RESEARCH ON ALVEOGRAPHICAL PARAMETERS OF WINTER WHEAT (*T. AESTIVUM*) VARIETIES

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ABSTRACT

Nowadays, many methods have been worked up in the interests of objective expression of winter wheat rheological quality. These define wide sprektrum in view of their complexity and apparatus claim.

We have to know the new, untraditional quality parameters because of satisfy both costumers of the Europe Union and the export market. The ambition of importers is shown by the fact that needs of certain suppliers and costumers for the alveographical parameter has increased.

Hungary could come in the uniform EU wheat market with special Hungarian wheat and stabilised good quality if we innovate the rheological characteristics. We have to find extra information about the baking value of winter wheat varieties and the qualification of export rate and we have to select special quality types for wheat growing.

In our research we examined the alveographical parameters of 10 winter wheat varieties (GK Kalász, GK Csillag, GK Élet, GK Garaboly, GK Verecke, GK Csongrád, GK Petur, GK Piacos, GK Kapos, GK Hattyú) in Szeged (Hungary) on the basis of the results in three years (2005-2007). We established with correlation analysis that is no statistical relation between the W and G; W and L parameters.

1. INTRODUCTION

The definition of quality has widened with meeting the market needs and costumer-oriented approach. More and more claim appear for special reological characteristics of dough on Hungarian and international wheat market.

The quality of wheat is a complex concept (Lásztity 1980, Véha and Gyimesi 1999, Matuz et al., 2007, Pepó 2007, Tanács 2007).

The Alveograph is suitable for the examination of rheological characteristics which characterises the extensibility of dough (Rakszegi et al., 2005).

The Alveograph qualification of wheat samples is a current method in the French professional word, but it is preferred in West-Europe and Europe Union, too. This method gives extra information for backing tests (Zsikla, 2005).The Alveograph is a modern model of Hankóczy Farinometer. The specialisation of the Alveograph is that: this machine deforms the dough not only in one, but more directions. In the meantime it originates a dough bubble from the dough; in other worlds it imitates the enlargements in the rising dough. The indexes of alveogram are the followings: P (mm) as pressure, L (mm) as break abscissa, G (ml) as swelling index, W (10^{-4}J) as deform work and P/L as a configure or relative of graph. The interpretation of the alveographical characteristics are equal with the extensographical characteristics (Markovics 2004). The attitude of graph means the resistance to extension, the length of graph means the extensibility, the subarea of graph is the energy (Faridi and Rasper 1987).

Vida et al. (1996) analysed the relation between the alveographical and other baking industry quality characteristics of 19 winter wheat varieties and they established the close positive correlation between the alveographical G, W and gluten index with statistical method. The alveographical G and W are in satisfactory significant relation with the wet gluten content.

Matuz el al. (1999) established the values and the value relation of 13 parameters (among others alveographical P, L, P/L, W, G wet gluten content, spreading of wet gluten) of 29 winter wheat varieties produced in 1995, 1996 and 1997. They used double correlation, factor analysis, polyvariable regression analysis and stepwise regression. The aim of their analyses was to define the parameter that has the closest correlation with the alveographical W. They stated that the majority of correlation is different annually.

2. MATERIALS AND METHODS

The 10 representative winter wheat samples (GK Kalász, GK Csillag, GK Élet, GK Garaboly, GK Verecke, GK Csongrád, GK Petur, GK Piacos, GK Kapos, GK Hattyú), which were produced in 2005-2007, originate from the Kecskés breeding station of the Cereal Research Non Profit Company (Hungary). The plot size was 20 m^2/variety, and the wheat types were produced without repetition.

The flour was made in Metefém FQC 109 Labor mill. The quality complied with the requirements of the MSZ 6367/9-1989 standard. The specification of the moisture complied with the requirements of the MSZ 6369/4-87 standard. We made Alveograph examinations with Alveograph by Chopin (AACC 1983.54.30.). The Alveograph examinations were performed in the Laboratory of University of Debrecen Centre for Agricultural Sciences and Engineering Faculty of Agronomy, Institute of Food Science, Quality Assurance and Microbiology. We used SPSS 12.0 for Windows, which runs on Microsoft Windows 2000 operation system.

3. RESULTS AND DISCUSSION

The changes of alveographical parameters

The four types in baking industry are grouped according to alveographical W (deform work) in some member states of Europe Union. In table 1 the GK Kalász variety presents the highest parameter in tree years (in 2005 $469*10^{-4}$J/g, in 2006 $459*10^{-4}$J/g, in 2007 $421*10^{-4}$J/g) and GK Garaboly shows the lowest value in 2005 ($83*10^{-4}$J/g), in 2006 ($89*10^{-4}$J/g) and GK Hattyú in 2007 ($144*10^{-4}$J/g).

We can see that similar situation in the case of average P value, too. GK Kalász shows P=95 mm in 2005, P=93 mm in 2006, P=90 mm in 2007. We analysed the lowest values of GK Garaboly. It was 23 mm in 2005, 29 mm in 2006 (GK Csongrád, too) and 30 mm in 2007.

We can see high L parameters in view of GK Petur in 2005 (253 mm), GK Csongrád in 2006 (203 mm) and in 2007 (209 mm). We analysed low L parameter in view of GK Kapos in 2005 (113 mm), GK Piacos in 2006 (121 mm) and GK Élet in 2007 (103 mm).

We count the G parameter from L, so the G values present similar tendency in tree years. In 2005 and in 2007 the L and G values in view of Petur were the highest parameters and GK Kapos presented the lowest parameters.

Table 1. The alveographical parameters of analysed winter wheat varieties (Debrecen, Hungary 2005-2007)

year	variety	W (10^{-4}J/g)	P (mm)	L (mm)	P/L	G (cm^3)
2005	GK Kalász	469	95	150	0,63	27,19
	GK Csillag	262	82	121	0,68	24,42
	GK Élet	162	47	159	0,30	27,99
	GK Garaboly	83	23	225	0,10	33,30
	GK Verecke	316	74	133	0,56	25,60
	GK Csongrád	116	40	160	0,25	28,08
	GK Petur	194	33	253	0,13	35,31
	GK Piacos	220	53	152	0,35	27,37
	GK Kapos	179	64	113	0,57	23,60
	GK Hattyú	122	27	197	0,14	31,16
2006	GK Kalász	459	93	146	0,63	28,24
	GK Csillag	247	70	130	0,53	25,61
	GK Élet	183	43	163	0,26	25,00
	GK Garaboly	89	29	181	0,16	23,15
	GK Verecke	302	76	152	0,50	28,06
	GK Csongrád	127	29	203	0,14	29,56
	GK Petur	212	53	174	0,30	30,12
	GK Piacos	257	72	121	0,59	24,70
	GK Kapos	214	55	192	0,28	29,56
	GK Hattyú	146	52	186	0,27	30,98
2007	GK Kalász	421	90	147	0,61	27,00
	GK Csillag	248	74	134	0,55	25,80
	GK Élet	213	70	103	0,68	22,60
	GK Garaboly	169	39	167	0,24	28,80
	GK Verecke	271	58	176	0,33	29,50
	GK Csongrád	171	40	209	0,19	32,20
	GK Petur	249	51	201	0,25	31,50
	GK Piacos	243	68	135	0,51	25,80
	GK Kapos	192	72	105	0,69	22,80
	GK Hattyú	144	30	200	0,15	31,50

Correlation among the analysed parameters

In table 2 are close linear positive correlation between the following parameters in 2005: W and P (0,886), W and P/L (0,747). Negative linear correlation is between the followings: P and L (-0,750), P and G (-0,757). We count the P/L value from P and L, the G from L , so there is no sense of the correlation in this situation. There is no statistical relation between W and G and W and L.

Table 2. Correlation among the analysed parameter in 2005

	W (10^{-4}J/g)	P (mm)	L (mm)	P/L	G (cm^3)
W (10^{-4}J/g)	1				
P (mm)	**0,886	1			
L (mm)	-0,412	*-0,750	1		
P/L	*0,747	**0,965	**-0,856	1	
G (cm^3)	-0,413	*-0,757	**0,998	**-0,869	1

** Correlation is significant at the 0.01 level
* Correlation is significant at the 0.05 level

We can see in table 3 similar situation as in table 2. There are close linear positive correlation between W and P (0,936), W and P/L (0,868). There are negative linear correlation between W and L (-0,606), P and L (-0,735). There is no statistical relation between W and G, W and L, P and G.

Table 3. Correlation among the analysed parameter in 2006

	W (10^{-4}J/g)	P (mm)	L (mm)	P/L	G (cm^3)
W (10^{-4}J/g)	1				
P (mm)	**0,936	1			
L (mm)	-0,606	*-0,735	1		
P/L	**0,868	**0,957	**-0,887	1	
G (cm^3)	0,098	0,076	0,508	-0,151	1

** Correlation is significant at the 0.01 level
* Correlation is significant at the 0.05 level

We present the date in 2007 in table 4. There are close linear positive correlation between W and P (0,769) too. There are negative linear correlation between P and L (-0,743), P and G (-0,730). There is no statistical relation between W and G, W and L, W and P/L.

Table 4. Correlation among the analysed parameter in 2007

	W (10^{-4}J/g)	P (mm)	L (mm)	P/L	G (cm^3)
W (10^{-4}J/g)	1				
P (mm)	**0,769	1			
L (mm)	-0,200	*-0,743	1		
P/L	0,445	**0,902	**-0,944	1	
G (cm^3)	-0,175	*-0,730	**0,999	**-0,943	1

** Correlation is significant at the 0.01 level
* Correlation is significant at the 0.05 level

The results of correlation analysis present in three years, that W and P positive, P and L negative connection are to each other and there is no statistical relation between W and G, W and L parameters.

4. SUMMARY

We have to know the new, untraditional quality parameters in Hungary, which satisfy the costumers of the Europe Union and the export market, too.
The gluten examination test is dominant in Hungary. It has its own reasons and traditions.
Hungary could come in the uniform EU wheat market with special Hungarian wheat and stabilised good quality if we innovate the rheological characteristics. The costumers decide about the conditions of EU and Hungarian market and the research innovations often aim at them.
The pizza-, strudel-, puff- and creeker flour types are curiosity flour types in the French, Polish, German, Dutch and Italian dough flour market. These flour types are required to have the followings: extensographical extensibility and alveographical "P" parameter.
More and more laboratories have Alveograph in Hungary. If we can standardize the claimed parameters, the market and the customers will be satisfied with Hungary. It is important to give the correct, fast specification of the claimed parameters. We have to find extra information about the baking value of winter wheat varieties and the qualification of export rate and we have to select special quality types for wheat growing.
In our research we examined the alveographical parameters of 10 winter wheat varieties (GK Kalász, GK Csillag, GK Élet, GK Garaboly, GK Verecke, GK Csongrád, GK Petur, GK Piacos, GK Kapos, GK Hattyú) in Szeged (Hungary) on the basis of the results in three years (2005-2007), which were produced in 2005-2007, originate from the Kecskés breeding station of the Cereal Research Non Profit Company.
The alveographical W value plays impotent roll in baking industry in some member states of Europe Union. The GK Kalász variety presents the highest parameter in tree years and GK Garaboly the lowest value in 2005, 2006 and GK Hattyú in 2007.
We established with correlation analysis in three years that is no statistical relation between the W and G; W and L parameters.

This extra information can give us help to select special quality types for wheat growing and qualify the different export rate.

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