

RESEARCH REGARDING THE PROCESS OF OBTAINING FLOURS FOR VARIOUS DESTINATIONS BY USING THE ADMIXTURES OF WHEAT AT ROMAN MILL

RUSU TITI^{1*}, NECULAIASA VASILE²

¹ SC Morărit Panificație SA Roman, România
² „Gheorghe Asachi” Technical University Iași, România

Abstract: The paper presents the manner of obtaining the flours for several destinations by mixing the wheat lots before milling. The admixing of the wheat lots is achieved by fulfilling the requests of the specialists from the bread factories so that for each range of products to use a certain type of „appropriate” flour. By means of the research work performed were determined the optimum quality indexes of the flour destined for the making of certain types of bakery products from wheat plots of several admixture variants.

Keywords: wheat plot, admixture, rheological characteristics, flour, dough.

1. INTRODUCTION

In order to obtain, by means of milling, finite products of a constant quality for a long period of time it is necessary to form wheat lots with medium quality indexes, close to the quality indexes of the flours destined for the making of certain categories of bakery products. The wheat lots are formed by mixing and homogenizing processes.

By mixing and homogenizing two or more wheat lots with different quality indexes it is obtained a wheat lot with certain quality indexes, called *milling lot*. The major concern of the specialists from Roman mill is to obtain flours of superior quality without necessitating important corrections by adding food additives.

The storage of the wheat in the Roman wheat mill’s silos is achieved in separate cells according to quality indexes such as: glassiness, hectolitic mass, content of gluten and the percentage of imperfect wheat berries.

From a technological point of view, the wheat received at the Roman mill is stored in silos, in ten cells corresponding to three categories, as follows:

1. wheat used to improve some weaker lots and which can be milled without being mixed;
2. wheat that can be milled alone but cannot be mixed with another category in order to improve its quality;
3. wheat that cannot be milled alone due to its poor technological characteristics.

The mixing of the wheat lots it is achieved by taking account especially of the information regarding the rheological characteristics of the dough, both before and after the making of the bakery products, in the test laboratories from the bread and bakery products factories.

* Corresponding author, e-mail: morapanif@yahoo.com

2. ADMIXTURE OF WHEAT PLOTS AND DETERMINATION OF THE MEDIUM QUALITY INDEX

The admixture operation is achieved in the wheat silo, with the help of volume percentage devices, in the ratios established according to calculations.

Based on the weight percentage calculated per each wheat plot the cells' percentage devices, which participate in the formation of milling lots, are simultaneously activated.

The Roman wheat mill is preparing flours destined to be used in the four baking departments specialized in bread making, bakery products, pastries and pretzels. The admixture of the wheat lots is indispensable in a situation in which the quality of wheat decreases every year and baking flours need to be corrected with food additives. The improvement of flours in every situation without a scientific determination of the quality coefficients it increases the price of the finite products in the detriment of quality and has a negative influence on the consumer's health.

For complete edification regarding the quality of the wheat lots that are going to be mixed, the physical and chemical coefficients of the flour are determined by using the baking test.

The medium quality coefficient for the formation of wheat lots was determined as a weighted mean of the quality coefficients of every lot that goes in the admixture.

3. THE TECHNICAL BASE TO PERFORM THE EXPERIMENTAL DETERMINATIONS

In order to perform the wheat admixture was used the wheat storage silo consisting of ten cells, with 200 tons capacity each. To determine the wheat percentage that goes into the mixture was used the method of „reverse ratios”.

The determination of the quality coefficients resulting after the admixture was achieved in the mill's own laboratory by using the following technical basis [1, 2, 4 - 6]:

- Capacitive humidimeter (Granomat) to determine the hectolitr mass, the humidity and temperature;
- Device to determine the wheat glassiness;
- Set of laboratory sieves, to determine the percentage of impurities;
- Falling Number 1300 to determine the falling coefficient;
- Sandkiewicz glutometer to determine the content of gluten;
- Laboratory mill type LM 120.

The analysis of the physical and chemical coefficients of the flour resulting after the milling of every wheat lot and the baking test were performed in the bread factory laboratory. As a technical base was used:

- The extensograph to determine dough resistance;
- Alveograph to determine the effort of dough deformation (W);
- Bradender Farinograph to determine the hydration capacity of flour and the behavior of the obtained dough;
- Glutometer to determine the quantity and the quality of the humid gluten;
- Automatic tunnel line to make bread and bakery products.

4. EXPERIMENTAL RESULTS

The experimental results regarding the physical and chemical characteristics of the wheat lots (G1 ÷ G3) obtained after the mixing operation presented in Table 1.

Table 1. The experimental results regarding the physical and chemical characteristics of the wheat lots (G1 ÷ G3) obtained after the mixing operation.

Analyzed physical and chemical coefficients	Determined value		
	Test G1	Test G2	Test G3
	65% Marsat 35% TCE	30% Marsat 70% Secuieni	25% Secuieni 75% Slobozia
Hectolitic mass kg/hl	74.8	78.5	76.2
Humidity %	12.8	14.2	13.6
Glassiness %	45	49	55
Ash %	1.92	1.78	1.82
Impurities %	3.2	2.4	2.7
Broken berries %	0.3	0.5	0.4
Humid gluten %	25	24.5	24

After performing the physical and chemical analysis for each wheat lot (G1...G3) it can be alleged that the best quality coefficients (hectolitic mass, ash, humid gluten) are those resulting from a mixture in the proportion: 65% Marsat wheat and 35% TCE wheat.

If the tests do not have very differentiated physical and chemical characteristics, the rheological effects are completely different. These data offer complete information regarding the destinations of the flours obtained from the three wheat lots.

The experimental results regarding the physical, chemical and rheological characteristics of the dough obtained of flours derived from mixed wheat lots, as compared to the dough prepared with the flour derived from a single wheat lot, considered control-sample, are presented in Table 2.

Table 2. The experimental results regarding the physical, chemical and rheological characteristics of the dough obtained of flours derived from mixed wheat lots.

Flour and dough quality coefficients	Control flour Type 650 100% TCE	Flour derived from the milling of the wheat lots (G1 ÷ G3)		
		Lot G1	Lot G2	Lot G3
Humid gluten %	28	29	28.5	28.2
Deformation index mm	12	10.5	9.5	8
Pharinogram Hydration cap. %	56.3	60.7	57.6	56.7
Developing min	2' 40"	2' 10"	2' 25"	2' 20"
Stability min	4.5'	5.5'	4.8'	4.7'
Moistening U.F.	150	135	140	143
Extensogram Resistance U.E. (45)	306	253	273	283
Extensibility mm	104	170	165	156
Ratio R/E	0.92	1.05	0.98	0.95
Alveogram Ratio P/L	1.25	1.27	1.26	1.25
Power W 10 ⁻⁴ J	50	96	95	91

From the data presented in Table 2 it can be observed that the quality parameters of the flour obtained from mixed wheat lots are superior as compared to those of the control flour obtained from a single lot. For the research and determination of the technological effect regarding the admixture of wheat plots was used the baking test. The tests were performed for three representative bakery products (traditional product, Neptun loaf, cake). The measured parameter for each of the three tests was the specific volume for 100 g of product [3]. The results of the determinations are presented in Table 3.

Table 3. The measured parameter for each of the three tests was the specific volume for 100 g of product.

Type of flour	Specific volume (cm ³ /100 g of product)		
	Loaf 0,450 kg.	Cake 0,800 kg.	Traditional product 2 kg.
Control flour (single plot)	310	322	315
Flour obtained from lot G1	390	490	460
Flour obtained from lot G2	430	460	435
Flour obtained from lot G3	425	455	467

From the experimental data of the baking tests results that the flour obtained from the wheat lot G1 is recommended for the making of cake, the flour obtained from the lot G2 for the making of the Neptun loaf and the flour obtained from the lot G3 can be used in the making of traditional products.

5. CONCLUSION

After performing the experimental determinations the following conclusions can be asserted:

- There are no variants to mix the wheat lots in order to correct the flours for destinations of use on all the necessary quality indexes;
- The mixing of the wheat lots and of the flour lots contribute to the correction of the flours considered to be weak regarding the baking characteristics;
- Are improved the rheological characteristics of the dough made from the flour derived from mixed wheat by increasing the gas retention capacity and the elasticity;
- Are improved the quality indexes of the bakery products by increasing the specific volume, the porosity and elasticity of the core;
- According to the rheological characteristics of the dough obtained from different types of flour it is chosen the optimum variant of mixing the wheat plots;
- For the flours destined for some products with a long period technology (during which the fermentation times are essential for the quality of the finite products) a simple correction by means of different mixing variants is not sufficient (see case cake);
- The mixture of wheat lots in order to obtain flours for several destinations of use represents a permanent laboratory activity in Roman mill and is applied in the phase of substantiation for the entire production of flour;
- The first step in correcting the grains and the flours is to perform the admixture before adding baking ameliorators or other ingredients;

These conclusions represent the response to the great challenge launched by the bakery industry to obtain in an industrial system high quality products, constant in time, starting from grains and flours of a variable quality.

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