WHEAT GRAINS LONG THERM STORAGE INFLUENCE REGARDING PHYSICAL PARAMETERS

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Abstract

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

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

INTRODUCTION

For evaluation the importance of storage we use data imputs for following parameters : Organolepticall analysis, Physical analysis (Purity, Hectolitric weight, 1000 grains weight, Absolut weight, Specific weight).

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.Physical analysis : We study follow parameters : Purity STAS 1069-77(3/88), 1000 grains weight SR 6124/1999, Absolut weight STAS 6123-73, Specific weight STAS 6123-73, Hectolitric weight SR 6123/1999.

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 = Combinațion Factor A x Factor B; $V1 = a_1b_1$, $V2 = a_1b_2$, $V3 = a_1b_3$, $V4 = a_1b_4$, $V5 = a_2b_1$, $V6 = a_2b_2$, $V7 = a_2b_3$, $V8 = a_2b_4$, $V9 = a_3b_1$, $V10 = a_3b_2$, $V11 = a_3b_3$, $V12 = a_3b_4$

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 physical properties of the wheat grains

Table 1.

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

The Varian	Storage variant	Purity, %	Relative Values	Diffe rence	Significance	Classification test Duncan
1	Warehouse to the beginning of storage, (control)	84.30	100.0	0.00	Mt.	D
2	Warehouse after 6 months	84.30	100.0	0.00	-	D
3	Warehouse after 12 months	83.10	98.6	-1.20	000	A
4	Warehouse after 18 months	83.10	98.6	-1.20	000	A
5	Metallic silo to the beginning of storage	84.30	100.0	0.00	-	D
6	Metalic silo after 6 months	84.30	100.0	0.00	-	D
7	Metalic silo after 12 months	83.70	99.3	-0.60	000	C
8	Metalic silo after 18 months	83.70	99.3	-0.60	000	C
9	Concrete silo to the beginning of storage	84.30	100.0	0.00	-	D
10	Concrete silo after 6 months	84.30	100.0	0.00	-	D
11	Concrete silo after 12 months	83.20	98.7	-1.10	000	B
12	Concrete silo after 18 months	83.20	98.7	-1.10	000	B

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

During the 18 months of seeds storage from Dropia cultivar there is a downward trend of the purity. The decrease is de 0,6% in metallic silo, 1,10% in reinforced concrete silo and 1,20% in warehouse. The higher rate of the changes in the purity occurred during the period where carried out hanDLS ing operations, so the main factor which caused the decrease of purity of wheat grains during storage are mechanical damages during various seeds handling operations.

Table 2.

Research results regarding the influence of storage system over the Mass of a thousand grains of the wheat grains during storage

The Variant	Storage variant	The mass of a thousand grains, g	Relative Values	Differ ence	Signifi cance	Classification test Duncan
1	Warehouse to the beginning of storage, (control)	47.60	100.0	0.00	-	G
2	Warehouse after 6 months	47.13	99.0	-0.47	000	F
3	Warehouse after 12 months	46.10	96.8	-1.50	000	B
4	Warehouse after 18 months	46.40	97.5	-1.20	000	C
5	Metallic silo to the beginning of storage	47.60	100.0	0.00	-	G
6	Metalic silo after 6 months	48.22	101.3	0.62	***	I
7	Metalic silo after 12 months	46.00	96.6	-1.60	000	A
8	Metalic silo after 18 months	46.10	96.9	-1.50	000	B
9	Concrete silo to the beginning of storage	47.60	100.0	0.00	-	G
10	Concrete silo after 6 months	48.19	101.2	0.59	***	H
11	Concrete silo after 12 months	46.90	98.5	-0.70	000	D
12	Concrete silo after 18 months	47.10	98.9	-0.50	000	E

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

After the mass of a thousand grains analysis during 18 months of storage there are very significant increases only in the metallic silo after 6 months of storage - 0,62g and in concrete silo after 6 months - 0,62g. thus are caused because of the watertight of the metallic silo and the inertia induced by thick layer of seeds on reinforced concrete silo. Others variants recording very significant decreases of this parameter, the higher decrease was 1,6g in metallic silo after 12 months. This phenomena are caused by the metabolism. In first period is metabolized carbohydrates then proteins, with heavier molecules, so the decrease is faster. In the last 6 months because low exterior temperature the metabolism slow hence the MMB.

Table 3.

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

The Variant	Storage variant	The absolute mass of grains, g	Relative Values	Difference	Significance	Classification test Duncan
1	Warehouse to the beginning of storage, (control)	35.35	100.0	0.00	Mt.	G
2	Warehouse after 6 months	33.69	95.3	-1.67	000	D
3	Warehouse after 12 months	32.90	93.1	-2.45	000	B
4	Warehouse after 18 months	32.00	90.5	-3.36	000	A
5	Metallic silo to the beginning of storage	35.35	100.0	0.00	Mt.	G
6	Metalic silo after 6 months	34.56	97.8	-0.79	000	F
7	Metalic silo after 12 months	33.69	95.3	-1.66	000	D
8	Metalic silo after 18 months	33.00	93.4	-2.35	000	B
9	Concrete silo to the beginning of storage	35.35	100.0	0.00	Mt.	G
10	Concrete silo after 6 months	34.63	98.0	-0.72	000	F
11	Concrete silo after 12 months	33.90	95.9	-1.45	000	E
12	Concrete silo after 18 months	33.21	93.9	-2.14	000	C

DLS (p 5%) 0.11; DLS (p 1%) 0.16 ; DLS (p 0.1%) 0.21

The decrease of absolute mass is a natural process caused by seeds metabolism and pests which eat various seeds components and is strictly influenced by the type of storage. The lower value of MA is recorded in warehouse - control 32.00 g because of hard exposure of the seeds to the environmental factors. The higher value is in the concrete silo at 6 months - 34.63g. All reductions of MA are very significant and at the same moment are higher in warehouse then in metallic silo and the lower are in the concrete silo.

Table 4.

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

The Variant	Storage variant	The specific mass, g/cmc	Relative Values	Difference	Significance	Classification test Duncan
1	Warehouse to the beginning of storage, (control)	1.50	100.0	0.00	-	E
2	Warehouse after 6 months	1.47	97.8	-0.03	000	C
3	Warehouse after 12 months	1.46	97.1	-0.04	000	B
4	Warehouse after 18 months	1.32	88.2	-0.18	000	A
5	Metallic silo to the beginning of storage	1.50	100.0	0.00	-	E
6	Metalic silo after 6 months	1.50	100.0	0.00	-	E
7	Metalic silo after 12 months	1.50	100.0	0.00	-	E
8	Metalic silo after 18 months	1.49	99.1	-0.01	00	D
9	Concrete silo to the beginning of storage	1.50	100.0	0.00	-	E
10	Concrete silo after 6 months	1.48	98.9	-0.02	000	D
11	Concrete silo after 12 months	1.47	98.2	-0.03	000	C
12	Concrete silo after 18 months	1.50	100.0	0.00	-	E

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

The MS value after 18 months of storage decrease very significant compared with control in each studied storage systems. Those decreases are different between storage studied systems because of their construction features which lead to the different metabolism speed and a different intensity of the physical process from the seed mass. The higher value of MS is recorded in metallic silo during the storage period and in the concrete silo at 18 months of storage.

Assessing during storage period the stored seeds in studied storage systems is shown that the silos had the lower decreases of MH because of autosortening in the loading procedure and the lowering of the intensity of the biological process. Overall the hectolitrical mass differences are very significant toward the control or distinct significant, the lower decrease are recorded in the metallic silo at 6 months - 0,03 kg/hi, in concrete silo 0,37 kg/hi after 12 months and 0,57 kg/hi after 18 months. The higher decreases of Mil are in warehouse 0,07 kg/hi after 6 months, 1,07 kg/hi after 12 months and 2,17 kg/hi after 18 months, in particular caused by biochemical and physical process in this storage.

Table 5.

Research results regarding the influence of storage system over the Hectolitric mass of the Wheat grains during storage

The Variant	Storage variant	The hectolitric mass, kg/hl	Relative Values	Difference	Significance	Classification test Duncan
1	Warehouse to the beginning of storage. (control)	78.47	100.0	0.00	-	H
2	Warehouse after 6 months	78.40	99.9	-0.07	00	G
3	Warehouse after 12 months	77.40	98.6	-1.07	000	D
4	Warehouse after 18 months	76.30	97.2	-2.16	000	A
5	Metallic silo to the beginning of storage	78.47	100.0	0.00	Mt.	H
6	Metalic silo after 6 months	78.44	100.0	-0.03	-	GH
7	Metalic silo after 12 months	76.40	97.4	-2.07	000	B
8	Metalic silo after 18 months	76.80	97.9	-1.67	000	C
9	Concrete silo to the beginning of storage	78.47	100.0	0.00	-	H
10	Concrete silo after 6 months	78.41	99.9	-0.06	0	G
11	Concrete silo after 12 months	78.10	99.5	-0.37	000	F
12	Concrete silo after 18 months	77.89	99.3	-0.57	000	E

DLS (p 5%) 0.05 ; DLS (p 1%) 0.06 ; DLS (p 0.1%) 0.09

CONCLUSIONS

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

It has been noticed that during storage the purity of seeds showed a decreasing tendency. The decrease was slow, insignificant, the more so as it took place over a long period of time and in fact, it weakened very much during the storage period.

As far as the Mass of one thousand grains is concerned, it has been noticed that in the long term, the highest values, very significantly higher than that of control, are obtained in cellular concrete silos. In the short term, the metal silo is the optimum, with results that are also very significantly higher. In the case of small quantities and a medium period of storage, a storage room can also be an option provided that a high storage management is ensured.

The climatic conditions are very important in respect of the Mass of one thousand grains (MTG), as, in the beginning, they block metabolism leading to the highest values of MTG. Later, however, these conditions cause a significant decrease of MTG through water consumption and lost of humidity as a result of breathing. In the case of cellular reinforced concrete silos, the existence of active aerating channels diminishes this.

The decrease of absolute Mass is closely influenced by the type of silo. Thus, the cellular reinforced concrete silo offers the best storage conditions in respect of the absolute Mass, recording the lowest decrease of absolute Mass against control.

The cellular reinforced concrete silo and that made of metal ensure the best conditions for maintaining the specific Mass.

The differences in hectolitre Mass against control are very significantly higher in the case of storage in silos.

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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