WHEAT GRAINS LONG THERM STORAGE INFLUENCE REGARDING RHEOLOGICAL PARAMETERS

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Abstract

This study try to find how storage modify the rheological properies of the wheat grains. Althrough we try to find how rheological 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 with rheological parameters evolutions during processing.

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

INTRODUCTION

For evaluation the importance of storage we use data imputs for following parameters : Rheological analysis (Elasticity of gluten, Extensibillity of gluten, Degradation of gluten).

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. Rheological analysis : We study following parameters : Elasticity of the gluten STAS 90/1988, Extensibillity of the gluten STAS 90/1988, Degradation of gluten STAS 90/1988.

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 rheological properties of wheat grains

Gluten elasticity during the storage period is constant. In warehouse variation of the storage parameters lead to a degradation of the gluten elasticity. Because the structure of the gluten is very stable and the environmental conditions are not extreme for leading to an biochemical degradation of the gluten structure all storage variants are similar.

Table 1.

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

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

During 18 month of storage it has been shown that because of biochemical stability of the gluten the influence of the storage life is not significant - 0,01 mm. There are high differences - 0,3 mm - between kinds of storage. The lower values are recorded in the warehouse after 6, 12 and 18 months - 15,50mm and the higher values are in the metallic silo after 6, 12 si 18 months -15,71mm. This phenomena is explained by the relative air humidity differences in the studied storage systems.

Table 2.

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

The Variant	Storage variant	Gluten stretching, mm	Relative Values	Difference	Significance	Classification test Duncan
1	Warehouse to the beginning of storage, (control)	15.80	100.0	0.00	-	E
2	Warehouse after 6 months	15.50	98.1	-0.30	000	A
3	Warehouse after 12 months	15.50	98.1	-0.30	000	A
4	Warehouse after 18 months	15.50	98.1	-0.30	000	A
5	Metallic silo to the beginning of storage	15.80	100.0	0.00	-	E
6	Metalic silo after 6 months	15.71	99.5	-0.09	000	CD
7	Metalic silo after 12 months	15.72	99.5	-0.08	000	D
8	Metalic silo after 18 months	15.71	99.4	-0.09	000	C
9	Concrete silo to the beginning of storage	15.80	100.0	0.00	-	E
10	Concrete silo after 6 months	15.63	98.9	-0.17	000	B
11	Concrete silo after 12 months	15.63	98.9	-0.17	000	B
12	Concrete silo after 18 months	15.64	99.0	-0.16	000	B

DLS (p 5%) 0.01; DLS (p 1%) 0.03 ; DLS (p 0.1%) 0.05

Table 3.

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

The Variant	Storage variant	Gluten degradation, mm	Relative Values	Difference	Significance	Classification test Duncan
1	Warehouse to the beginning of storage, (control)	40.50	100.0	0.00	-	A
2	Warehouse after 6 months	41.60	102.7	1.10	***	C
3	Warehouse after 12 months	41.60	102.7	1.10	***	C
4	Warehouse after 18 months	41,60	102.7	1.10	***	B
5	Metallic silo to the beginning of storage	40.50	100.0	0.00	-	A
6	Metalic silo after 6 months	40.50	100.0	0.00	-	A
7	Metalic silo after 12 months	40.50	100.0	0.00	-	A
8	Metalic silo after 18 months	40.49	100.0	-0.01	-	A
9	Concrete silo to the beginning of storage	40.50	100.0	0.00	-	A
10	Concrete silo after 6 months	40.60	100.2	0.10	-	A
11	Concrete silo after 12 months	40.60	100.3	0.10	-	A
12	Concrete silo after 18 months	40.60	100.3	0.10	-	A

DLS (p 5%) 0.31 ; DLS (p 1%) 0.42 ; DLS (p 0.1%) 0.57

It has been shown during 18 months storage that the gluten degradation stabilized after short time. The maximal values was founded after 6, 12 and 18 months in warehouse 41,60mm witch signified the most intense degradations and the lower gluten degradation was recorded in metallic silo 40,50mm, close to the concrete silo value - 40,60mm during the whole storage period. The explanation lies in the similarity of the thermal and relative air humidity of the storages and the same requirements of the gluten.

CONCLUSIONS

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

The evolution of storing conditions has little influence upon the elasticity of gluten. It worsens only in the case of the storing room, due to oscillations of the storing parameters.

Due to the biochemical stability of wheat seeds, the storage period has little influence upon gluten dilation - approximately 0.01 mm. On the other hand, there are important difference - 0.3 mm - between the different types of storage. The metal silo is the best solution of storage, while the storage room is the worst. The results in silos tend to show similar values, which in the long term may recommend the cellular reinforced concrete silo.

The degradation of gluten takes place only in the storage room, where it is very significantly higher against control. Degradation of gluten does not take place in silos.

Signs of decay, shown by the seeds' acidity, can be noticed only in the case of control, the storage room, during storage.

In the other two storages systems, the metal silos and the reinforced concrete silos respectively, the decay processes are blocked.

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.

ACKNOWLEDGMENTS

The researches were carried out in the Exploratory research project code 690/2009 “The study of influences of some technological elements upon the wheat yield quality in the conditions of the North-Western part of Romania”. We want to thank C.N.C.S.I.S. for founding and supporting the researchs.

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