EFFECT OF CLIMATIC FACTORS ON WHEAT GRAIN QUALITY

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ABSTRACT

Quality in general is the sum of characteristics. In this work factors of complex quality have been examined. The factors, which determine the wheat quality, can be sorted into two groups, the natural factors and the growing factors. The natural factor (rain full, temperature, air) determines the varieties and the growing technology. The growing factor (variety, seed corn, sowing-time, nutrients etc.) determines the profit.

The wheat was harvested at two different times, and they were grown by the same agro technological treatments. Before the harvest we examined the kernel, we get information about the possible injury. After the harvest we examined the gluten characteristic, the alveograph and valorigraph behaviors. The effects of varieties were dominated, but there was a full of meaning the weather, because the harvest was drawn away so the plant gave a lot of rain. Yield is an economic index and it is a connection with the kernel hardness, the order of the varieties shows it. In this study we examined these parameters, and the connection among these factors.

Keywords: wheat quality, gluten, alveograph, valorigraph

INTRODUCTION

In Hungary there is a one step harvest, so we have to determine the harvest time. This time is, when there is a beginning of the whole ripening. In this time the biological value of the wheat is good. In USA, GB, Canada, there are two step harvests. In the first step they harvest the wheat in a wax ripening and after 3-5 day, when it is dried, they are threshing. The advantages are the dried weeds and the good quality. But if it is raining the grain quality and quantity get worse and it needs more work, because you have to go to the land twice and it causes more cost.

We have to choose the right harvest time; it must be fitted with variety, because we get good quality and quantity.

We need to plan the harvest, but the weather may change that. Some research examines the harvest time and its effects to the wet gluten, the hectolitre and the baking parameters. The hectolitre and the baking parameters got worst in the overripen phase.

The different consumption habits do require diverse quality, and thus the quality behavior must be permanent (VÉHA, 2007). To maintain this permanency in biological system is far too difficult, since different conditions, i.e. the agricultural land use, the weather, etc have all significant role in variance of quality factors (SZABÓ, 1986). POLLHAMER (1981) sorted the agricultural land in two groups. In the first group is the agro technical factors (sowing time, artificial fertilizer, seed grain amount, etc.), in the second group is the effect of the land.

MATERIALS AND METHODS

Eleven different registered bread wheat varieties with diverse technological qualities were used in this study. The samples were provided by the Cereal Research NPC, Szeged, in Hungary, and included the following varieties: GK Garaboly, GK Békés, GK Kalász, GK Verecke,GK Holló, GK Ati, GK Petur, GK Nap, GK Élet, GK Csongrád, GK Hattyú.

We examined the Hardness index with the Perten SKCS 4100 (Perten Instruments, Sprinfield, Illinois, USA) instrument is one of the well know machines, which examine the kernel hardness. Brabender ® Quadrumat ® Senior (Brabender GmbH & Co. KG, Duisburg, Germany) laboratory mill was used to determine the milling properties and the flour yield of the different types of wheat.

Figure 1. Brabender ® Quadrumat® Senior laboratory mill

Ash content refers to the mineral content of flour. It depends on many factors, such as the variety of wheat, the fertilization, the climate, etc. The gluten index (GI) was examined by Glutomatic 2200 (Perten Instruments AB Huddinge, Sweden). The faringraph determines dough and gluten properties of a flour sample by measuring the resistance of dough against the mixing action of blades. Absorption is the amount of water required to center the faringraph curve on the 500-Brabender unit line. We used the Brabender ® faringraph (Brabender GmbH & Co. KG, Duisburg, Germany). We used Chopin Alveorgraph NG (CHOPIN Technologies, Villeneuve-la-Garenne Cedex, France) the alveograph test were determined according to the EU-Standards. The alveograph determines the gluten strength of dough.

It is measuring the force required to blow and break a bubble of dough. The results include P Value, L Value, P/L Value and W Value. Statistica 8.0 (StatSoft, Inc. Tulsa, USA) and Microsoft © Office 2003 Excel software for Windows were used to perform statistical analyses. The wheat was tested for significance using analysis of variance techniques (ANOVA). A level of significance of $P < 0:05$ is used throughout the analysis.

RESULTS AND DISCUSSION

The crop land was: 6729 Szeged, Alsóváros's black soil 39. The soil type was loam font soil, the thickness of the topsoil was 30-35 cm, and there was P and K supply. The fore crop was oil radish. The different between the Bemutató 2 (Bem. 2.) and the Bemutató 3 (Bem. 3.) was the harvest time (11 days).

The physical, physicochemical and baking characteristics of the 11 varieties in research have been evaluated. *Table 1.* shows the Hardness Index and other technological traits of the wheat samples.

Table 1. Selected technology parameters of the entries in the study

Harvest time	Variety	Flour yield (%)	Ash content (%/d.m..)	Gluten index (%)	Alveograph W (x10-4 J)	Falling number (s)	SKCS HI
Bem.2.	GK ATI	72.19	0.68	83	385.9	361	67.68
Bem.2.	GK BÉKÉS	73.37	0.71	84	443.4	442	71.57
Bem.2.	GKCSONGRÁD	70.55	0.68	76	258.3	394	49.54
Bem.2.	GK ÉLET	75.41	0.56	93	378.1	433	75.29
Bem.2.	GKGARABOLY	69.06	0.52	65	234.0	348	46.58
Bem.2.	GK HATTYÚ	67.32	0.49	80	194.2	320	78.68
Bem.2.	GK HOLLÓ	63.33	0.52	74	241.5	396	32.56
Bem.2.	GK KALÁSZ	66.89	0.62	91	453.1	406	62.41
Bem.2.	GK NAP	70.91	0.51	71	254.3	352	49.15
Bem.2.	GK PETUR	76.43	0.52	98	256.1	381	70.21
Bem.2.	GK VERECKE	75.89	0.53	98	311.8	417	44.29
Bem.3.	GK ATI	75.86	0.66	56	272.0	372	62.4
Bem.3.	GK BÉKÉS	74.28	0.72	73	401.5	437	63.27
Bem.3.	GKCSONGRÁD	68.60	0.63	68	240.7	432	41.39
Bem.3.	GK ÉLET	74.19	0.54	92	359.6	449	68.69
Bem.3.	GKGARABOLY	69.74	0.53	61	222.8	322	71.99
Bem.3.	GK HATTYÚ	67.56	0.48	67	194.1	338	25.32
Bem.3.	GK HOLLÓ	68.73	0.61	60	188.3	409	58.21
Bem.3.	GK KALÁSZ	77.29	0.74	93	415.1	453	42.15
Bem.3.	GK PETUR	75.24	0.59	95	284.8	394	66.95
Bem.3.	GK VERECKE	76.89	0.56	96	265.1	450	47.16

Table 2. Results of ANOVA

Methods	Connection
Flour Yield (%)	N.S., ↑
Gluten Index (%)	N.S., ↓
Thousand kernel weight (g)	N.S., ↑
Falling Number (s)	N.S., ↑
Water Absorption Capacity (%)	N.S., ↓
Hardness Index	S., ↓
Alveograph, P (mm)	N.S., ↓
Alveograph, L (mm)	N.S., ↓
Alveograph, P/L	N.S., ↑
Alveograph, W (x10-4 J)	S., ↓

S.- Significant
N.S.- Non Significant

The SKCS 4100 classifies the results in two groups. Under 50, the wheat samples belong to Soft Wheat-, while samples above values 50 considered as Hard Wheat category.
The samples were tested for significance using analysis of variance techniques (ANOVA). A level of significance of $P < 0.05$ is used throughout the analysis. The *Table 2.* shows the results.

CONCLUSIONS

In our study the flour yield and the thousand kernel weight increased, but they weren't significant. The gluten index decreased and it wasn't significant also. The P, L values of the alveograph decreased and they weren't significant. The changing of Hardness Index was significant. The samples had different Hardness Index, and it was significant. Different weathers existed at the different harvest time. The rainwater was 24.8 mm, it caused the decrease of Hardness Index (*Figure 2.*). The other significant change was the W value of alveograph (*Figure 3.*).
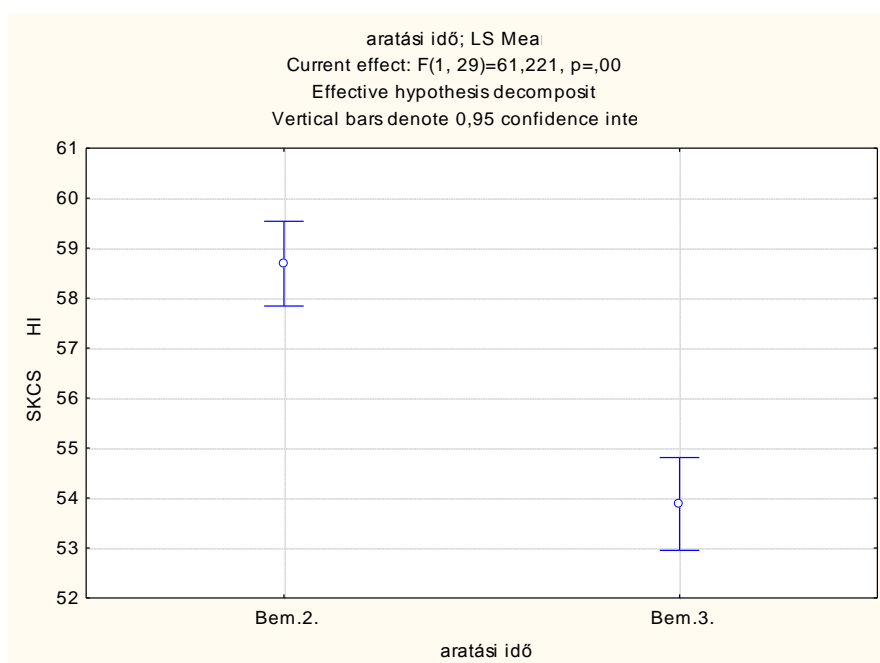

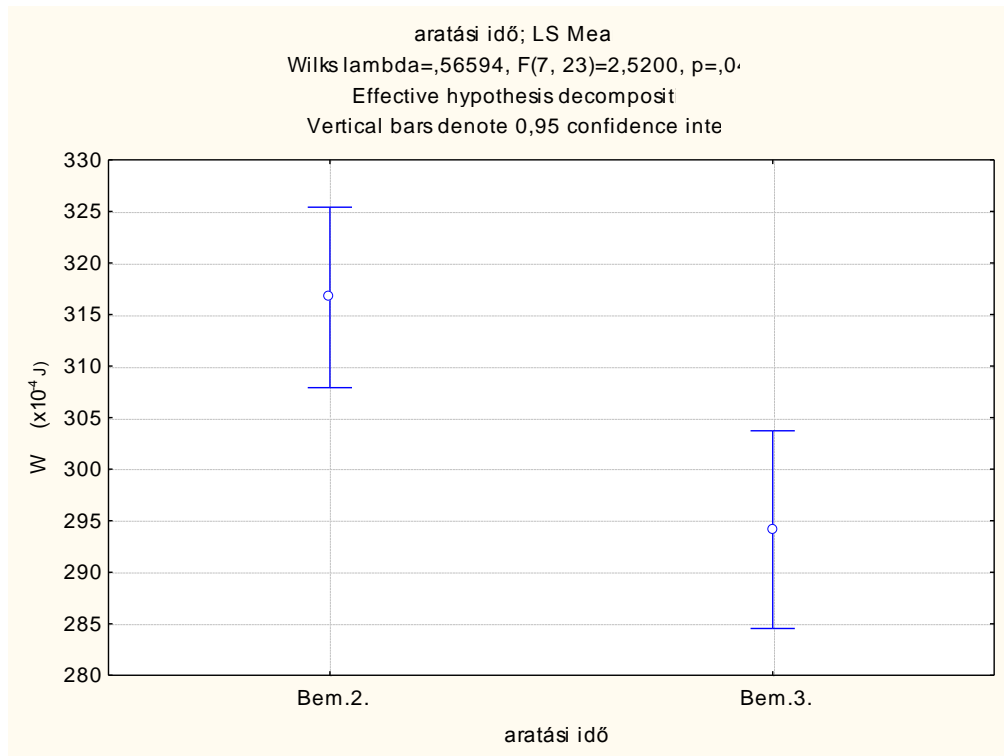**Figure 2. Hardness Index confidential interval**

Figure 3. W value of alveograph confidential interval

The wheat was harvested at two different times, and there was same agro technological treatment. The effects of varieties were dominated, but there was a lot of rain between the two harvest times. We examined the Hardness Index, the gluten characteristic, the alveograph and valorigraph (water absorption capacity) behaviors. We found two significant correlations. The Hardness Index decreased and W value of alveograph showed the same.

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