

## **RESEARCH REGARDING THE PERFORMANCES OF THE REFRIGERATORY UNIT FOR PRESERVING THE WHEAT SEEDS**

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### **Abstract**

*The research permit to analyze of performance the equipments used for cold preservation of cereals, specific consumes of electrical energy, ecological implication of use of electrical energy which has been produced into electrical power plant which uses as primary source of energy the fossils fuels, the influence of technical parameters to the quality of preservation process. The equipment for cold preservation of grains used for research has a frigorific machine and adequate tools for measurements and control.*

*The goal of research is to evaluate how the special technology used for cold preservation of grains complains the request about the quality of product, and also to evaluate the possibilities to extend that technology at the national level for preservation of cereals using low temperatures.*

### **INTRODUCTION**

The main preoccupations for storage of cereals are to prevent the self-heating phenomena. There have been proposed different preventives measures, among them, after cleaning of cereals, in top is placed the reducing of moisture content of cereals under critical level, and cooling of cereals bulk.

In the last period there is a growing emphasis on improving food safety and quality of ownership and germination of agricultural products, such as performance analysis and refrigeration facilities, at a minimum cost of energy.

In that way was proceeding at utilizations of cooling equipments for cereals for preservation and for control of post-harvest process.

### **MATERIAL AND METHODS**

The experiments were made in the district of Călărași. Two lots of wheat from the Josef and Capo cultivars were tested, from parcels where standard and unitary technologies for wheat crops were applied.

The researches have been carried out with a frigorific unit, namely Granifrigor KK 140 AHY, using the principle of cold compression machines. Work environment requires a safety, unpolluting, chlorine free, frigorific agent.

The first lot of wheat from the Josef cultivar was submitted to the cooling operation during the period July 18<sup>th</sup> - July 20<sup>th</sup>, 2008, for 42 hours. The cereals had an initial humidity of 13.6% and an initial average temperature of 34.1° Celsius. The seed quantity submitted to the cooling operation was of 156 t, the harvesting being made in one day, followed by the storage in a cell having the following dimensions: L = 9 m, l = 6 m and h = 4 m.

The seeds from the 2nd wheat lot from the Capo cultivar were cooled during the period July 25<sup>th</sup> - July 27<sup>th</sup>, 2008, for 53 hours. The cereals had an initial humidity of 10.7% and an initial average temperature of 33.8° Celsius. The seed quantity was of 159 t, the harvesting being made in one day, followed by the storing in a similar cell.

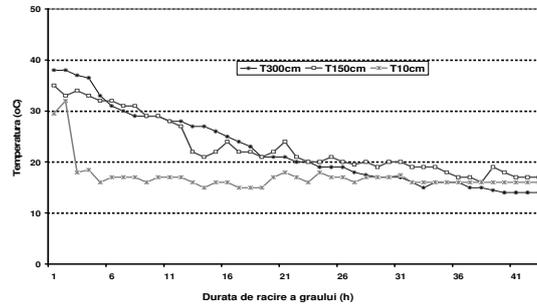
The laboratory analyses were made with the Infratec 1241 machine, of FOSS brand, with the help of which initial, intermediary and final determinations were made regarding the content in humidity, protein, gluten, Zeleny index and hectoliter mass of the agricultural products submitted to cooling. The cereals temperature was measured every hour, on three heights of the wheat layer, respectively on basis, at 150 cm height and at 300 cm height.

For the measurement of the electric energy consumption a three-phase counter has been used.

## **RESULTS AND DISCUSSION**

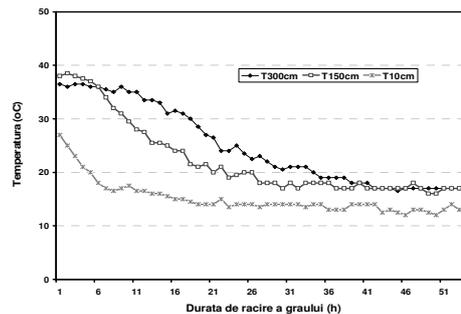
Following the experiments it has been noticed that in the first lot of wheat from the Josef cultivar stored under cool conditions post-harvesting phenomena took place that led to the increase in humid gluten, thus leading to the increase in the wheat quality for bakery. The cereals humidity was reduced by 0.3% compared to the initial one and the other parameters analyzed were within the normal limits known from the specific literature.

The final temperature of the wheat from the Josef cultivar after 42 hours of cooling with the Granifrigor unit was of 16° Celsius at the basis of the cell, 17° Celsius at the height of 150 cm and 14° Celsius at the roof of the storage cell (figure 1). The electric energy consumption during the cooling of the first lot of wheat was of 6.4 kWh/t of agricultural product. This value falls within normal limits of consumption/tonne of agricultural product which is specific for the areas with temperate climate as our country has, as well.



**Fig. 1. Evolution of cereal temperatures during cooling of grains from Josef cultivar**

The Capo wheat variety from the second storage cell was submitted to the cooling operation with the same frigorific installation. The cooling duration for the cereals was longer than in the first lot, this being due to the low humidity of the wheat measured, upon the reception.



**Fig. 2. Evolution of cereal temperatures during cooling of grains from Capo cultivar**

The final temperature reached in the mass of the cereals after 53 hours of functioning of the frigorific installation was of 13.5° Celsius at the basis of the cell and 17° Celsius at heights of the wheat layer of 150 cm and 300 cm (figure 2). The electric energy consumption necessary for the conditioning of the wheat from the Capo cultivar through cooling process was higher, this being due to the low humidity of the cereals.

The laboratory parameters analyzed for the wheat from the Capo cultivar reached within the normal limits, proving that the method of cooling preservation keeps the physical-chemical composition of the stored cereals.

In table 1 there are presented the main results of cooling on the experiences of the two varieties of wheat, with aggregate Granifrigor type AHY-140.

*Table 1*

**Results of parameters analysed in experiments**

Parameters	Value	
	Josef cultivar	Capo cultivar
Moisture content at the beginning of storage, %	13.6	10.7
Moisture content after cooling, %	13.3	10.4
Temperature at the beginning of storage, °C	34.1	33.8
Temperature at the end of cooling, °C	15.6	15.8
Humid Gluten content of cereals at storage beginning, %	26.7	29.6
Humid Gluten content after cooling, %	27.2	28.9
Protein content at the beginning of storage, %	12.8	13.9
Protein content after cooling, %	13.3	14.2
Electrical energy consumed for preserve 1t of grain, kWh/t	6.4	8

Analyzed results recorded in table 1 is found that the cooling GRANIFRIGOR type AHY-140, preserve and even lead to improved nutritional qualities of agricultural products made in the analysis.

**CONCLUSIONS**

1. The electric energy consumption for cooling the cereals with the Granifrigor unit depends upon the exterior temperature, upon the humidity of the environmental air, upon the cereals humidity and temperature.
2. Humid cereals cooled with the Granifrigor installation can be more easily conditioned than very dry cereals.
3. The technology for cereals conditioning by cooling might represent an efficient method of environmental protection.

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