

THE INFLUENCE OF THE STORAGE SYSTEM AND OF THE PRESERVATION PERIOD UPON THE PHYSICAL-CHEMICAL INDEXES AT THE WINTER WHEAT

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Abstract

The study related to the influence of the storage system and of the preservation period upon the physical-chemical parameters has been realized at a granary from Bihor county, over the period July 2013 – June 2014.

In order to analyze the quality of the stored wheat, the following quality indexes have been taken into consideration: purity, the mass of a 1000 wheat grains, the hectoliter mass and the content of humid gluten.

The analysis of the autumn type of wheat's quality indexes has been realized for three systems of storage: storehouse, cellular metallic granary and concrete granary; and in what the preservation period is concerned there have also been three periods analyzed: at the moment the wheat started to be stored, after 6 months of storage and after 12 months of storage.

The quality of the analyzed wheat presents significant variations according to the storage system, it presents a decrease according to the period of time that it can maintain its purity, its mass of 1000 grains and its hectoliter mass and it presents an increase in the gluten content after 12 months of storage.

Key words: wheat, storage system, granary, physical-chemical indexes.

INTRODUCTION

Starting with the development of the agricultural production, and especially with the wheat production, there appeared the need to store huge quantities of products in order to ensure a daily consumption or in order to ensure consumption for longer periods of time.

Keeping the physical-chemical indexes at corresponding values during the storage period represents an essential request of the wheat that is going to be used in the bakery industry.

After being harvested, the wheat grains present themselves as a non homogenous mass, in which other components appear: impurities, insects and mites, micro organisms, which can affect the quality of the wheat while it is being stored.

The decrease of the stored cereals' quality is an irreversible process, so the prevention of quality losses must be a priority for any authority or for any manager implied in cereal industry or business. (Gh.V Roman and co., 2012).

The main aim of the act of storing agricultural products is to prevent the quality decrease of the grains and to maintain untainted the complex qualitative features of the grains. (Salontai Al. and co., 1988).

In order to store and value the autumn wheat at corresponding indexes for baking purposes, a conditioning is a must when entering a storage space and another must is to ensure the temperature and humidity conditions over the whole storage period.

The grains that have a humidity between 15 and 15,5% preserve themselves very well at a temperature under 15°C; cooling the grains is a method to avoid the development of insects, as under 15°C the insects can not multiply themselves. (Gh.V Roman and co., 2012).

The main physical-chemical indexes which influence the quality of the wheat while the latter is being stored and preserved are; the purity, the mass of 1000 wheat grains, the hectoliter mass, and the content of humid gluten.

The physical purity represents the percentage content of pure seed from the analyzed species in comparison with the total mass of the analyzed sample, and, by expansion, of the lot that it represents.

The mass of 1000 grains represents the mass of 1000 grains expressed in grams, at the humidity existent in the moment of determination.

The hectoliter mass represents the mass (weight), expressed in kilograms, of a volume of grains of 0,1m³(equivalent with the capacity of 100 liters). (Hodişan N., A. Timar, 2010).

MATERIAL AND METHOD

The study related to the influence of the storage system and of the preservation period upon the physical-chemical indexes, for the autumn wheat, has been realized in a cereal storehouse within a wheat storehouse from Bihor county, during the period July 2013 – June 2014.

2 factors have been analysed for the research:

- Factor A- the storage system:
 - a₁-100 ton storehouse;
 - a₂- cellular metallic granary;
 - a₃- concrete granary.
- Factor B- storage period:
 - b₁ – physical-chemical indexes at the moment of storage;
 - b₂ – physical-chemical indexes after 6 months of storage;
 - b₃ – physical-chemical indexes after 1 year of storage;

As a witness variant the a₁b₁ variant was taken - storehouse at storage.

For the wheat grain mass the following main physical and chemical indexes have been determined: purity, mass of 1000 grains, hectoliter mass and content of humid gluten.

The grain samples have been prelevated with the cylinder probe.

RESULTS AND DISCUSSIONS

The quality of the wheat used in the bakery industry is influenced by the purity of the seeds' mass, as the impurities present in the seeds negatively influence the quality of the flour, reason for which, before being stored, the wheat undergoes the operation of conditioning. While they are being stored, their purity presents certain variations, and the results obtained are presented in table 1.

Table 1

The influence of the storage system and of the preservation period upon the purity of the wheat grains

The storage variant	Purity %	Relative values	Differences	Significance
Storehouse at storage, Witness	84.50	100.00	0.00	-
Storehouse after 6 months	84.20	99.60	-0.30	000
Storehouse after 12 months	83.40	98.70	-1.10	000
Cellular metallic granary at storage	84.50	100.00	0.00	-
Metallic granary after 6 months	84.30	99.76	-0.20	000
Metallic granary after 12 months	83.80	99.17	-0.70	000
Concrete granary at storage	84.50	100.00	0.00	-
Concrete granary after 6 months	84.25	99.70	-0.25	000
Concrete granary after 12 months	83.60	98.93	-0.90	000

LSD 5%=0.06 LSD 1%=0.09 LSD 0,1%=0.15

While the wheat is stored and deposited the purity of the wheat grains decreases, according to the storage system as well as to the time period the storage lasts, in comparison to the witness wheat – storehouse at storage.

The lowest purity, of 98.70% is registered at the wheat stored for 12 months and the highest purity, of 99.76 % is registered at the wheat stored in a metallic granary for 6 months.

The lowest purity registered for the wheat kept in the storehouse for 12 months is due to the handling operations (moving the wheat from one

place to another in open space), due to the possible mixture with different species seeds, mixture that takes place in the storehouse.

The results obtained according to the storage system and to the preservation period, for the mass of 1000 grains, are presented in table 2.

Table 2

The influence of the storage system and of the preservation period upon the mass of 1000 autumn wheat grains

The storage variant	Mass of 1000 grains - g	Relative values	Differences	Significance
Storehouse at storage, Witness	47.50	100	0.00	-
Storehouse after 6 months	47.15	99.26	-0.35	000
Storehouse after 12 months	46.30	97.47	-1.20	000
Cellular metallic granary at storage	47.50	100	0.00	-
Metallic granary after 6 months	47.30	99.57	-0.20	000
Metallic granary after 12 months	47.10	99.15	-0.40	000
Concrete granary at storage	47.50	100.00	0.00	-
Concrete granary after 6 months	47.25	99.47	-0.25	000
Concrete granary after 12 months	47.15	99.26	-0.35	000

LSD 5%=0,85 LSD 1%=0.1.30 LSD 0,1%=2.09

The mass of 1000 grains presents higher decreases while it is kept and deposited at the storehouse storage variant, after a storage period of over 12 months it reaches -1.20 g, and the variant with the lowest decrease after 12 months is represented by the concrete granary storage, it being of -0,35 g.

After 6 months of storage, the mass of 1000 grains is lower at the metallic granary storage, of -0.20 g, followed by the concrete granary, - 0.25 g and by the storehouse with -1.20 g.

The losses related to the mass of 1000 grains registered during the storage period are due to the physiological processes that take place in the grain mass during their preservation and storage.

The hectoliter mass represents an important indicator related to the quality of the wheat for bakery, and the results obtained after 6 and after 12 months of storage respectively, according to the storage systems, are presented in table 3.

The lowest losses of the hectoliter's weight are registered at the wheat stored in metallic granary, of 0,20 kg/hl, after 6 months of storage and of 0,70 kg/hl after 12 months of storage, and the higher losses take place when

the wheat is kept in the warehouse after 6 months of storage, being of 0.30 kg/hl, and of 1.1 kg/hl after 12 months of storage.

From the data analyzed it comes out that during the storage and the preservation of the wheat significant losses of the hectoliter mass take place, losses which depend upon the storage system as well as on the biological processes which take place in the grain mass.

Table 3

The influence of the storage system and of the preservation period upon the hectoliter mass of the wheat grain.

Storage variant	Hectoliter mass kg/hl	Relative values	Differences	Significance
Storehouse at storage, Witness	77.50	100.00	0.00	-
Storehouse after 6 months	77.20	99.61	-0.30	000
Storehouse after 12 months	76.40	98.58	-1.10	000
Cellular metallic granary at storage	77.50	100.00	0.00	-
Metallic granary after 6 months	77.30	99.74	-0.20	000
Metallic granary after 12 months	76.80	99.09	-0.70	000
Concrete granary at storage	77.50	100.00	0.00	-
Concrete granary after 6 months	77.25	99.67	-0,25	000
Concrete granary after 12 months	76.60	98.83	-0.90	000

LSD 5%=0,45 LSD 1%=1.45 LSD 0,1%=2.33

The content of humid gluten is a basic indicator of the quality of the wheat used for bakery, which presents significant variations while it is being kept and stored. The results obtained are presented in table 4.

Humid gluten presents significant decreasing variations according to the storage system, and increasing variations according to the storage period.

The lowest values of the humid gluten during the storage are registered after the wheat has been kept in the storehouse for 6 months, being of 27.80%, and of 27.90% after 12 months of storage. The highest values of the humid gluten during the storage have been registered when the wheat was kept in a metallic granary, being of 28.35%, after 12 months of storage and of 28.25% after 6 months of storage.

From the data presented one can notice that the wheat has got relatively higher values of the humid gluten when it is kept in metallic and concrete granaries in comparison with the values registered when the wheat

is kept in the storehouse. The content of gluten decreases after 6 months of storage, no matter in what kind of a storage system the wheat is kept in, but increases after 12 months of storage.

Table 4

The influence of the storage system and of the preservation period upon the quantity of humid gluten at the autumn wheat

Storage variant	Gluten content %	Relative values	Differences	Significance
Storehouse at storage, Witness	28.50	100.00	0.00	-
Storehouse after 6 months	27.80	97.54	-0.70	000
Storehouse after 12 months	27.90	97.89	-0.60	000
Cellular metallic granary at storage	28.50	100.00	0.00	-
Metallic granary after 6 months	28.25	99.12	-0.25	00
Metallic granary after 12 months	28.35	99.47	-0.15	00
Concrete granary at storage	28.50	100.00	0.00	-
Concrete granary after 6 months	28.15	98.77	-0.35	00
Concrete granary after 12 months	28.20	98.94	-0.30	00

LSD 5%=0,59 LSD 1%=0.90 LSD 0,1%=1.45

The increase of the gluten content after 12 months of storage is due to the decrease of the wheat grains' humidity content and to their maturation.

The content of humid gluten and all the bakery features have been better at the wheat kept in the cellular metallic granary, fit with active aeration devices.

CONCLUSIONS

The study regarding the evolution of the bakery wheat quality indexes, wheat stored and kept in a cereal storehouse, comprises three storage systems: storehouse, cellular metallic granary and concrete granary, in three different periods: at storage, after 6 months of storage and after 12 months of storage and it presented decreasing variations of the analyzed indexes.

The lowest purity, of 98.70% was registered at the wheat stored in a storehouse after 12 months of storage, and the highest, of 99.76% was registered at the wheat stored in the cellular metallic granary after a period of 6 months.

The mass of 1000 grains represents the highest losses during the storage in the storehouse, after a storage period of 12 months reaching - 2.53

g, and the lowest decrease is registered after 12 months, at a storage in a concrete granary, a decrease of -0,35 g.

The hectoliter weight registers the lowest losses at the wheat kept in a metallic granary, of 0,20 kg/hl, after 6 months of storage and of 0,70 kg/hl after 12 months of storage and the highest losses take place when the wheat is kept in a storehouse, after 6 months from the storage, being of 0.30 kg/hl, and after 12 months of storage reaching 1,1 kg/hl.

The content of humid gluten has got the highest values when the wheat is kept in a cellular metallic granary, of 28.35% after 12 months of storage and the lowest values, of 27.80% when it was kept in a storehouse, after 6 months since the storage. It can be then noticed that, the content of gluten decreases after 6 months of storage in all the systems of storage but it increases after 12 months of storage, this increase being due to the decrease of the humidity content and to the maturation of the grain mass.

According to the storage system, the best indicators have been registered at the cellular metallic storehouse which had an active aeration system, after which it progressively decreases at the concrete granary storage, followed by the storehouse storage.

According to the storage period, it can be noticed that the physical indexes: purity, mass of 1000 grains and the hectoliter weight decrease progressively after 6 and after 12 months of storage respectively and the content of gluten decreases after 6 months of storage and increases after 12 months of storage.

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