RESEARCH ON THE MODIFICATION OF THE BAKING PROPERTIES DURING THE FLOUR MATURATION TIME

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Abstract

Wheat is one of the most important food plants grown in over 45 countries, feeding 35-40% of the world's population. The main utility is manufacturing bread and various products made from flour. Bread is the basic food for the majority of the world's population. No other food satisfies the needs of the human body as completely and economically as wheat bread. The most complete and perfect food is bread, which is obtained from flour of wheat.

Through this study, it was followed how the different properties of bakery of white flour type 650 alter during the maturation period for 30 days. The analysed properties were studied on 3 batches of type 650 flour obtained in February 2022. Type 650 white flour was studied because it is the most used flour in the bakery industry and the consumption of white bread is approximately 65% compared to the others bread assortments.

On the flour samples obtained by grinding, the following parameters were monitored at intervals of 10, 20 and 30 days: moisture content, wet gluten content, hydration capacity, dough development time, dough stability.

For all three flour samples taken in the study, it is observed that the capacity of flour hydration increases during storage by 1.4 units in batch 3, by 1.8 units in batch 2 and by 2 units to batch 3, the development time of the flour, determined for the three batches of type 650 flour, registers a decrease, which varies between 0.4 in lot 2 and 3, and 0.9 in lot 1; and as for the stability of the dough, there is an increase that signifies the time the dough maintains its maximum consistency, which indicates the dough's tolerance for kneading. The gluten content and the moisture content during the storage period decrease in all 3 flour samples.

Key words**: **wheat, flour, baking properties.

INTRODUCTION

Wheat is an important component of human consumption, being an important source of carbohydrates, proteins, vitamins, dietary fiber and other bioactive compounds (Paunescu et al., 2016).

Newly harvested wheat which is processed almost immediately after harvest presents a series of problems to the millers and bakers. Newly harvested wheat generally has poor milling and baking quality. After wheat is aged, the bran is easier to separate from the endosperm, flour extraction increases, and ash content drops. These improvements have been related to postharvest maturation and physical changes in the wheat kernel (Wang &Flores, 1999). After milling the flour, a series of processes related to the maturation of the flour takes place on the following days, which influences the quality of the obtained flour, being closely related to the storage conditions. Hrušková and Machová, 2002, reported that flour is a very hygroscopic material and its moisture changes with the changes in temperature and humidity of the store environments. According to Zhang et al., 2021, post-

harvest maturation resulted in an increase in glutenin content and a decline in the gliadin and gliadin/glutenin ratio in middle- and strong-gluten wheat as well as a decreased glutenin content in weak-gluten wheat.

It is well known that wheat quality can not be determined only from gluten content and its deformation index, requiring a more thorough qualitative assessment designed to provide information about the flour quality obtained by grinding (Dodocioiu et al., 2015). Following the percentage distribution of flour quality, it is estimated that 75% is attributed to wheat quality parameters and 25% to milling process (Vizitiu, 2012).

The quality of the bread is given by the type of flour and yeast as the main raw material and water, salt and other elements as secondary raw materials (Capruciu et al., 2018).

MATERIALS AND METHODS

Through this study, it was followed the way in which the different baking properties of white flour type 650 change during the 30 days maturation period. The monitored properties were studied on 3 batches of flour type 650 obtained in February 2022. White flour type 650 was studied because it is the most used flour in the bakery industry and the consumption of white bread is approximately 65% compared to the other types of bread. The flour samples were obtained by grinding common wheat (*Tritticum vulgare*) obtained from the 2021 harvest from farmers in Dolj county. The flour samples were packed in 25 kg raffia bags and kept in storage at temperatures of 25°C and relative air humidity of 75%. On the flour samples obtained by milling, the following parameters were monitored at intervals of 10, 20 and 30 days:

-moisture content
-wet gluten content
- hydration capacity
- dough development time
-dough stability.

RESULTS AND DISCUSSIONS

During 30 days, the effect of flour maturation on the quality indices of type 650 white flour was studied on 3 batches. Flour packed in 25 kg raffia bags was kept in storage on wooden racks.

The results regarding the determination of moisture content of the 3 batches of flour taken in the study and kept in storage at a temperature of 25°C and a humidity of 75%, for 30 days, during which an attempt was made to keep the mentioned parameters constant, are listed in figure 1.

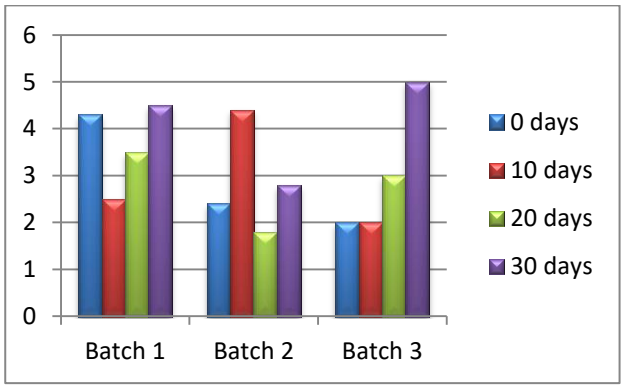

Figure 1. Variation of moisture content during the storage period

From the data presented in figure 1 it can be observed that during the flour maturation process, moisture content decreases from 13.7% in the flour batch 1, value which it had before storage, to 13.1%, i.e. by 0.6% after 10 days of storage, after 20 days of storage it reaches 12.8%, and after 30 days storage the moisture content of the flour registers a slight increase reaching 12.9%.

For flour type 650 from batch 2, as for flour from batch 1, a drop in moisture value is recorded from 13.5% before storage, to 12.9% after 10 days storage, to 12% after

20 days storage and after 30 days storage it registers a slight increase of 0.35 reaching 12.3%.

For type 650 flour from batch 3, the moisture value before storage was 14.3%, and 10 days after storage, the moisture decreased to 13.6, 20 and 30 days after storage, it continued to decrease, reaching 13.2%, respectively 13%. In conclusion, it can be observed that for all 3 samples of white flour type 650, the moisture content decreases during storage, the largest decrease being recorded in the flour from batch 3 which registers a decrease in moisture of 1.3%, this batch also having the highest moisture before storage, namely 14.3%.

Among the nitrogenous substances that make up the wheat grain, gliadin and glutenin occupy the first place by the proportion in which they are found. These amino acids form in the presence of water, an elastic mass called gluten, which actually forms the material that gives the dough special properties of elasticity, plasticity, hydration capacity. These properties depend on the amount of gluten that flour can form, then on the qualitative ratio between gliadin and gluten, as well as other factors. In general, high gluten content is an indication that the respective flour has good baking properties.

A flour is considered to have very good quality at a wet gluten content above 26%, good quality 24-26% wet gluten, satisfactory quality 22-24% wet gluten and unsatisfactory quality at values of wet gluten content below 22%.

Analysing from this point of view the quality of flour resulting from wheat grains subjected to maturation for 30 days, the data from figure 2 results.

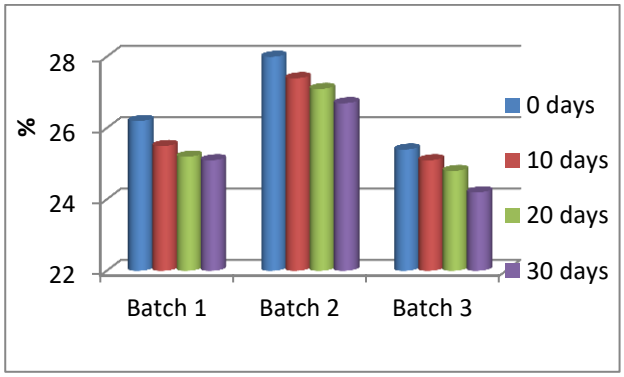

Figure 2. Variation of gluten content during the storage period

From figure 2 it can be seen that regarding the gluten content from batches 1-3, the flours are good quality. The gluten content during the storage period for 30 days decreases in all three samples: in the sample from batch 1 the content of gluten decreases from the value of 26.2%, value recorded before storage, and 10 days after storage the value of wet gluten reaches 25.5%, so it registers a decrease of 0.7%, and 20 days after storage, the wet gluten content reaches the value of 25.2%, the decrease being only 0.3%, and after 30 days the decrease is 0.1%, the value of the wet gluten content reaching 25.1%. It can be seen that in batch 1 the decrease during the 30 days of flour maturation is 1.1% wet gluten.

In flour batch 2, where the wet gluten content registers the highest value, namely 28%, the decrease is greater, reaching 27.4% after 10 days of storage, 27.1% after 20 days of storage, and 30 days after storage to 26.7%. In this case the decrease recorded is 1.9.

The flour from batch 3, where the gluten content before storage is 25.4%, shows the same decrease as flour from batch 1, i.e. after 10 days of storage it reaches a wet gluten content of 25.1%, 20 days after storage at a content of 24.8, and 30 days after storage at a content of 24.2%. The decrease in this case is 1.1.

In conclusion, in all 3 batches of flour studied, a decrease in wet gluten content is observed during the 30-day maturation period, a decrease of 1.1-1.9. However, during this period it is known that the properties of gluten (elasto-viscous) improve.

The farinographic method uses the farinograph invented by the Hungarian researchers Jenä von Hankozy and C.W. Brabender, to measure some parameters when kneading the dough, to evaluate the quality of the flour.

It allows the study of the evolution of the dough under specific kneading conditions after it has been brought to the standard consistency of 500 U.B. (Grayg and Caldwel 1958) and allows the determination of:

- the hydration capacity of the flour, considered to be the amount of water it needs to form a dough of standard consistency (500 U.B.)
- development time – the time interval required for the dough to reach the standard consistency and shows how quickly the dough or the gluten network is formed
-stability- expresses the time the dough maintains its maximum consistency, showing the dough's tolerance to kneading.

Depending on these indicators, the quality of the flour is presented in the table 1

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Table 1. Quality of the flour

	Weak	Medium	Strong
Development time (min.)	1--2	3-8	8-15
Stability (min)	0-1	4-5	10-15

Analysing the flours from the experimental variants, were obtained the results presented in figures 3, 4 and 5.

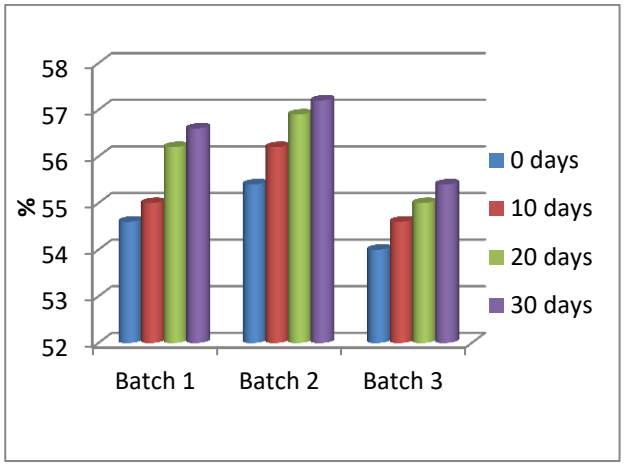

Figure 3. Variation of the hydration capacity during the storage period

For all three flour samples taken in the study, it is observed that hydration capacity of the flour increases during storage by 1.4 units in batch 3, by 1.8 units in batch 2 and by 2 units in batch 3. In terms of capacity value of hydration for the 3 analysed samples, flour falls into the satisfactory to good category.

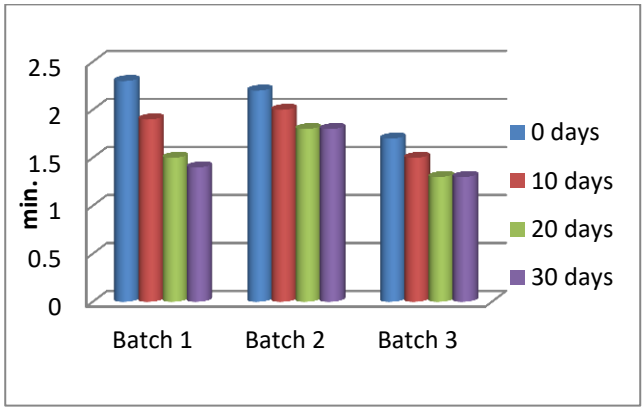

Figure 4.Variation of dough development time

Analysing the data in figure 5, it is observed that the stability of the flour dough from batch 1 recorded the value of 3.2 min. before storage, 10 days after storage the determined value was 3.6 min., 20 days after storage the dough stability value was 4.1, and 30 days after storage it was 4 ,3 min.

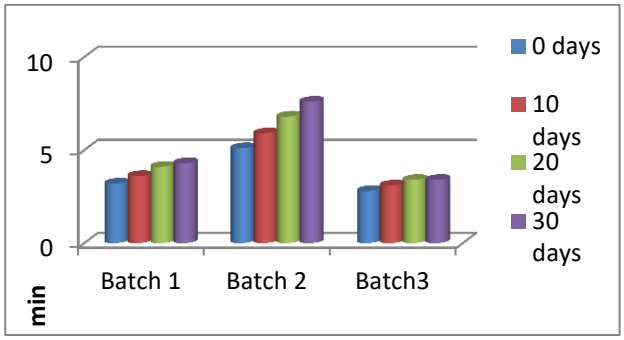

Figure 5. Variation of dough stability

For the flour sample from batch 2, as in the case of the flour from batch 1, an increase in dough stability is recorded, an increase that is directly proportional to the increase in storage time. The value recorded for the stability of the flour at this time before storage is 5.1 min. and reaches the end of the storage period at the value of 7.6 min.

An increase in dough stability during the 30-day flour maturation is recorded for flour from batch 3, but the increase recorded is much smaller than in the case of flour batches 1 and 2, i.e. it increases from the value of 2.8 min. before storage at the value of 3.4 min. at 30 days.

In conclusion, for all 3 flour samples subjected to maturation over a period of 30 days, an increase in dough stability is recorded, increase that signifies the time the dough retains its maximum consistency, which indicates the dough's tolerance for kneading.

CONCLUSIONS

In conclusion, it can be observed that for all 3 samples of white flour type 650:

- the moisture content decreases during storage, the largest decrease being recorded in the flour from batch 3 which registers a decrease in moisture of 1.3%, this batch also having the highest moisture before storage, namely 14.3%.

-a decrease in wet gluten content during the 30-day maturation period, a decrease of 1.1-1.9. However, during this period it is known that the properties of gluten (elasto-viscous) improve.

-that hydration capacity of the flour increases during storage by 1.4 units in batch 3, by 1.8 units in batch 2 and by 2 units in batch 3. In terms of capacity value of hydration for the 3 analyzed samples, flour falls into the satisfactory to good category.

-the development time of the flour registers a decrease, which varies between 0.4 in lot 2 and 3, and 0.9 in lot 1;

-for all 3 flour samples subjected to maturation over a period of 30 days, an increase in dough stability is recorded, increase that signifies the time the dough retains its maximum consistency, which indicates the dough's tolerance for kneading.

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