THE CONDITIONING OF WHEAT ON THE FLOUR EXTRACTION RATE AND THE AMOUNT OF WET GLUTEN

Roxana Margarit
Valahia University of Targoviste, street Aleea Sinaia, no.13, Targoviste, Romania
E-mail: roxanamargarit25@yahoo.com

Abstract
The milling industry, one of the important branches of the food industry, deals with the transformation of cereals into flours, used in the manufacture of bread, biscuits, pasta, cereal flakes, etc.
Conditioning consists of treating wheat grains with water. Flour obtained from conditioned wheat has a lighter color, less polluted with bran particles. By conditioning the wheat, its humidity reaches an optimal value that allows the best possible separation between the coating and the endosperm. Energy consumption is reduced by 5-15% depending on the type of conditioning, in the case of grinding conditioned grains compared to unconditioned.
The wheat for analysis was moistened at different humidity (15%; 15,5%; 16%; 16,5%; 17%), and kept at rest for 6, 8, 10, 12 hours.

Key words: wheat, conditioning, yield, flour.

Received: 05.10.2020 Reviewed: 30.10.2020 Accepted: 16.11.2020

1. INTRODUCTION

Wheat conditioning is the operation that has an influence on the whole grain of wheat because it determines to the greatest extent the technological properties of wheat, the technological process of grinding, the degree of extraction and mineral content of flour, the separation of germs and baking properties of flour.
The role of wheat conditioning is to modify the mechanical-structural properties related to the composition of the grains and their physico-chemical properties, in order to facilitate the separation of less shredded shells and at the same time to accelerate the process of transforming the endosperm into flour. On the other hand, the aim is to produce biochemical transformations in grains (the complex of protein substances, especially gluten, the complex of carbohydrates, the activity of enzymes etc.) that influence the baking qualities.
Conditioning is based on different moisture diffusionwithin the grain, for its predominance within the coating, where it must reach up to 60-80% compared to the endosperm. This difference is achieved by overseeing the rest period of the wheat after moisturizing, which must be established so that the largest amount of water remains in the coating.
The optimum moisture of the grains differs depending on the variety, placed between 15-16%. When conditioning, it is taken into account that the moisture migrates slower inside the endosperm than in the coating, being necessary a rest period for uniformity. This lasts between 6 to 12 hours and is influenced by the variety, the amount of water administered, the temperature and other factors.

2. MATERIALS AND METHODS

2.1 Materials

The wheat used in the experiment was ground using an industrial mill with three rollers for grinding, three grinding rollers, two bran cutters and a vibrating sieve.
The experiment was performed for grinding process optimization in order to increase the flour yield and monitor the amount of wet gluten depending on the degree of extraction. Type 650 flour was obtained from this type of wheat, which is used for bread making.

2.2 Methods

2.2.1 Determination of wheat moisture

Humidity represents the amount of water contained in the mass of wheat grains, expressed as percentage, compared to the maximum possible humidity of 100%.

The principle of the conductometric method: consists in modifying the conductivity of the device (humidimeter) by introducing the sample, since the electrical resistance of solid materials is inversely proportional to their humidity.

2.2.2 Determination of vitreosity

Vitreosity indicates the degree of compaction of the endosperm in wheat grains. At a cross section through the wheat grain, vitreous (transparent) and floury (matte) areas can be observed. In the vitreous areas, the structure appears compacted, whereas in the floury areas, the structure appears less dense.

The principle of the method consists in examining the sectioned (or whole) wheat grains and determining the glassiness.

Theseed cutter(farinotom) consists of three superimposed discs, extended with handles, joined together in the middle by a screw, around which they can pivot. The third disc is provided with 50 alveoli over which the holes of the first disc overlap, and the second disc is a knife that passes between the upper perforated disc, and the one with alveoli.

After sectioning, the grains can also be counted:

- 1/4 vitreous, 1/3 vitreous, 1/2 vitreous and 1/1 vitreous.

Calculation formula.

Glassiness is expressed as percentage and is calculated by the formula:

$$\text{Vitreosity} = \left(A + \frac{B}{2}\right) \times \frac{100}{50} \quad [\,\%\,]$$

where:

A = the number of completely vitreous grains;

B = the number of partially vitreousgrains;

50 = the number of grains in the sample taken for determination.

For bakery wheat, the minimum required vitreosity is 30% as per STAS.

2.2.3 The classic method of determining the amount of wet gluten:

Form a 50% hydrated ground wheat doughwith 2% salt solution, the formed dough is washed with 2% salt solution until total removal of starch.

Calculation method:

Wet gluten is calculated as percentage of the formula:

$$\textbf{Wet gluten} = \frac{m1}{m} * 100 \quad (\%)$$, where:

m_1 = the amount of gluten after washing and rinsing, (g);

m = the amount of ground wheat analyzed, (g).

Determination of the hectolitre mass of wheat

The principle of the methodisweighing the wheat quanityfilling a cylindricalvessel, with a volume of 1 liter.

3. RESULTS AND DISCUSSIONS

Wheat used in research had the following properties:

Table.1 Properties of wheat utilized in experiments

Wheat	M.U.	Value
U	(%)	14
H.M.	(Kg/hl)	75
Vitreosity	(%)	80
Wet gluten	(%)	28

Table.2 Centralization of results

Wheat with 80% vitreosity	Rest time, h	Mill yield, (%)	Wet gluten, (%)
Humidity after conditioning 15 %	6	68	26
	8	79	27
	10	71	28
	12	72	28
Humidity after conditioning 15,5 %	6	69,5	27
	8	71	27
	10	71,8	28
	12	72,5	28
Humidity after conditioning 16 %	6	73	28
	8	72,5	28
	10	74	29
	12	76	30
Humidity after conditioning 16,5 %	6	73	29
	8	75	30
	10	76	30
	12	78	31
Humidity after conditioning 17 %	6	70	29
	8	73	29
	10	75	30
	12	76	30

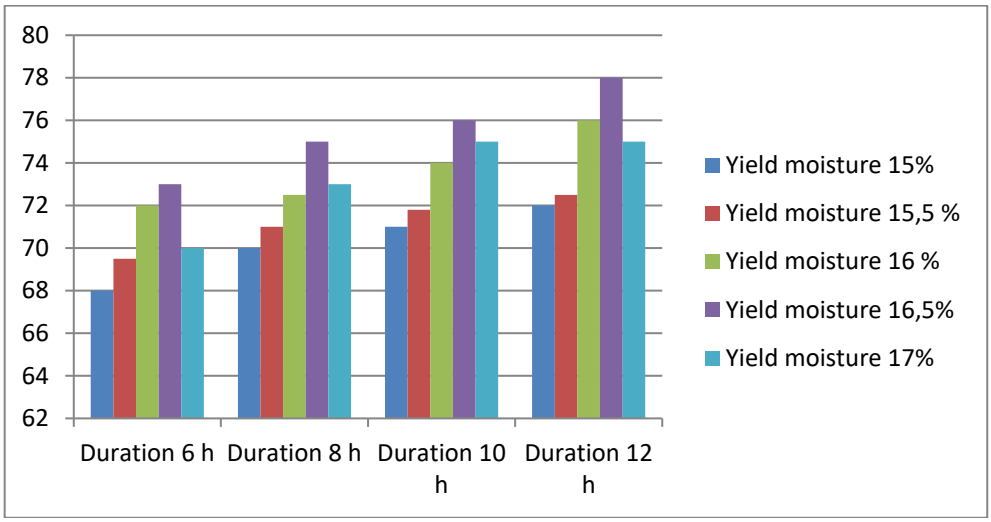

Figure 1. Flour yield depending on wheat moisture and rest period

The wheat sample with 15% moisture registered a maximum yield of 72% aftera rest period of 12
hours.
The wheat sample subjected to the conditioning operation with 15.5% moisture registered a maximum yield (72.5%) aftera rest period of 12 hours.

The sample with 16% moisture registered a maximum yield (76%) aftera rest period of 12 hours following its moistening.
The sample with 16.5%moisture recorded the highest yield (78%) aftera rest period of 12 hours.
The sample with17% moisture recorded a maximum yield of 75% aftera rest period of 12 hours.

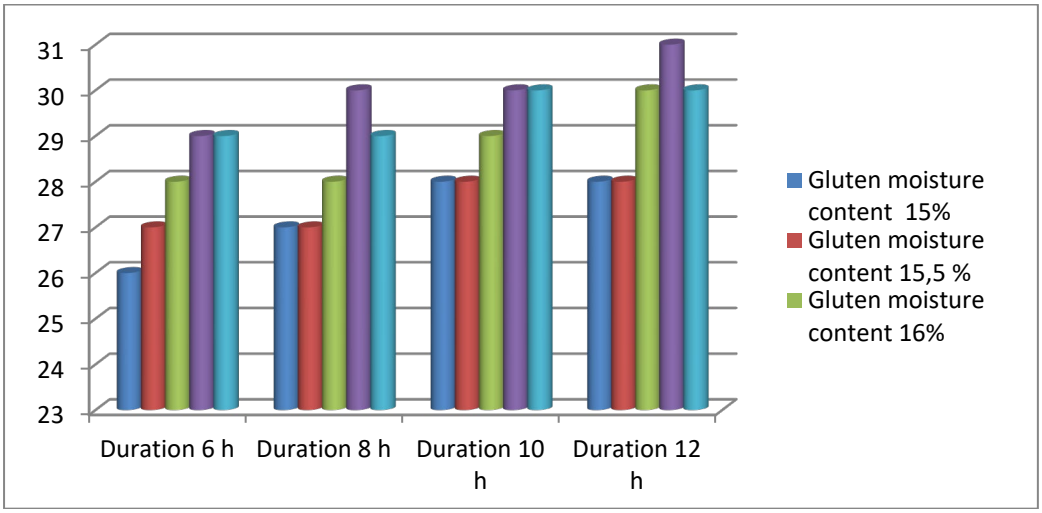

Figure 2. The amount of wet gluten depending on the moisture and duration of wheat conditioning

After six-hour wheat rest period of the wheat, the highest amount of wet gluten was recorded at 16.5% (29% wet gluten) and 17% moisture (29% wet gluten).
Aftereight-hour rest period of the wheat, the highest amount of gluten was obtained at 16.5% moisture (wet gluten 30%).
Afterten-hour rest period of the wheat, the highest amount of gluten was recorded at 16.5% moisture (30%).
Aftertwelve-hour of rest periodof the wheat, the highest value of gluten was recorded 16.5% moisture (31%).

4. CONCLUSIONS

Upon research, the following were concluded:
- The optimal moisture for conditioning the 80% vitreous wheat sample is 16.5%;
- The highest flour yield for this type of mill was displayedat 16.5% moisture;
- The amount of gluten increased with rest period duration and at 16.5% moisture.

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