1. INTRODUCTION AND SETTING THE OBJECTIVES

Wheat as one of the most important commodity in public nutrition is at the same time a product that is tested for both physical and chemical properties in a most versatile way. Over the past one hundred years there have been very many researchers who - also taking into account numerous factors - analysed the quality changes in wheat. Wheat classification, based on quality testing is very advanced since its further use (food industry, animal nutrition, and storage) is based on the quality parameters obtained.

Considering the fact that the different wheat lots are only stored for 5-7 months until they are processed and also that they are delivered over long distances new data are to be obtained as to the changes in the quality of the new varieties during storage.

The aim of my research was to find out whether the different quality parameters change during the storage period, and if they do how they come about. In order to realise this objective, apart from the parameters usually and generally tested in Hungary, alveograph and falling number reading were obtained as well as sedimentation values were determined during the period following the harvest.

One of the questions to answer was whether the four new wheat varieties with high quality milling parameters (Mv – Magvas, Mv – Pálma, Mv – Emma, Fatima) would preserve their harvest qualities during the storage period.

The other question to be determined was how winter wheat with a moisture content of 16% would behave during the storage period since it is a well-known fact that in the case of old varieties difficulties emerged during storage when the moisture content exceeded 15%. Characteristically, in years when large amounts of surplus wheat was produced storage took place in distress facilities and a number of primary producers, who did not have the necessary technical preparedness (lack of sufficient equipment, drying capacity) made attempts at storing wheat lots with this moisture content. With new varieties data have to be obtained as regards the effects of such conditions. The consideration of the question of storage may be further justified by the fact that very few research locations have the opportunity to set up storage experiments these days as it entails considerable equipment and cost requirements.

The formation of these quality indicators was also analysed during storage in inert gas (argon) in order to decide which indicators the air driven out of the storage space and the kernel mass influenced. In order to answer these questions tests of commercial samples were also conducted.

2. MATERIAL AND METHOD

2.1. The wheat varieties dealt with in this research

Mv – Magvas is one of the highest yielding hard wheat varieties. It has an excellent baking quality, a characteristically A_2 farinograph value, a stable high falling number and a gluten content which may even exceed 30% under favourable conditions. Its uniformly sized grains ensures optimal milling and a high flour output. It may be claimed to be one of the varieties that gives the most stable quality. It is characterised by excellent frost-resistance, medium-early maturing, medium straw height and also medium desease resistance.

Mv – Pálma is one of the early, hard milling varieties that have a most reliably yield capacity. It has a wet gluten content of between 28-32 %. In practice it has a farinograph value of B_1, but depending on the cropping site this value may be A_2 as well. Its freezing resistance, stalk hardiness and disease resistance are excellent. It can safely be sown until the end of October.

Mv – Emma is a variety that has average yields but at the same time it is an improving variety with wet gluten contents that may exceed even 35 %. The quality of its gluten is excellent and its flour can produce extremely voluminous loaves. It yields stable A_2 category farinograph value. Its freezing resistance and stalk hardiness are excellent but it is characterised by medium disease resistance ability and medium early maturing. Owing to its good stalk quality the variety is not susceptible to lodging.

Fatima is a variety capable of extremely high yields and tolerating drought very well but having gluten contents of over even 30 %. The value of its gluten expansion is optimal and its farinograph value is either A_2 or B_1. It has good freezing resistance and excellent stalk hardiness and disease resistance at medium-early maturing.

2.2. The method of storage

Storage conditions: The what samples were stored in the sample storage room of the Central Laboratory of the Centre for Agricultural Science of the University of Debrecen in bags following due cleaning after the harvest. The stored amounts were 50 kilos per variety with temperatures of between 15.4 and 18 °C at the beginning of storage and between 12.6 and 13.3 °C in the 22^{nd} week. Cleaning was conducted in accordance with MSZ 6367-2:2001 cleannes testing standard with sieves with 2.5-1.1 transversal holes. In the course of this

operation the cleanness of the amounts to be stored corresponded to the MSZ 6383:1998 standard for wheat. Following the period of after-maturing samples were taken from the stored amounts weekly for the purpose of determining the quality parameters. The durations of traditional storage was from 30th 08 2001 to 02nd 01 2002 (124 days) in 2001, in 2002 it was from 17th 09 to 21st 02 2003 (161 days) and in 2003 from 25th 07 to 09th 01 204 (167 days).

In order to study the changes in the quality parameters part of the samples from the samples from 2002 and 2003 (20 kilos) were stored in argon gas in the Central Laboratory of the Centre for Agricultural Science of the University of Debrecen in 25 litre hermetically closed plastic bins. The durations of storage in argon gas were 187 days in 2002 and 168 days in 2003.

In 2002 an experiment was set up to study the during-storage behaviour of wheat stored at the following moisture contents: (a) 13.0-13.5 %, as applied in practice, (b) over the 14.5 % defined in the standard for wheat (16%). The duration of the storage experiment with moistured grain was 48 days.

Parallel to the experiments set up, the same tests were carried out with so-called commercial samples (a mixture of several varieties) taken from the Mill in Hajdúnánás in all the three years

2.3. Laboratory tests

The following parameters were examined from the samples of the wheat varieties: moisture, protein, gluten content, gluten expansiveness, baking quality, sedimentation value, falling number and alveograph values. Ash and protein content was determined from the flours of the different varieties in the Central Laboratory of the Centre for Agricultural Science of the University of Debrecen.

Measured indicator	**Method**	**Equipment**
Moisture content	MSZ 6367-3:1983	Drying oven
Protein content	MSZ 6367-11:1984	Khjel-Tech 1026
Gluten content	MSZ ISO 5531:1993	Perten T2000
Falling number	MSZ ISO 3093:1995	Perten 1400
Zeleny-value	MSZ ISO 5529:1993	Sklárny Kavalier PT 010-70
Farinogrph value and water absorbtion	MSZ ISO 5530-1:1994	Brabender farinograph
Alveograph value	AACC-1983.54.30	Chopin MA 87 typ.

2.4. Calculation methods applied in the evaluation of the experiment results

In preparing the thesis the average and standard deviation values found in the tables were calculated by using Microsoft Word and Microsoft Excel programs. In order to more precisely identify the trends in the diagrams, smoothed the average values are indicated and there are also trend-lines to illustrate the directions of the changes.

3. MAJOR RESULTS AND CONCLUSIONS OF THE RESEARCH WORK

3.1. Results for the traditional storage

Results for moisture content analyses

The four wheat varieties (Mv-Magvas, Mv-Pálma, Mv-Emma and Fatima) studied in the storage experiment were put in the store after having been dried to the storage moisture content artificially. During the storage period the moisture content were determined from samples taken weekly. In the case of all the four varieties (Mv-Magvas, Mv-Pálma, Mv-Emma and Fatima) and in all of the three years (2001, 2002 and 2003) the moisture content was observed to be constant and there were no changes over storage time.

Results for protein content analyses

Protein content during the different storage periods (17-22; 12 weeks) were analysed in 2001 and 2002 for four varieties (Mv-Magvas, Mv-Pálma, Mv-Emma and Fatima) while in 2003 variety Fatima was not included. In the course of the variety tests Mv – Emma was classified as an improving variety while the others - Mv – Magvas, Mv – Pálma and Fatima – were classified as excellent in the mill. In this storage experiment we wanted to find out whether the varieties classified as improving and excellent in the mill preserved this quality during the storage period.

According to the standard requirements for wheat, set by standard MSZ 6383:1998 a variety is classified as improving if its protein content is at least 12.5 % on dry matter base with a multiplier of 5.7 applied.

It was found that in 2001 the average value of the protein content of the samples taken weekly from variety Mv-Pálma did not reach this limit while the averages of the protein content of

the varieties Mv-Magvas, Mv-Emma and Fatima exceeded the limit. In 2002 the average value of the protein content of variety Mv-Magvas was 0.05 % below the limit value of 12.5 % set for improving quality, while the other three wheat varieties tested (Mv-Emma, Mv-Pálma and Fatima) produced averages that were above the limit value of 12.5 % set for improving quality. Protein content did not change considerably with the advancement of storage time in any of the four varieties studied. The wheat varieties dealt with in the storage experiment (Mv – Magvas, Mv – Pálma, Mv – Emma and Fatima) retained their protein content during the storage period.

In the figures below (Figures 1, 2 and 3) the formation of the protein content is illustrated in the three years analysed.

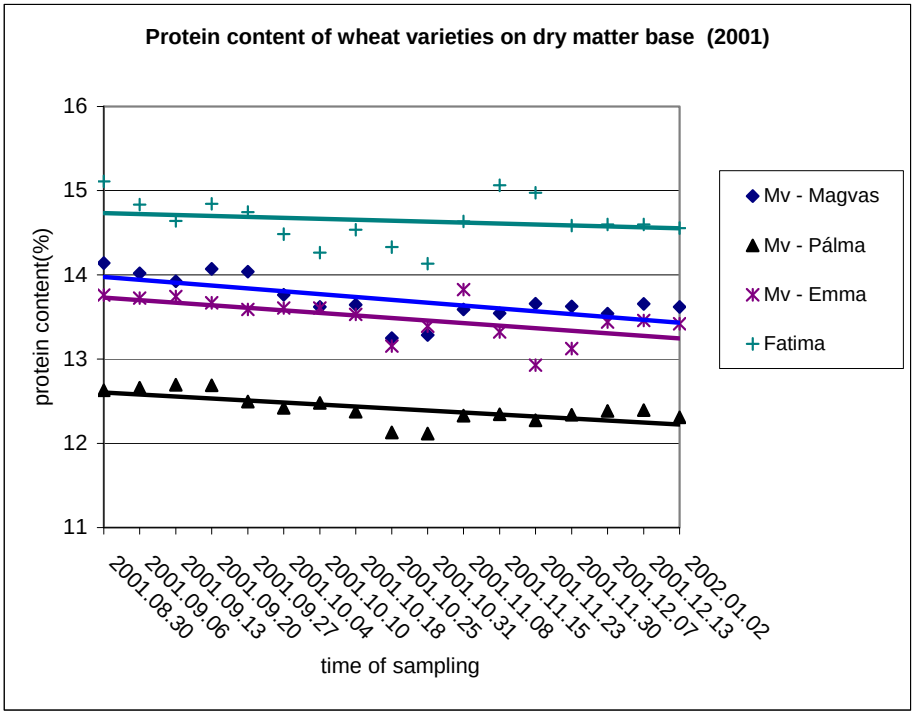

Figure 1: Wheat protein content on dry matter base (2001)

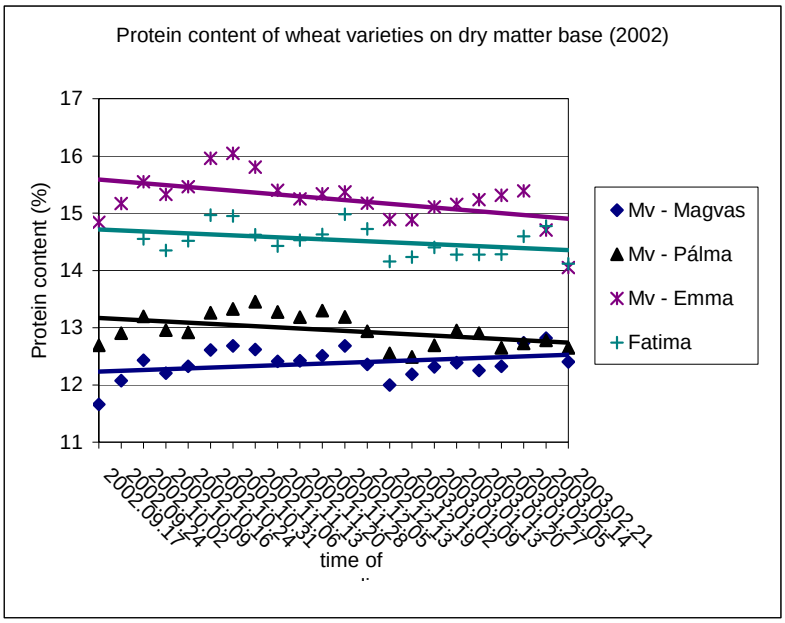

Figure 2: Wheat protein content on dry matter base (2002)

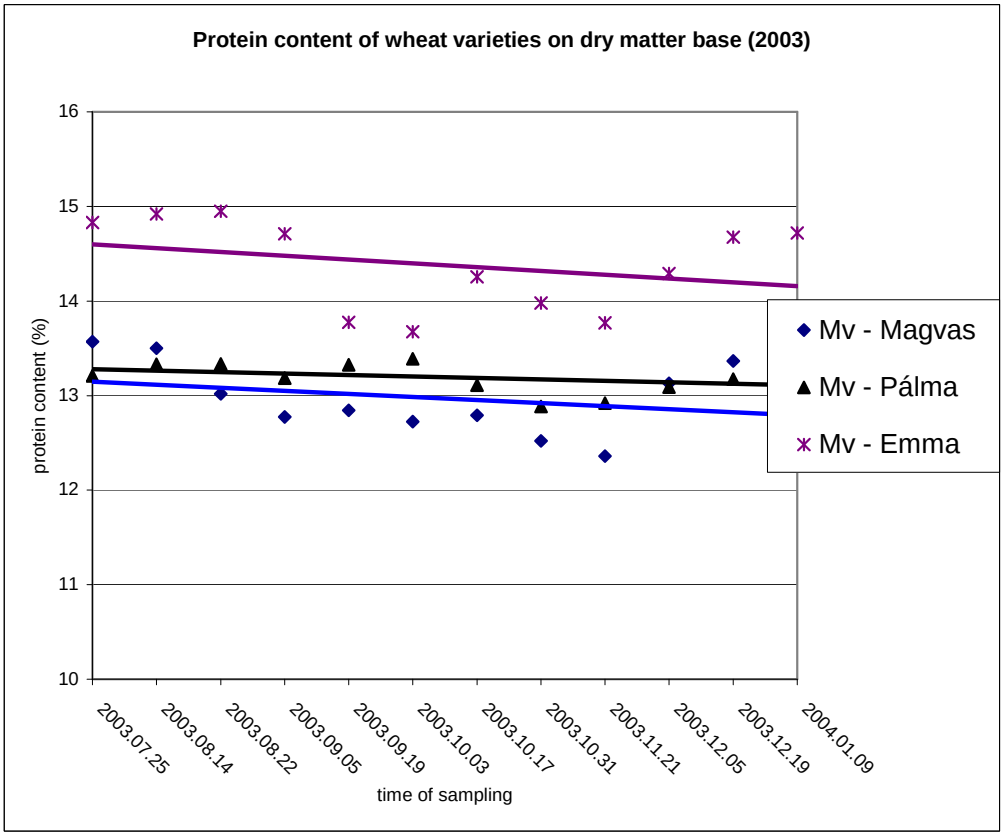

Figure 3: Wheat protein content on dry matter base (2003)

The findings for the protein content of the four varieties during storage showed that this parameter did not change even as regards the samples taken weekly. The wheat samples (amounts) put into the store as improving or excellent quality maintained their qualities as regards protein content throughout the storage period.

Results for gluten content analyses

Gluten content showed slight increase in all the four varieties in relation to the advancement of storage time.

This means that the gluten content found at harvest time were not only retained in the varieties but this parameter revealed moderate increases during storage. This finding supports the theory of after-maturing whereby the gluten improves in both its quality and quantity.

In variety classification Mv – Magvas and Fatima are registered as having gluten content of over 30 %, Mv – Emma is indicated to have a gluten content of over 35 % and Mv – Pálma is registered at 28.0-32.0 %. In our storage experiment the varieties (Mv – Magvas, Mv – Pálma, Mv – Emma and Fatima) revealed considerable differences as regards their gluten contents. It was variety Mv – Emma that had the highest readings as follows: 39.15 % in 2002, 33.51 % in 2001 and 29.25 % in 2003. It reached the improving limit value only in 2002. The lowest gluten content was found with variety Mv – Magvas at 26.38 % in 2003. As a result the determination of the gluten content of different wheat varieties is of extreme importance from the point of view of further utilisation.

Results for gluten expansiveness analyses

As regards the values for gluten expansiveness none of the varieties revealed considerable changes during the storage period. During the initial stage of the storage period gluten expansiveness showed a slightly increasing trend and after reaching a certain value this quality indicator remained in the region of the higher value. There were 10-30 % differences found between the initial and end-of storage values, which fact also supports the theory of after-maturing.

Results for Zeleny value analyses

In 2001 it was variety Mv – Emma that had the highest Zeleny value at 59.65 ml, which was followed by variety Fatima at 58.88 ml. The other two varieties Mv – Magvas and Mv – Pálma showed significantly lower Zeleny values at 45.82 ml and 38.06 ml, respectively, but

even so all the four varieties exceeded the lower limit values, i.e. 35 ml set for improving variety. In 2002 too, it was Mv – Emma at 55.27 ml whose Zeleny value exceded the lower limit value for improving variety by more than 20 ml while the other three varieties stayed below this value. The three varieties that were analysed (Mv – Magvas, Mv – Pálma and Fatima) have values over 30 ml and are considered to be good milling quality. In 2003 the Zeleny values of all the three varieties tested (Mv – Magvas, Mv – Pálma and Mv – Emma) exceded the 35 ml limit value for improving quality. During the experiment no changes in relation to the length of storage time were found. The effect of the cropping year, however, is very momentous on the varieties and in different years this factor brought about as high as 10-30 % differences in the case of individual varieties. All these arguments indicate that it is also important to determine this quality indicator for new varieties at the beginning of the storage period.

Results for Hagberg falling number analyses

The differences found in the samples taken every week corresponded to the ones permitted for the analytical method. The storage duration did not influence the values of falling numbers in any of the varieties. The varieties preserved their values determined at harvest and the beginning of storage under optimal storage conditions (13-14 % moisture content, 98 % purity).

The figures below (figures 4, 5 and 6) the formation of falling numbers is illustrated in the three years analysed.

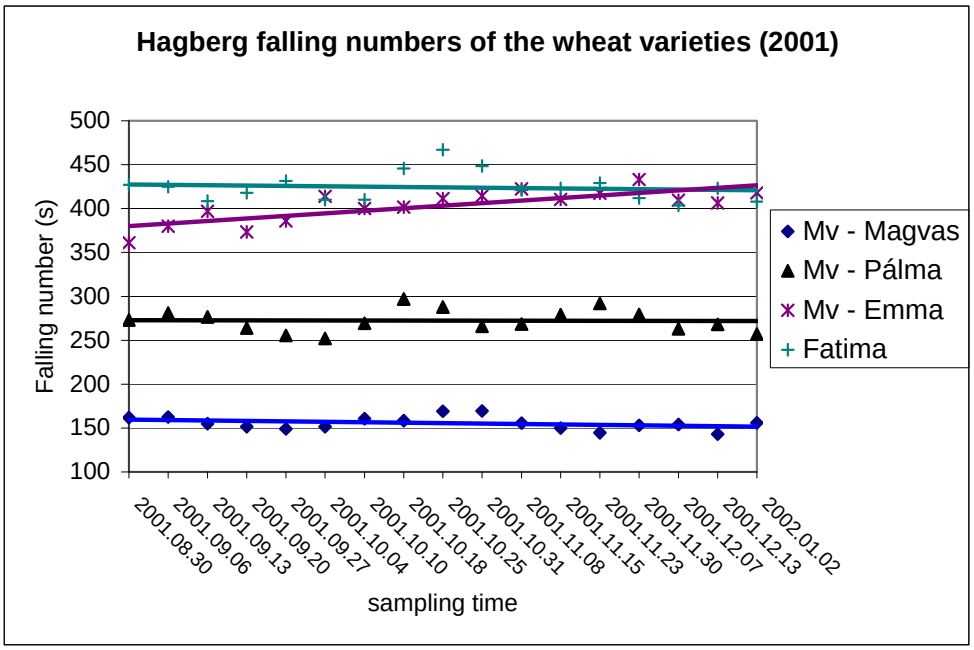

Fig. 4: Hagberg falling number values of the wheat varieties (2001)

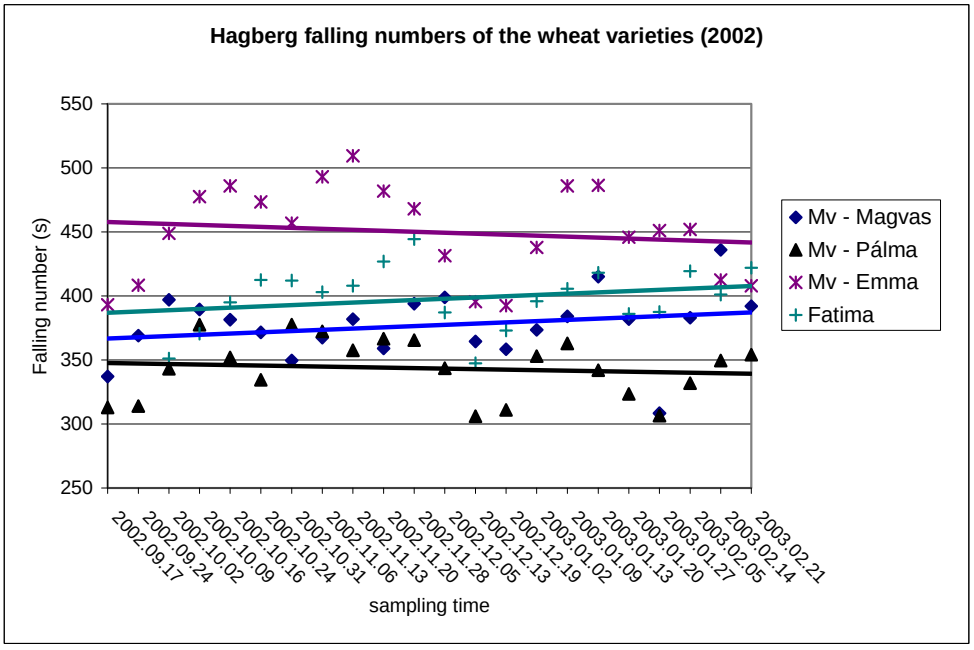

Fig. 5: Hagberg falling number values of the wheat varieties (2002)

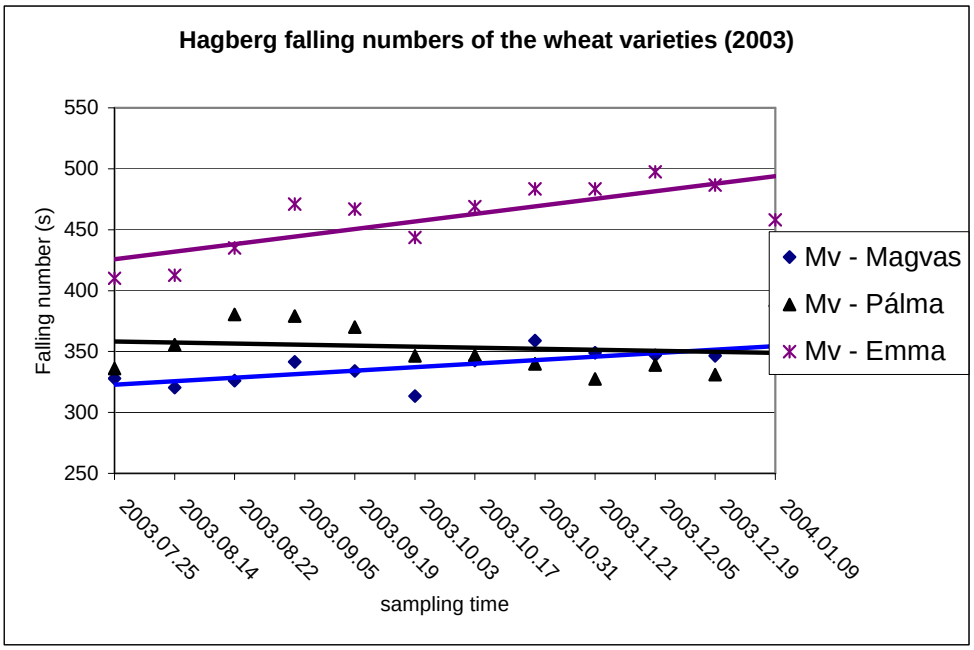

Fig. 6: Hagberg falling number values of the wheat varieties (2003)

Farinograph water absorbtion

In the storage experiment there were significantly different varieties but in all the three years of the experiment slight increases in the values were observed as the storage duration advanced.

Results for farinograph value analyses

After the wheat varieties (Mv – Magvas, Mv – Pálma, Mv – Emma and Fatima) were put in the storehouse the farinograph values analysed improved slightly until the after-maturing period finished and then after a few weeks stagnation they showed slight decreases with the advancement of the storage duration, which corresponds with the research results of several researchers.

The following figures (figures 7, 8 and 9) the farinograph values are demonstrates over the three years of the study.

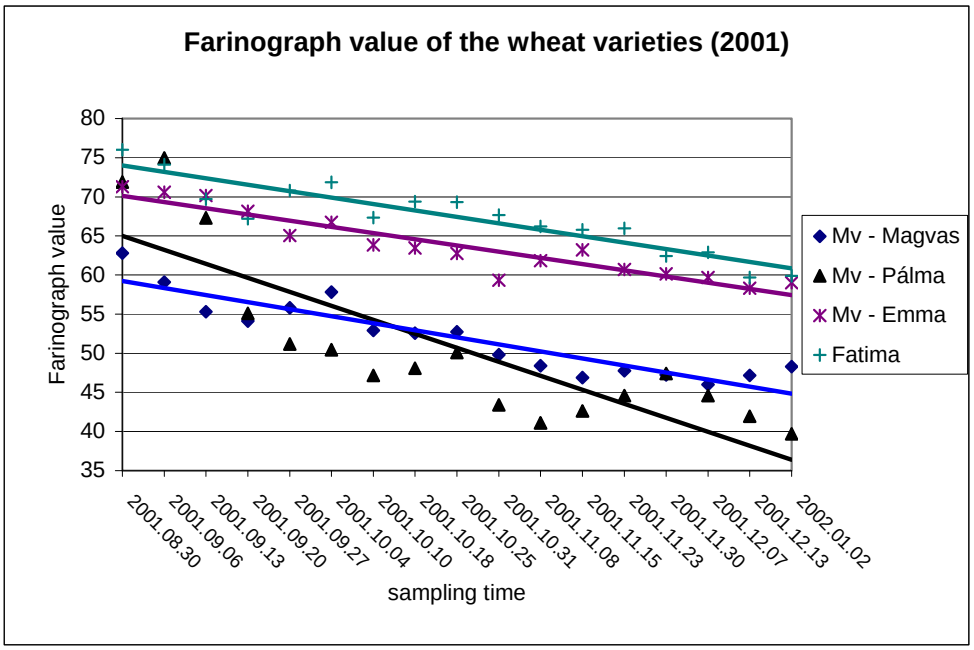

Figure 7: Farinograph value of the wheat varieties (2001)

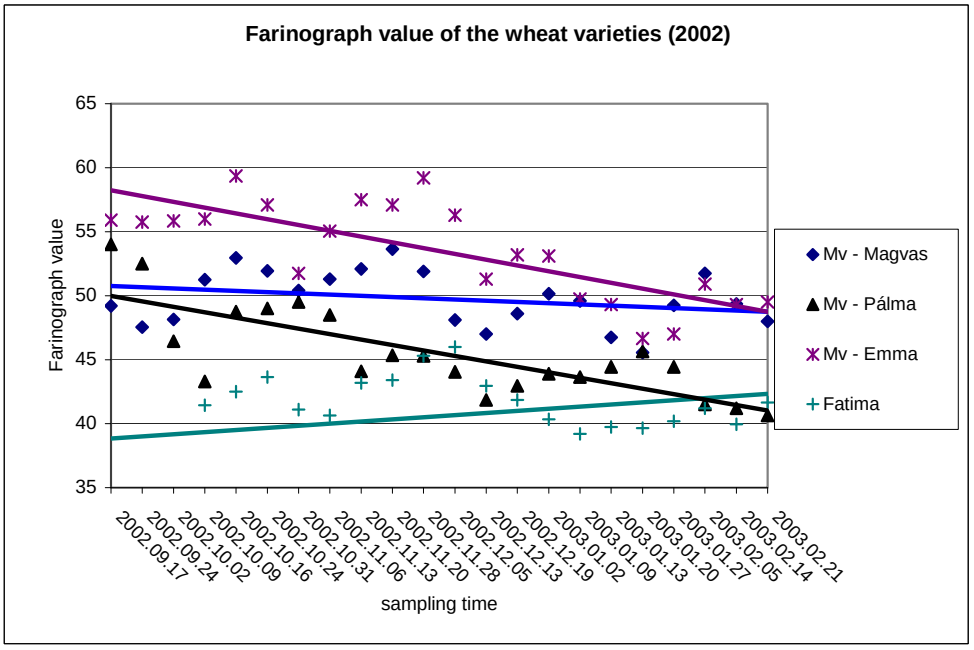

Fig. 8: Farinograph value of the wheat varieties (2002)

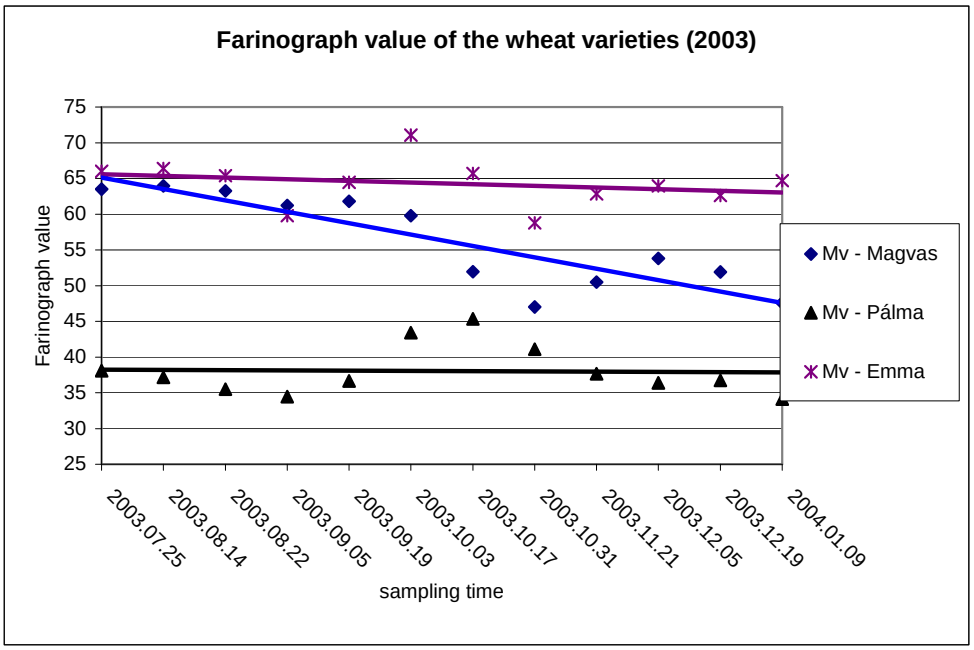

Figure 9: Farinograph value of the wheat varieties (2003)

Results for alveograph parameters analyses

The alveograph quality parameters of the four varieties tested (Mv – Magvas, Mv – Pálma, Mv – Emma and Fatima) showed very close trends to one another during the storage period.

Alveograph L (mm) and G (ml) values did not change during the storage period.

Alveograph P (mm) and W (10^{-4} J) values showed slight - 20 – 30 % - decreases with the advancement of the storage duration with the exception of 2003 when neither decreases nor increases were observed as regards these two parameters.

The figures (Figure 10, 11, and 12) below show the alveograph W (10^{-4} J) value of the four varieties (Mv-Emma, Mv-Magvas, Mv-Pálma and Fatima) tested.

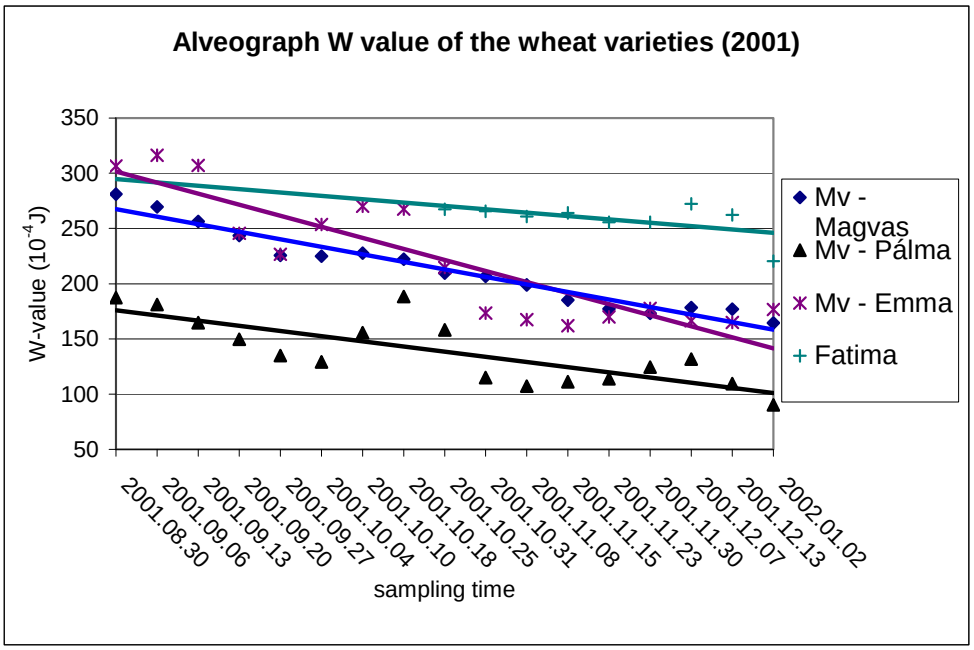

Figure 10: Alveograph W value of the wheat varieties

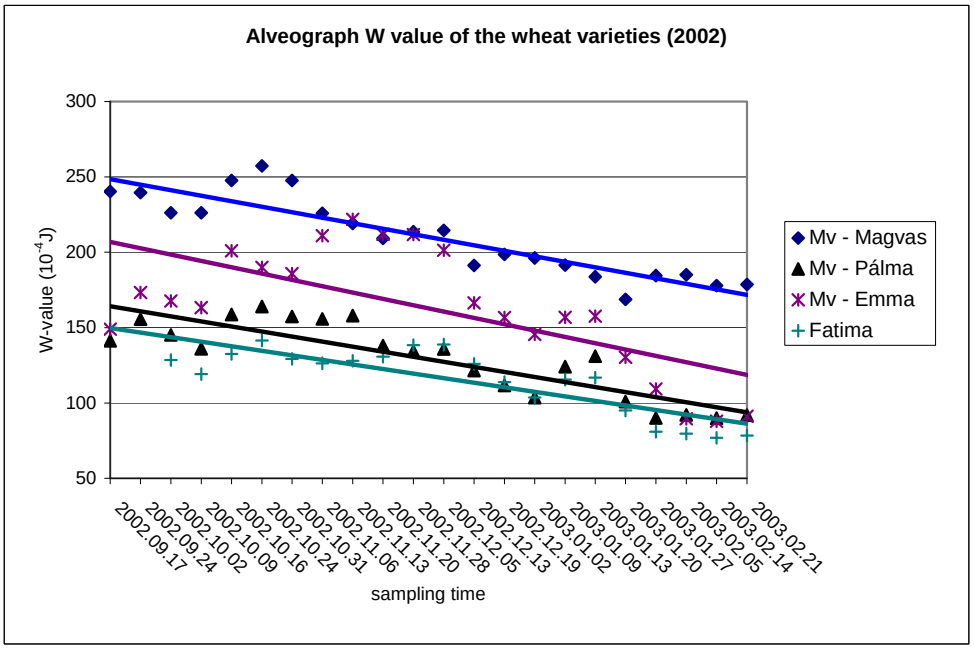

Figure 11: Alveograph W value of the wheat varieties (2002)

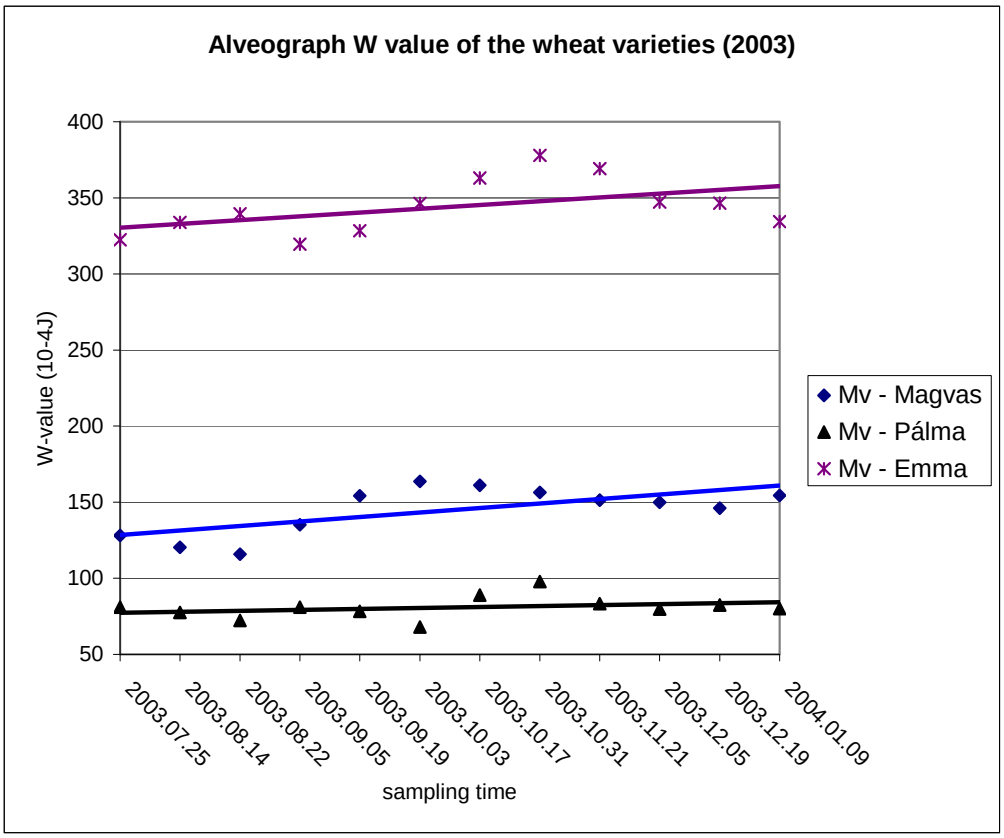

Figure 12: Alveograph W values of the wheat varieties (2003)

It is important to measure the alveograph parameters for the new varieties during the duration of storage as well since with the opening of EU markets the determination of this parameter, in general, is also required by the customers.

3.2. Results for the analyses of storage in argon gas

In 2002 the quality of wheat samples from different locations in Hajdú-Bihar County **(**Berettyóújfalu, Hajdúnánás és Polgár) was tested when stored in argon gas and in air. The samples were mixtures of various varieties, so called milling or commercial samples. The storage experiment lasted for 14 weeks.

After being dried artificially the moisture content of the samples handled in the experiment ranged between 10.89 and 13.89 %. None of the samples showed changes in this indicator as the storage duration advanced.

There were no considerable differences found as regards moisture contents between the samples store in argon gas and air.

What concerns protein contents it was the samples from the region of Polgár that resulted the lowest value in the range of 12.60 – 13.80 % in either storage method. The protein content of the samples from the regions of Berettyóújfalú and Hajdúnánás were over 14 %. There were no changes experienced in either of the storage methods or with the advancement of the storage period (Figure 13).

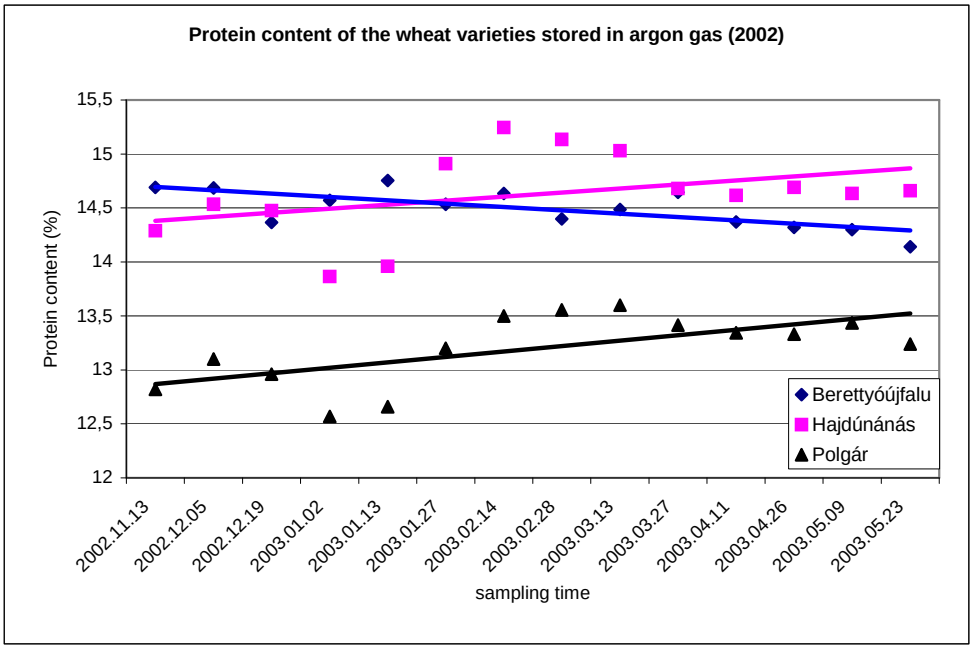

Figure 13: Protein content of the wheat varieties stored in argon gas

Similarly to the values for the protein content the gluten content of the samples from the region of Polgár were also lower and in the range of between 31.42 and 33.34 %, while the samples from the silos of the mills in Berettóújfalu and Hajdúnánás this indicator ranged between 32.32 and 36.11 %. It was established that the gluten content did not change over the storage time.

The values for gluten expansiveness of the samples from the regions of Hajdúnánás and Polgár are similar and the averages range between 3.83 and 4.93 mm, while the ones from Berettyóújfalú resulted higher – 5.24 and 5.71 mm – values for this parameter. There are no differences between the two storage methods and the indicators show no changes with the advancement of the storage duration.

The Zeleny value was also the lowest for the samples from the region of Polgár and ranged between 32 and 40 ml while for those from Berettyóújfalu and Hajdúnánás they were between 40 and 62 ml. No differences were noticed between the samples in either storage method or with the advancement of the storage period.

The Hagberg falling number were identical in the two storage methods for the samples from all the three production locations. As regards absolute values, however, the sample from the region of Polgár revealed the lowest value. The values were preserved throughout the storage period.

As regards the analyses of water absorbtion and baking quality no differences were found either between the two storage methods or the production locations.

There are no differences between the two storage methods in the results of the alveograph analyses but slight decreases were found in the L (mm); G (ml) and W (10^{-4} J) values with the advancement of the storage period. The ash content of the flours made from the samples stored in argon gas and air did not show changes with the advancement of the storage period.

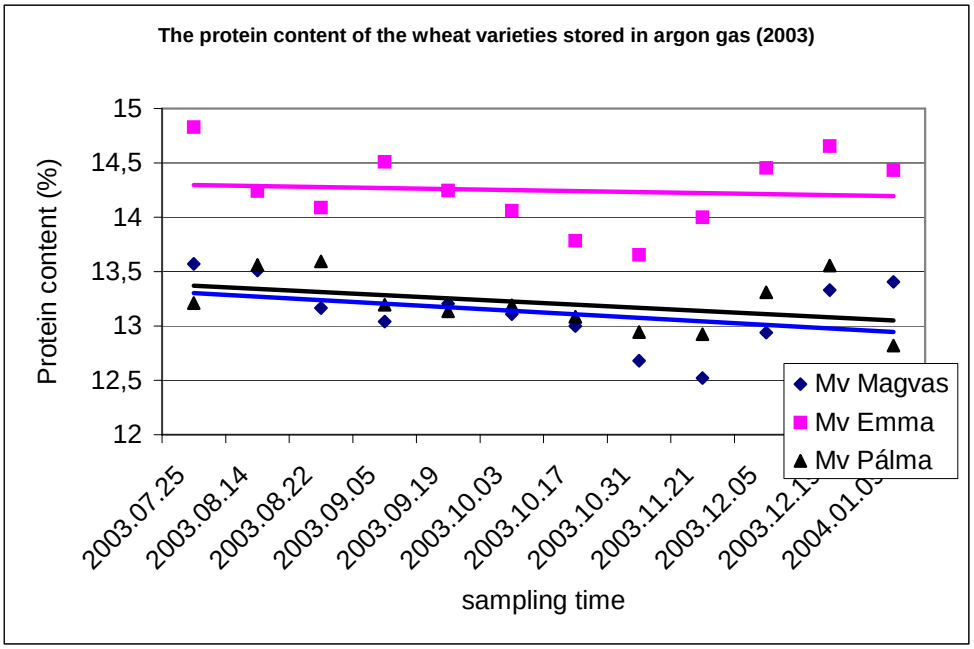

Figure 14: The protein content of the wheat varieties stored in argon gas (2003)

The protein content of the flours from the different cropping locations were nearly the same or remained withing the measurement limits in both the argon gas and the air storage method.

In 2003 three excellent quality wheat varieties - Mv Magvas, Mv Emma and Mv Pálma - were selected. The storage experiment with the mixtures from the different production

locations was repeated. The quality of the different varieties were tested over 12 weeks stored in air and argon gas.

The moisture content of the wheat varieties varied between 11.53 and 13.95 %.

No differences were found either in the gluten content (Figure14) or the gluten expansiveness and Zeleny value, or the falling number, baking quality and alveograph value of the samples of the different wheat varieties (Mv – Magvas, Mv – Pálma, Mv – Emma and Fatima) whether stored in argon gas or in air. There were no differences found as regards storage time duration either.

The gluten and ash content of the flours from the different wheat varieties ranged between 11.42 and 13.66%, and 0.48 and 0.61%, respectively.

3.2. Results for the grain from the moistened storage experiment

Moisture content

The moisture content were determined seven times after the wheat samples had been moistened.

We found that a certain period of time (five days) were needed to reach the moisture content of 16 % and following it nearly identical values were obtained for all the varieties. The average values for the different varieties were between 15.59 and 16.51 % and the values of standard deviation ranged between 0.25 and 0.50.

As regards the **protein content** we found that this indicator did not change with the advancement of the storage duration even when the moisture content were increased to 16 %. The averages were between 12.66 and 14.51 % and the value of standard deviation ranged between 0.07 and 0.49.

The average values of the **gluten content** of the varieties analysed were between 30.14 and 31.28 % and the value of standard deviation ranged between 0.91 and 1.91.

The gluten content of the wheat varieties that had been moistened to 16 % showed slight decreases with the advancement of the storage duration.

The values for **gluten expansiveness** did not show changes in relation to storage duration in the case of the wheat varieties moistened to 16 % either.

The **Zeleny-test** is also a characteristic analysis for wheat proteins, the value of which may range between 0 and 100. The higher the Zeleny value is the better the quality is.

In the case of the four varieties we analysed this indicator did not show changes as regards the samples with moisture contents of 16 % in relation to the length of the storage period. It had

average values of between 40 and 63 ml and the value of standard deviation ranged between 1.07 and 8.32.

Analysing the **Hagberg falling number** it can be claimed that each variety showed unequivocal decreases with magnitudes of 20 -75 %. The average falling numbers for the varieties were between 144.43 and 207.86 at a value of standard deviation ranging between 14.40 and 111.89. The decreases in the values of the falling numbers can be explained with the fact that at a moisture content of 16 % wheat starts germinating, i.e. starch will decompose – and this is revealed in low falling number.

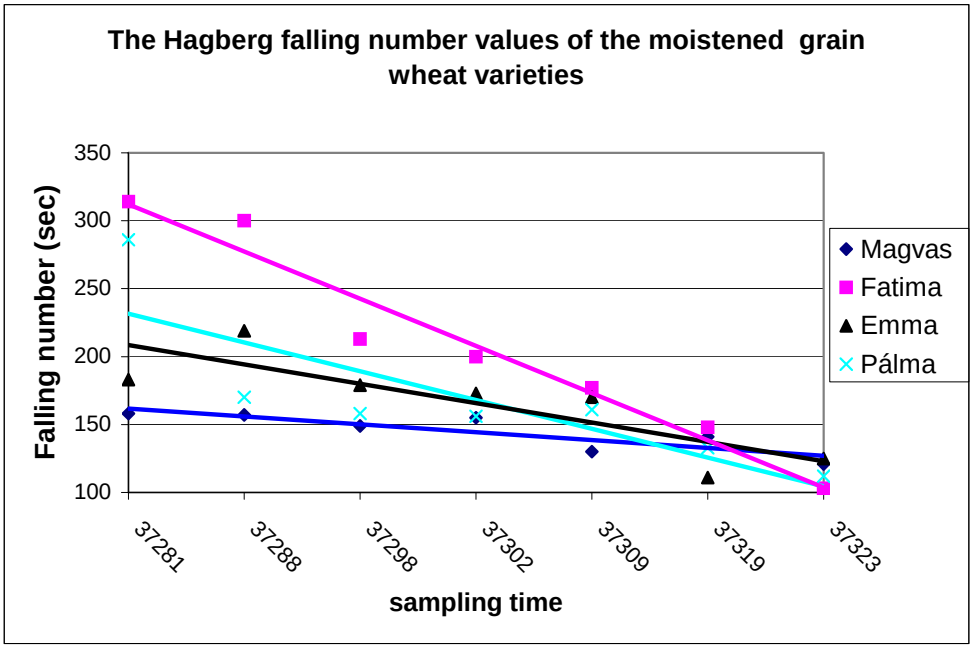

Figure 15: The Hagberg falling number values of the moistened grain wheat varieties

When analysing **baking quality** slight decreases were found both in the **water absorbtion** and the Farinograph **value**, which is similar to the test findings for wheat lots stored following other methods (in air, argon gas).

As regards **alveograph values** no changes were in these values for the samples moistened to 16 % in relation to the storage duration.

We were able to conduct our storage experiment with wheat samples (Mv – Magvas, Mv – Pálma, Mv – Emma and Fatima) moistened to 16 % for seven weeks (19^{th} 01 2002 – 8^{th} 03 2002). Apart from Hageberg falling numbers with the other test parameters (protein, gluten content and expansiveness, Zeleny value, farinograph and alveograph value) there were not any changes different from those under other storage conditions found.

By the end of the seventh week, however, the test sample started germinating and went of, so it became impossible to continue the investigation.

3.4 Commercial samples

In order to compare our storage test results involving different wheat varieties the storage experiment was also conducted with so-called commercial samples (mixture of different wheat varieties) in three years (2000, 2001 and 2002).

The commercial samples were obtained from the so-called “diamond cells” of the silo system of Hajdúnánási Malomüzem (the Mill in Hajdúnánás). During the storage duration we checked the temperature of the silo cell and the grain lot contained in it. The diamond cell contained 300 tonnes of homogenised wheat, which was put in it for storage after harvest. The samples were taken from this every month and conducted the tests for protein, gluten content, Zeleny value, falling number, farinograph value (Figures 16, 17 and 18) and alveograph value.

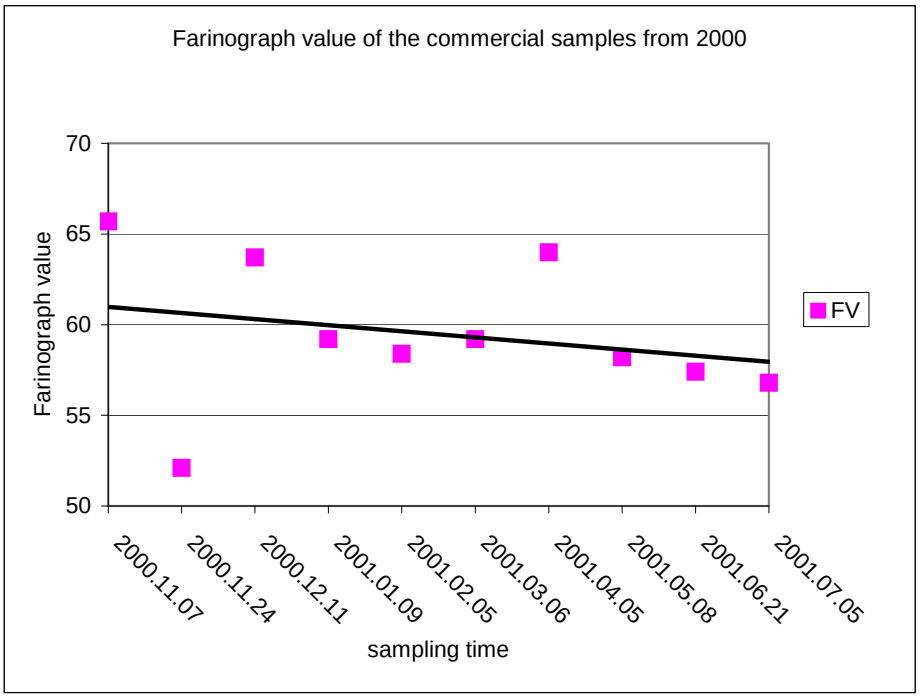

Figure 16: Farinograph value of the commercial samples from 2000

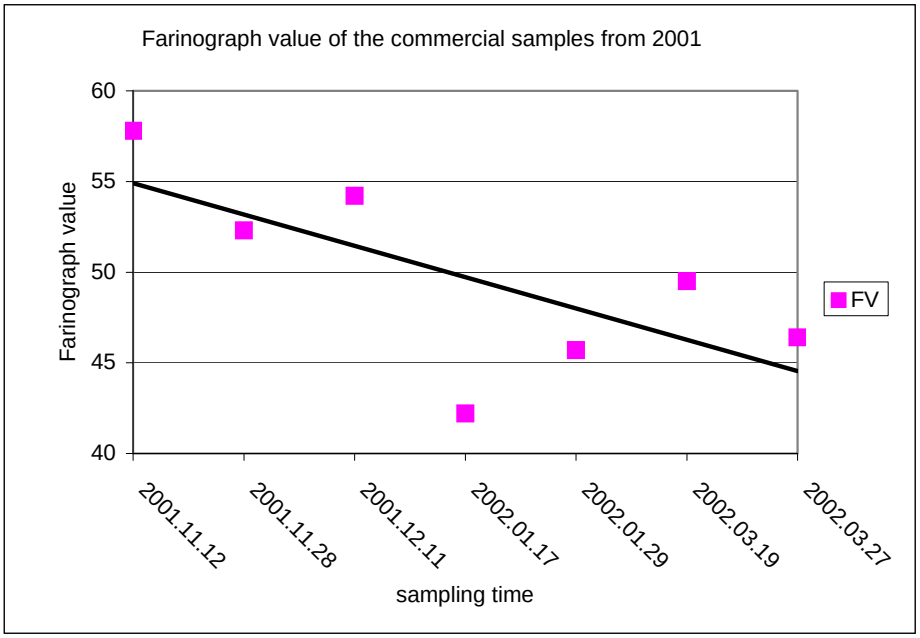

Figure 17: Farinograph value of the commercial samples from 2001

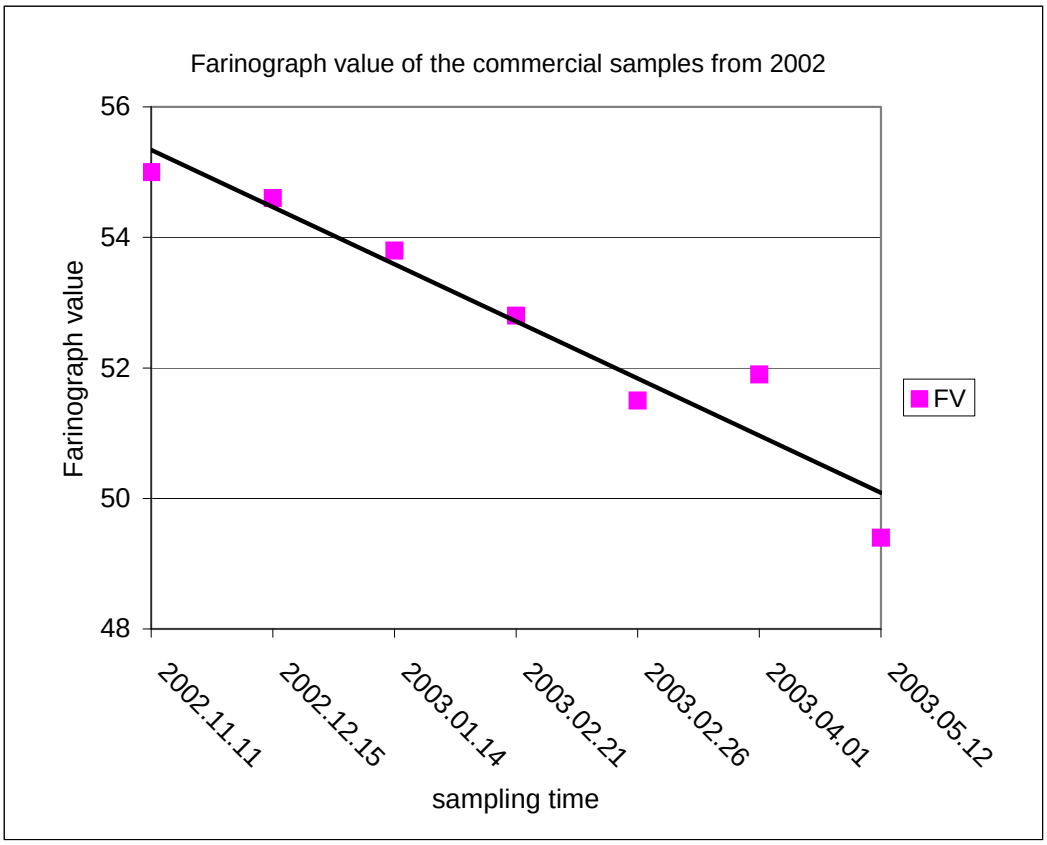

Figure 18: Farinograph value of the commercial samples from 2002

The findings of the investigation of the commercial samples also support the ones obtained from the different wheat varieties and storage methods.

Consequently there were no changes found in protein and gluten content, gluten expansiveness and Zeleny value analyses but there were small decreses found in farinograph and alveograph W (10^{-4} J) values. In order to verify this small decrease in farinograph value this parameter was again determined from samples taken weekly from a commercial amount in 2004.

4. NEW AND NOVEL SCIENTIFIC RESULTS

- I have concluded that the quality of the four good quality varieties (Mv- Magvas, Mv-Emma, Mv-Pálma and Fatima) studied in the experiment had farinograph value that showed decreases with the advancement of the storage period. The decreases in

farinograph value were influenced by both the cropping year and the variety. By the end of the six months storage period the decreases in the farinograph value had brought about changes in the quality also affecting the Hungarian classification group in all the four varieties (Mv- Magvas, Mv-Emma, Mv-Pálma and Fatima) in 2001, in two varieties (Mv-Emma and Mv-Pálma) in 2002, and in one variety Mv-Magvas in 2003.

- As regards alveograph P (mm) value I have concluded that in the storage experiment they showed decreases in all the four wheat varieties (Mv- Magvas, Mv-Emma, Mv-Pálma and Fatima) analysed. The decreases in the alveograph P (mm) values were influenced by both the cropping year and the variety. Moreover, these investigations prove that the alveograph L (mm) and G (ml) readings for the four wheat varieties (Mv- Magvas, Mv-Emma, Mv-Pálma and Fatima) did not change throughout the storage experiment. The alveograph L (mm) and G (ml) values were strongly affected by the variety and the cropping year. In opposition to farinograph value the alveograph W (10^{-4}J) value showed more significant decreases in all the four varieties (Mv-Magvas, Mv-Emma, Mv-Pálma and Fatima) in relation to the lengt of the storage duration. The values and the degrees of the decreases in the alveograph W (10^{-4} J) value are primarily determined by the variety but the cropping year also has a considerable effect.
- I concluded that the gluten content and expansiveness for the four wheat varieties (Mv- Magvas, Mv-Emma, Mv-Pálma and Fatima) dealt with in the experiment increased slightly. The amounts and the degrees of the increases in the gluten contents were significantly influenced by the effect of the cropping year as well.
- The Zeleny value of the four wheat varieties (Mv- Magvas, Mv-Emma, Mv-Pálma and Fatima) dealt with in the storage experiment were stable and did not show changes during the storage duration.
- On the basis of these investigations it has been revealed that there are considerable differences in the values for falling number and this quality parameter is also considerably influenced by the effects of the cropping year. It has been concluded that the falling number value of the four wheat varieties (Mv- Magvas, Mv-Emma, Mv-Pálma and Fatima) dealt with in the experiment did not change over the storage duration.

- On the basis of my measurements on wheat with moisture content of 16 % I studied the behaviour of the quality parameters during the storage of amounts at such moisture content. Some of the quality parameters (crude protein content, Zeleny value, farinograph value and water absorbtion, alveograph parameters.) of the four wheat varieties (Mv- Magvas, Mv-Emma, Mv-Pálma and Fatima) were stable and changed only with the advancement of the germination stage, in the decaying stage, while the changes in the gluten content and falling number came about already in the first weeks of the storage period. The amount of wet gluten remained stable until the third week of the storage period while the falling number showed decreases already in the first week of the storage period.
- I have concluded that the changes in the quality parameters (crude protein, wet gluten content, falling number, Zeleny value, farinograph value and water absorbtion, alveograph parameters) of the four wheat varieties analysed did not differ considerably from the changes experienced under traditional storage conditions when these varieties were stored in an argon gas atmosphere.

Results, utilizable in practice

- With the introduction into public growing of new varieties the quality parameters defined in the variety classification have to be determined again and again. With the expansion of markets the determination of parameters, e.g. alveograph parameters, not used in Hungary before have to be determined.
- Due to prolonged (intervention, several year) storage periods of wheat we have to know how long the new varieties can preserve their quality and may be stored. During the storage period the changes in the different quality features, especially the ones for which there are small databases are available (Zeleny value, Hagberg falling number), have to be investigated.
- As regards storage in inert gas there were no beneficial changes found in comparison with the traditional storage method (silo and flat storage). Consequently, its application in practice is not to be recommended as it can only function as a cost-increasing factor.
- It was proved in a storage experiment that wheat with a moisture content of 16 % cannot be stored for a long period as unfavourable external and internal (moulding, decreases in falling number) processes are triggered, which result in the wheat going off.

- Through the studies with mill samples it was proved that lots put in the stores with a storable quality could be utilised in their original quality even after ten months storage. Special attention has to be paid, however, to checking the quality indicators that show decreasing trends.

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