WHEAT GRAINS LONG THERM STORAGE INFLUENCE REGARDING CHEMICAL PARAMETERS

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Abstract

This study try to find how storage modify the chemical properies of the wheat grains. Althrough we try to find how chemical parameters of wheat grains are changed during storage and if those parameters are significant improuved. Paper is a part of my Phd. Thesis and will be coroborate withchemical parameters evolutions during processing.

Key words : wheat, grains, chemical parameters, grains storage.

Introduction

For evaluation the importance of storage we use data imputs for following parameters : Chemical analysis (Protein content, Starch content, Wet gluten content, Ash contetnt and Acidity).

MATERIALS AND METHODS

Taking samples : We use to take samples cilindrical probes. From surface and upper layers samples was taken with cilindrical probes. Procedure was according to Thierer L.V. 1976 and Duda M. 2003.

Obteining working samples : We form successively elementar, brutto, homogenized, laboratory and work samples according with Mureşan T., Pană N.P., Cseresnyes Z, 1986.

1.Organoleptical analysis : Was study colour, aspect, smell and tste of grains according Thierer L.V. 1966. If this parameters was out of normal range grains was considered out of standards and study of those samples was ended.

2. Chemical analysis : We study following parameters : Protein content SR ISO 9153/98, Starch content SR EN ISO 10520/2002, Wet gluten content SR EN ISO 21415-2/2008, Ash contetnt STAS 90/1988 and Acidity STAS 6283/4-84.

3. Experimental Methodic

We conduct research regarding the influence of the storage system and the period of storage over the physical properties of the wheat grains.

For research was taken into study two factors :

Factor A, storage system, with variants: a1 - 1000 tone warehouse; a2 - 70 tone metallic silo; a3 - 15000 tone reinforced concrete silo.

Factor B, storage period, with variants: b1 - at the beginning of storage; b2 - after 6 months of storage; b3 - after 12 months of storage; b4 - after 18 months of storage.

From factors combination and variants result an experience type 3x4=12 variants for each studied genotype according with. The control was for each genotype the warehouse at the begining of storage.

Experimental methodology follow pattern - The Variant = Combinație Factor A x Factor B; V1 = a1b1, V2 = a1b2, V3 = a1b3, V4 = a1b4, V5 = a2b1, V6 = a2b2, V7 = a2b3, V8 = a2b4, V9 = a3b1, V10 = a3b2, V11 = a3b3, V12 = a3b4

We use Polifact statistic processing software according with Ardelean M..

4. Biological material

We study wheat, Triticum aestivum L. ssp. vulgare Host McKey, „Dropia" cultivar, created at I.C.C.P.T. Fundulea in 1992 and registered in 1993.

RESULTS AND DISCUSSION

Research results regarding the influence of the storage system over the chemical properties of wheat grains

Table 1.

Research results regarding the influence of storage system over the Protein content of the wheat grains during storage

The Variant	Storage variant	The protein content, %	Relative Values	Difference	Significance	Classification test Duncan
1	Warehouse to the beginning of storage, (control)	13.21	100.0	0.00	Mt.	G
2	Warehouse after 6 months	13.05	98.8	-0.16	000	C
3	Warehouse after 12 months	13.05	98.8	-0.16	000	C
4	Warehouse after 18 months	12.35	93.5	-0.86	000	A
5	Metallic silo to the beginning of storage	13.21	100.0	0.00	Mt.	G
6	Metalic silo after 6 months	13.15	99.5	-0.06	000	F
7	Metalic silo after 12 months	13.15	99.5	-0.06	000	F
8	Metalic silo after 18 months	13.00	98.4	-0.21	000	B
9	Concrete silo to the beginning of storage	13.21	100.0	0.00	Mt.	G
10	Concrete silo after 6 months	13.13	99.4	-0.08	000	DE
11	Concrete silo after 12 months	13.14	99.4	-0.07	000	E
12	Concrete silo after 18 months	13.12	99.3	-0.09	000	D

DLS (p 5%) 0.01; DLS (p 1%) 0.02; DLS (p 0.1%) 0.03

Reduction of the protein content is very significant, the lower value after 6. 12 and 18 months is founded at the seeds stored in warehouse, 13,05%, 13,05% and 12,35%. The higher value is recorded after 6 and 12 months in metallic silo 13,15% and after 18 months in concrete silo. The protein content decreases are caused mainly because of the metabolically processes. This has been shown by the correlation between outdoor temperature - the seeds temperature - and the reduction of the protein percentage. Also the much higher relative air humidity from the warehouse change the percentage of the proteins regarding total weight of seeds.

Table 2.

Research results regarding the influence of storage system over the Starch content of the wheat grains during storage

The Variant	Storage variant	The starch content, %	Relative Values	Difference	Significance	Classification test Duncan
1	Warehouse to the beginning of storage, (control)	60.70	100.0	0.00	-	H
2	Warehouse after 6 months	60.37	99.5	-0.33	000	D
3	Warehouse after 12 months	60.40	99.5	-0.30	000	E
4	Warehouse after 18 months	56.32	92.8	-4.38	000	A
5	Metallic silo to the beginning of storage	60.70	100.0	0.00	-	H
6	Metalic silo after 6 months	60.65	99.9	-0.05	00	G
7	Metalic silo after 12 months	60.65	99.9	-0.05	00	G
8	Metalic silo after 18 months	59.64	98.3	-1.06	000	C
9	Concrete silo to the beginning of storage	60.70	100.0	0.00	-	H
10	Concrete silo after 6 months	60.60	99.8	-0.10	000	F
11	Concrete silo after 12 months	60.60	99.8	-0.10	000	F
12	Concrete silo after 18 months	58.60	96.5	-2.10	000	B

DLS (p 5%) 0.03; DLS (p 1%) 0.04 ; DLS (p 0.1%) 0.05

Toward the control the starch content decrease very significant. The lower value is recording after 6, 12 and 18 months in warehouse 60,37%, 60,40% si 56,32%. The higher value of the starch content was after 6, 12 and 18 months in metallic silo 60,65%, 60.65% and 59.64%. This is caused by the slow metabolism of the seeds stored in metallic silo under less favorable microclimate conditions for biological processes and consequently a low consume of starch.

Table 3.

Research results regarding the influence of storage system over the Wet gluten content of the wheat grains during storage

The Variant	Storage variant	The wet gluten content, %	Relative Values	Difference	Significance	Classification test Duncan
1	Warehouse to the beginning of storage, (control)	29.27	100.0	0.00	-	C
2	Warehouse after 6 months	28.87	98.6	-0.40	000	A
3	Warehouse after 12 months	28.90	98.7	-0.37	000	A
4	Warehouse after 18 months	28.90	98.7	-0.37	000	A
5	Metallic silo to the beginning of storage	29.27	100.0	0.00	-	C
6	Metalic silo after 6 months	29.20	99.8	-0.07	0	B
7	Metalic silo after 12 months	29.20	99.8	-0.06	0	B
8	Metalic silo after 18 months	29.20	99.8	-0.06	0	B
9	Concrete silo to the beginning of storage	29.27	100.0	0.00	-	C
10	Concrete silo after 6 months	29.18	99.7	-0.09	00	B
11	Concrete silo after 12 months	29.18	99.7	-0.08	00	B
12	Concrete silo after 18 months	29.17	99.7	-0.10	00	B

DLS (p 5%) 0.05; DLS (p 1%) 0.07; DLS (p 0.1%) 0.10

The wet gluten because of his high biochemical stability and a constructive features of the storages decrease very significant in warehouse 28.90% after 6 months, 28.90% after 12 months and 28.87% after 18 months, significant in metallic silo 29,20% after 6,12 si 18 months and distinct significant in the concrete silo 29.18% after 6 and 12 months and 29.17 after 18 months. Those reductions are caused by the microclimate changes, temperature and humidity witch differentiates the metabolism speed and water absorption process in the studied storage systems.

Table 4.

Research results regarding the influence of storage system over the Ash content of the wheat grains during storage

The Variant	Storage variant	Ash Content, %
1	Warehouse to the beginning of storage, (control)	1,808
2	Warehouse after 6 months	1,80
3	Warehouse after 12 months	1,80
4	Warehouse after 18 months	1,80
5	Metalic silo to the beginning of storage	1,808
6	Metalic silo after 6 months	1,80
7	Metalic silo after 12 months	1,80
8	Metalic silo after 18 months	1,80
9	Concrete silo to the beginning of storage,	1,808
10	Concrete silo after 6 months	1,80
11	Concrete silo after 12 months	1,80
12	Concrete silo after 18 months	1,80

Certain quantities of mineral substances are consumed by the seeds germs for maintaining their life, but because of low percentage 1,8% from the seeds weight and because most of these mineral substances are located in coatings and are not used by seeds the share remains the same. Storage pests have a low affinity for the coatings and so for mineral substances located there, the percentage of mineral substances is not affected by those pests.

Table 5.

Research results regarding the influence of storage system over the Acidity of the wheat grains during storage

The Variant	Storage variant	Acidity
1	Warehouse to the beginning of storage, (control)	2,5
2	Warehouse after 6 months	2,9
3	Warehouse after 12 months	2,9
4	Warehouse after 18 months	3,2
5	Metallic silo to the beginning of storage	2,5
6	Metalic silo after 6 months	2,5
7	Metalic silo after 12 months	2,5
8	Metalic silo after 18 months	2,5
9	Concrete silo to the beginning of storage	2,5
10	Concrete silo after 6 months	2,5
11	Concrete silo after 12 months	2,5
12	Concrete silo after 18 months	2,5

During storage the alteration signs, reveal by the seeds acidity occurs only in control - warehouse. The reason is an better relative air humidity and temperature management In the storage area. Neither in control those values are not higher than the alteration level. The higher value is 3,2 in warehouse and 2,5 in silos.

CONCLUSIONS

After analyzing the results obtained, the conclusions captured the most important aspects of the process of storing the seeds from chemical point of view in respect of the storing system, the duration of storing and the quality parameters of the seeds.

The decrease of protein content is caused primarily by metabolic processes. After the temperatures increase, metabolism accelerates, the consumption of nutrients, including proteins, becoming higher. The highest values of protein content arc recorded in silos.

Storing seeds in silos is the best solution in respect of starch content. As reinforced concrete silos can maintain a microclimate that is less favorable to metabolic processes, the lowest values of starch content is recorded in them.

Due to the gluten's biochemical stability and to the superior protection provided by silos to the bulk of wheat seeds, the proportion of wet gluten content decreases only in the storage room.

The minerals have a constant value during the time of storage. Certain quantities of them are used by the germs of the seeds to maintain life, but due to their low proportion of approximately 1.8% of the mass of the grains and also to the fact that the greatest portion of these minerals can be found in the shells, where metabolic processes are lower, there are no significant changes.

During storage the alteration signs, reveal by the seeds acidity occurs only in control – warehouse but are under the dangerous level.

In the case of wheat seeds, we recommend vertical storage systems, which are equipped with infrastructure that allows taking care of seeds. The best solution is the reinforced concrete silo.

Long term storage in the case of these seeds is favored by filling the cells as well possible with homogeneous large bulks of seeds. For wheat grains, storage should last at least six months.

These periods can be extended only when the frequency of measuring quality indices is increased and when active aeration, cooling and moving are performed to take care of the seeds.

It has been proved that temperature and humidity are the most important environmental factors in the storage of seeds. Their control can be efficiently achieved through tightness and ventilation of storage systems, conditioning of the air used for ventilation and thermal insulation.

Given the importance of metabolism and of the factors that influence it, we recommend the setting up of an integrated monitoring and prediction system based on laboratory and even in situ results, as well as the use of mathematic process simulation models.

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