

RESEARCH ON INFLUENCE ECOLOGICAL STORAGE OF WHEAT AT LOW TEMPERATURES ON THE FLOUR STARCH CONTENT

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Cereal storage by cooling is a ecological method of preserving their quality. The paper focuses on the influence of low temperatures and the storage duration of the wheat of the Dropia type on the starch content of the flour resulting from grinding. The wheat samples were stored at temperatures of 5, 10 și 20 °C for de 3, 6 ,9 and 12 months. After storage at these temperatures, the samples were brought to the same humidity of 14,5 %, kept to rest for the same period, and milled with Bühler lab mill.. The experiment shows that storage at a temperature recommended by the method of cool preservation, i.e. 10°C, preserving the bread making qualities of wheat.

Key words: cereals, storage, low temperatures, starch

Cereal storage by cooling is a ecological method of preserving their quality. Research in this field started a few decades ago in Germany and USA but this method is still under specialist attention [5]. The influence of low temperature storage on the technological properties of wheat is of increasing concern to specialists all over the world. Starch is one of the main components of wheat flour[2]. The amount and properties of the starch in the flour determine, along with other factors, the bread making qualities of wheat . The research presented in this paper aims at determining the correlation between the temperature and duration of wheat storage, at one hand, and the starch content of the flour resulted from milling on the other.

MATERIAL AND METHOD

The raw material used in the experiments was Dropia wheat. The wheat samples were stored at temperatures of 5, 10 și 20 °C for de 3, 6 ,9 and 12 months. After storage at these temperatures, the samples were brought to the same humidity of 14,5 %, kept to rest for the same period, and milled with Bühler lab mill. After homogenizing the fractions resulting from the three grits and the three grinders, the flour was analyzed by means of the PER CON Inframatic 8611 analyzer manufactured by Perten Instruments, Sweden [1].

RESULTS AND DISCUSSIONS

The variation of the starch content function of the storage duration for the case of storage at the thermal level of 5 °C may be seen in the graph in *figure 1*.

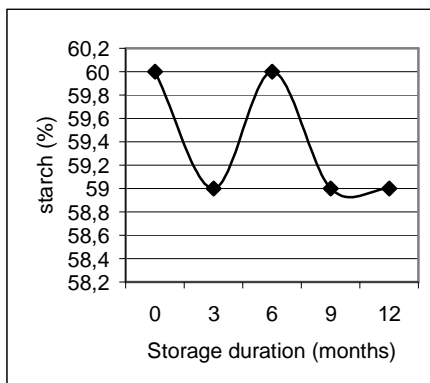


Figure 1 Variation of starch content function of storage duration for Dropia wheat flour for storage at a temperature of 5 °C

The study of the graph in *figure 1* shows that during the first 9 months there is a sinusoidal variation of the starch content in the flour as the wheat storage duration increases. After 12 months of storage the content of starch in percent remains stabilized at the same value determined after 9 months. The analysis of the correlation between the wheat storage duration at a temperature of 10 °C and the starch content leads to the results shown in the graph in figure 2. In the case of storage at a temperature of 10 °C, the percent of starch content determined after three months' storage is the same as in the original sample. During the next 9 months of storage the starch content decreases and then increases by 1% every 3 months.

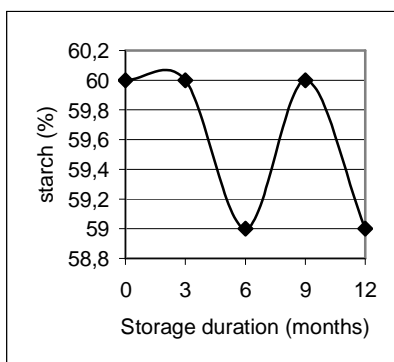


Figure 2 Variation of starch content function of the storage duration for Dropia flour for wheat storage at a temperature of 10 °C

Another focus of analysis was the interdependence between the storage duration for a temperature of 20 °C and the starch content, the results being synthetically presented in the graph in *figure 3*.

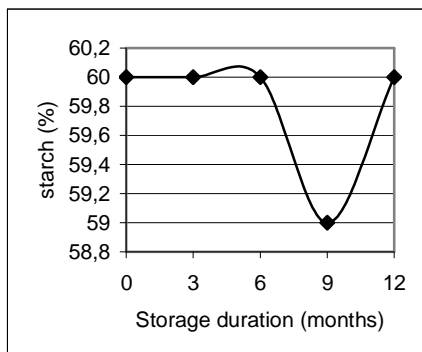


Figure 3 **Variation of starch content function of the storage duration for Dropia flour for wheat storage at a temperature of 20 °C**

At a temperature of 20 °C the percent of starch content remains relatively stable after storages of 3, and 6 months. After 9 months of storage the starch content decreases by 1%, and after 12 months it comes back to the value registered before storage. *Table 1* shows the results of the statistic calculation of the coefficient of correlation between the variation of the storage duration and the starch content (in %) of the flour of the analyzed type depending on the wheat storage temperature. The data in *table 1* show a strong correlation between the variation of the storage duration of the Dropia wheat and the percent of the starch content in flour when it is stored at a temperature of 5 and 10 °C, and a weaker correlation for storage at a temperature of 20 °C.

Table 1

The coefficient of correlation between the storage duration and the starch content of flour function of the wheat storage temperature

No	Storage temperature (°C)	Coeff. of correlation r
1	5	-0.57
2	10	-0.57
3	20	-0.35

If the variation of starch content is analyzed after 3 months of storage, the following data function of the temperature are obtained, as shown in the graph in *figure 4*.

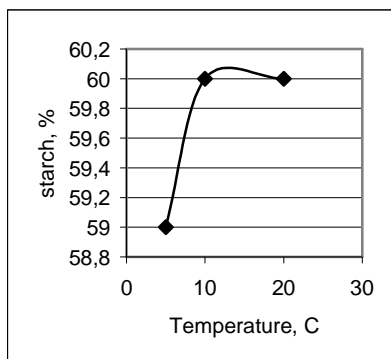


Figure 4 Variation of starch content function of temperature after 3 months' storage

The analysis of the graph in *figure 4* shows a slight increase of the starch content in the flour as the storage temperature increases from 5 to 10°C. When the storage temperature is increased to °C the starch content stays the same. After 6 months of storage the influence of the storage temperature upon the starch content may be seen in *figure 5*.

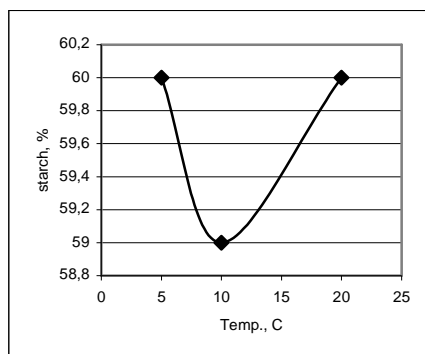


Figure 5 Variation of starch content function of temperature after 6 months' storage

In case the wheat is stored for 6 months the slightly lower value of the starch content is registered for the use of a temperature of 10 °C. The other temperature levels, i.e. 5 and 20 °C have led to the same value of the starch content. The analysis after 9 months of wheat storage revealed an influence of the temperature on the percent of starch content in the flour as shown in the graph in *figure 6*.

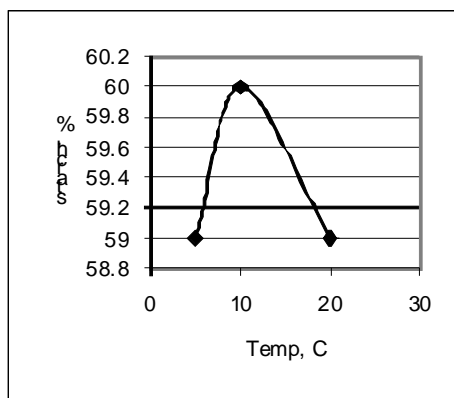


Figure 6 **Variation of starch content function of temperature after 9 months' storage**

As it is shown in *figure 6*, after 9 months of storage the starch content is slightly bigger when the storage temperature is 10 °C. At the end of the storage period, i.e. 12 months, the data on the influence of temperature on the percent of starch content are seen in the graph in *figure 7*.

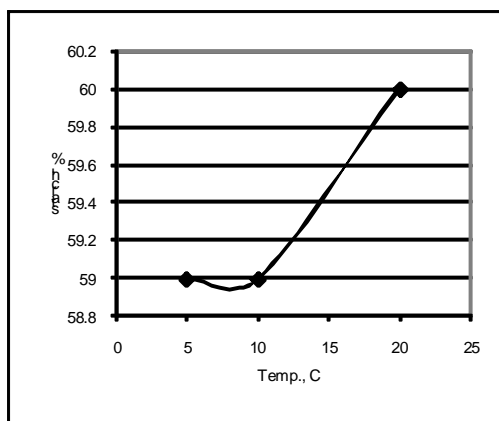


Figure 7 **Variation of the starch content function of temperature after 12 months' storage**

According to the data in *figure 7*, the starch content has the same value for a storage of 12 months at a temperature of 5 and 10 °C and a slightly higher value for the use of the thermal level of 20 °C.

The data in *table 2* show a strong correlation between the starch content and the storage temperature for the intervals 9-12 months and 0-3 months. The storage intervals of 3-6 months and 6-9 months stand out by small coefficients of correlation between storage temperature and the starch content, so in these cases the influence of the storage temperature is minimal.

Table 2

The coefficient of correlation between the storage temperature and the starch content of flour function of the storage duration of wheat

No.	Storage duration (months)	Coeff of correlation r
1	3	0.75
2	6	0.18
3	9	-0.18
4	12	0.94

CONCLUSIONS

For Dropia flour the storage period over which the starch content remains the same in time is longer as the temperature is higher. It should be remarked that determining the percent of the starch content with the PER CON Inframatic 8611 analyzer actually determines the proportion the starch has in the composition of flour, and it does not represent only its quantitative variation. The percentage of starch in the flour may change due to the metabolic processes that occur in the wheat grain during storage. The analyzed data lead to the conclusion that during wheat storage the amount of starch in the flour varies slightly, registering different values function of the storage temperature. It may be explained by the consummation of nutrients within the grain due to the natural respiration processes of wheat during storage[2]. The experiment shows that storage at a temperature recommended by the method of cool preservation, i.e. 10°C [3,4,6], does not lead to major changes in the starch content of the flour, therefore preserving in this respect the bread making qualities of wheat.

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