to prepare the seedbed than to follow by all costs, the optimum time of sowing.

In weed control, agro-technical works are of significant importance. The weed whack can solve the weed problem by 90%. It is essential to emphasize the importance of choosing the optimum time for the carrying out of the work and also to make sure that the unit should be adjusted according to the moisture of the soil and of the phenophase of the wheat crop.

It turned out that the use of biofertilizers diminishes the chances of weed growth and has benefic effects on wheat crop.

Crop residues from the plant and organic fertilizers have been used as a basic fertilizer for growing wheat in ecological conditions. Pease have been chosen as a pre-plant for wheat due to the fact that they are a vegetable

and have several advantages (they are nitrogen-fixing; they are very good for cereal grains as well; they contribute to the growth and maintenance of natural soil fertility).

The most frequently used organic fertilizers are the half-fermented manure and the garbage juice. These fertilizers can be applied directly to the wheat crop, or more frequently, to the pre-plant so that the wheat will benefit from the residual effect.

The administration of organic fertilizers is particularly important on clay soils (they are acidic and contain a lot of clay), and on soils nutrients. They improve the physical, chemical and biological properties of the soil.

Organic wheat is grown without the use of chemical fertilizers, insecticides, fungicides, herbicides and pesticides.

In organic agriculture, wheat is selected from the chemically untreated seed grain and the soil on which the plants grow are only naturally fertilized.

After harvest, wheat is stored in special silos: mixing it with conventional cereals is not allowed. Moreover, chemical treatments during storage are forbidden as well.

Grinding takes place due to a milling equipment which has an exclusive use in the case of organic grains and which is equipped with steel grinding mechanism. The wheat is ground in order to obtain better meal flour because it preserves minerals and because it is rich in amino acids, in phospholipids and in fiber.

Agricultural production requires the acquisition of food products without using synthetic chemicals, in accordance with organic production rules. These rules meet the standards, the guidelines and the national specifications, and are certified by an inspection and certification body [3,4].

Thus, in the case of bread production in the ecological system there are the following regulations:

- flour origin - the flour must come from non-GM cereals;
- drying - it is forbidden to use direct heating with fossil fuels (e.g. gas, coal, gasoline, etc.);

- grain-preservation - it must be made with physical systems, such as: ventilation, refrigeration, controlled atmosphere (nitrogen, carbon dioxide)
- grinding - mixing mills will be used only for organic wheat
- ingredients - all ingredients must be of an organic origin;
- proofing - it is allowed only with sourdough starter, which is produced by natural fermentation;
- additives - they are prohibited;
- baking - heating must be indirect (for any fuel), or direct, on wood;
- tag - it will contain the approximate degree of extraction, the grinding method;
- packaging - bread packaging takes place only with the help of natural materials. For indispensable products it is permissible to use cellophane.

There is a clear difference between organic products and those obtained in a conventional manner. Case studies from several countries prove the fact that organic products generally contain a higher quantity of health beneficial substances (vitamins, amino acids, minerals) and are less contaminated with harmful substances (nitrite, nitrate, pesticide residues).

Organic products are becoming increasingly popular among worldwide consumers, and this could be explained primarily by an increased interest in eating healthy and natural food as much as possible and secondly, by the fact that the efforts to preserve clean water, clear skies and uncontaminated soil apparently begin to take shape.

Organic food product is obtained, first of all from raw materials (ingredients) coming from farming. This type of agriculture must obey the following principles and rules:

- removing any polluting technologies from an unpolluted area;
- using varieties and species with high resistance to environmental conditions;
- improving and maintaining natural soil fertility;
- using fertilizers and soil enhancers, pesticides, raw materials for feed preparation, ingredients for food preparation, in accordance

with the list of products allowed in organic farming;

- the absence of genetically modified organisms and of plant irradiation;
- the absence of synthetic chemical additives: preservatives, colorings, flavorings, emulsifiers, acidifying taste hardeners, thickeners, etc..

Conventional food product is obtained from raw materials derived from conventional agriculture, where chemical synthesis and also artificial food additives have been used.

A first advantage of organic bread consumption represents the fact that the ingredients used in its production are not contaminated with chemicals. This bread does not contain food additives (E numbers). It also has a complex nutrient intake - minerals, fiber, amino acids and vitamins - and an ideally balanced proportion between plastic elements - proteins, carbohydrates and lipids.

The most valuable benefit offered by organic products represents the positive and healthy reaction of the body. There is no such thing as chemicals, preservatives or additives in this type of food, crops lack insecticides and herbicides and products do not contain genetically modified organisms. This means that the the nutritional value and the quality of organic products are necessary and compulsory for the human body to function at the optimum parameters. Therefore, several nutrients represent the major benefits offered by organic products, unlike the products obtained from conventional agriculture.

Statistics indicate that there are many minerals, vitamins and antioxidants in eco products, as opposed to the conventional ones. The benefits of organic food are becoming more and more important for people suffering from chronic health diseases, such as cancer.

Chemicals and fertilizers used to increase crop productivity are absorbed by plants and get into the human body, creating imbalances that may pose real danger for those who already have serious health problems.

Organic foods have a fundamental role in ensuring and maintaining people's health, as they fulfill more important self recovery

functions than those reported so far and have a greater hygiene value than other types of food. In more general terms, eating organic food means consuming products that are clean, healthy and diversified, and which lack residues. Moreover, these products have a balanced content of high quality bioactive substances and minerals and contribute to the physiological rational nutrition of the human body.

Ensuring a healthy environment depends on the lifestyle, therefore we should highlight the importance of consumption in a rational manner (as far as ecology is concerned).

Therefore, developed countries are continually shifting their mode of production and consumption in order to achieve economic and nutritional goals without ecologically harming the other nations [5].

2. MATERIALS AND METHODS

The raw materials used for the tests that show how they affect the system in which wheat was grown and also the quality of the products obtained afterwards are the following:

- organic wheat and common wheat;
- flour type 650 (organic and regular);
- yeast bread;
- sea salt (for organic products) and iodized salt (for ordinary products);
- natural mineral water (for organic products) and water (for ordinary products).

The methods of analysis used to analyze flour are:

- Determination of flour moisture
- Determination of wet gluten.
- Determination of gluten index.
- Determination of the Falling Number
- Determination of the power of the flour by using the alveografic method

The methods of analysis used used to analyze bread are:

- Determination of bread moisture
- Determination of bread porosity
- Determination of bread elasticity
- Determination of bread volume
- Determination of bread acidity

- Determination of the height / diameter ratio (the widening of the bread) (Banu and Stoica , 2004).

3. RESULTS AND DISCUSSION

Further to the analysis performed on organic wheat flour and on conventional wheat flour respectively, the following results have been obtained:

Table . 1- Indices of flour quality

Analyzed Parameter	Symb	Measur Unit	Obtained Values	
			Organic wheat flour	Conventional wheat flour
Humidity	U	%	11,9	14,5
Wet gluten	GU	%	24	26,2
Gluten index	GI	%	43	74
Fall index	FN	sec	258	241
Maximum pressure	P	mm	40	70
Dough extensibility	L	mm	67	75
Extensibility index	G	-	18,2	19,2
Energy absorbed by the dough	W	J	162	202
The ratio of elastic and viscous properties	P/L	-	0,60	0,93
Elasticity index	Ie	-	49,6	51,1

Lasztity and Salgo (2002) point to the Italian system of grading wheat quality based on alveografic parameters. Thus, one can distinguish three quality classes:

Improver (W 300, P / L 1), High quality (W 160, P / L 0.6) and wheat for confectionery products (W 115, P / L 0.5).

There are other sources which deal with the problem of the optimal values of alveografic parameters depending on their technological destination. They make a broader classification: W <120 - poor quality flour, which cannot be used for making bread, W 120 - 160 - weak flour, susceptible to making

biscotti (and fancy cakes), W160-250 - regular flour which has an average power used to obtain common bakery products via soft dough (Pugliese, Ciabata, Francese, pane piuma etc.) or hard dough (pane ferrarese), W250-310 - strong flour for obtaining products such as maggiolino, baguettes, rosetta, soffiato, biove etc. and $W > 300$ obtained from strong grain and meant to provide products that require long fermentation periods, by using technological processes.

These processes apply indirect methods that use natural yeasts with long growth periods or high sugar doughs (pandoro, panettone, veneziane).

A similar classification is offered by Practically Edible, the online food encyclopedia: $W < 130$ - flour that cannot be used in panification; $W < 170$ - flour for biscuits and cakes, $W: 190$ and 220 - weak flour, $W 180$ and 260 - flour for pizza and similar dough; $W: 180$ and 320 flour for products which grow fast; $W: 230$ and 290 - average power flour, $W > 350$ flour used in combination with weaker flours to obtain bread and other products; $W: 380$ and 450 flour for products with long rising time (Popa and Tamba).

The interpretation of the tests results regarding the flour obtained from organic wheat and from conventional wheat:

In the case of organic wheat flour, humidity represents 11.9%, as for conventional wheat flour it is 14.5%. According to the SR 877-96, flour humidity must be within the value 14.5%. Taking into account the classification of flour according to their moisture, organic wheat flour belongs to the dry flour category ($u < 14\%$), whereas conventional wheat flour is included in the average humidity flour class ($14\% < u < 15\%$).

For organic wheat flour, the wet gluten content value is 24% and for conventional wheat it is 26.2%. According to SR 877-96, the wet gluten content of the types of flour in our country is 22-30%. Therefore, both types of flour are found within these values.

In the case of organic wheat, the value of flour gluten index is 43%, while for conventional wheat flour it is 74%. By classifying flour

according to the gluten index, organic wheat flour represents a low flour ($GI < 60$), whereas conventional wheat flour is an average-quality flour ($GI = 60-80$).

For organic wheat flour, the index drop value is 258 seconds, while in the case of conventional wheat flour- 241 seconds.

As a result, taking into account the index drop, whose values are in the range of 250-300 seconds, organic wheat flour is recommended to multicereale bread, specialty rolls for hamburgers, while conventional wheat flour, whose index is between 175 and 275 seconds is recommended for loaf, hearth bread, toast bread.

The alveografic analysis of organic wheat flour indicates the following results: the maximum pressure $P_{max} = 40$ mm; dough extensibility $L = 67$ mm; scalability index $G = 18.2$, the amount of energy absorbed by the dough $W = 162$ J, the P / L ratio = 0.60 and the elasticity index $I_e = 49.6$.

The alveografic analysis of conventional flour indicates the following results: the maximum pressure $P_{max} = 70$ mm; dough extensibility $L = 75$ mm; scalability index $G = 19.2$, the amount of energy absorbed by the dough $W = 202$ J, the P / L ratio = 0.93 and the elasticity index $I_e = 51.1$.

According to the P / L ratio which, in the case of ecological wheat flour, has the value 0.60, the flour is recommended for bakery products. As far as conventional flour is concerned, this ratio reaches the value 0.93, which means that it is intended for bakery products (cakes, muffins) and toast bread.

The amount of energy absorbed by the dough (W) for conventional wheat flour, is 202 therefore the flour is should be used to obtain toast bread and bakery products (D. Hut, 2001). The interpretation of the tests on products made from organic and from conventional wheat flour lead to the following results:

Table .2-quality parameters of buns

Analysis of products	Symbol	Measure unit	Obtained values	
			Organic wheat	Conventional wheat

			flour	flour
Humidity	U	%	41	41
Porosity	P	% vol.	84,0	82,0
Elasticity	E	%	95	95
Volume	V	cm ³ /100 g	424,00	554,00
Acidity	A	degrees of acidity to 100 g of product	2,0	2,0
Ratio height / diameter	H/L	-	0,5	0,77

The interpretation of the tests on products made from organic and from conventional wheat flour.

For both types of buns made from organic wheat flour, conventional wheat flour respectively, the humidity value of the kernel is 41%. According to the SR 878-96, the maximum amount of moisture kernel for the baked white bread is 45%, therefore both types of buns match these values.

The porosity of organic wheat flour buns is 84.0% vol, and in the case of conventional wheat flour it reaches the value 82.0% vol. According to SR 878-96, the minimum porosity value of the baked white bread is 73% vol. Thus, the buns made from organic wheat flour, as well as those made from conventional flour, fall within the rules of the STAS. As a consequence, the products have been obtained from fermented and baked enough dough.

The elasticity of the two types of buns is 95%, thus corresponding to the optimum elasticity value of the kernel, for the baked white bread, in conformity with the SR 878-96, exceeding the minimum allowed value of 73%.

The volume of the buns made of organic wheat flour is 424 cm³, and in the case of conventional wheat flour buns: 554 cc. Both types of buns (those made of organic wheat flour and of conventional flour) fall within the rules of the SR 878-96 regarding the optimal values of their volume. Thus, the results

obtained indicate a higher volume of 275 cm³ /100 g product, as STAS indicates for the baked white bread.

Therefore, the product "buns" made from organic, as well as of conventional flour, is mellow and well grown.

The acidity of the two types of obtained products is equal and has the value 2 (degrees of acidity per 100 g) and this is the reason why products fall under the admissibility conditions imposed by SR 878-96, which provide for the white bread a maximum acidity value of 3.5.

4. CONCLUSIONS

From the determinations made on flour and on the finished product which has been obtained by processing flour and other ingredients, we have obtained the following results: in the case of the product made from organic wheat flour, the dough had a normal consistency. It was flexible and non sticky, and after baking, the final product became slightly flattened.

Regarding the product obtained from conventional wheat flour, the results showed a dough which had a normal consistency as well, but it was slightly sticky and slightly elastic.

Conventional wheat flour buns had a greater volume than those made of organic wheat flour, and this was partly due to the higher content value of wet gluten of normal flour, as opposed to the organic one.

On the other hand, the buns made from organic wheat flour showed a higher porosity value than the ones made from conventional flour.

This aspect, along with the fact that organic flour had a higher value of the fall index than conventional flour, lead to the conclusion that organic wheat flour used in bread samples should be used to obtain multicereal bread, specialties, hamburger buns, while conventional flour is recommended for loaf products, hearth bread, toast bread.

5. REFERENCE

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