WHEAT QUALITY FOR A BETTER LIFE

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Abstract

The wheat flour is the basic food product. Grain texture (hardness) in wheat (Triticum aestivum L.) is a major determinant of end-usage. Wheat kernel hardness determines quality, flour yield, flour particle-size, water absorption and other quality characteristics of cereals. The aim of our research was to determine the correlation between the set of grains and its milling product. We found correlation among these results.

Keywords*:* wheat quality, protein content, grain

1. INTRODUCTION

The wheat is the most valuable cereal. It is grown in 240-250 m acre all over the world (Pena 1997, Matsuo 1985). Cereal grains and wheat in particular, are among the most important crops globally (Véha 2007).There is a requirement to ensure the organoleptic quality of crops to ensure good commercial returns and safety of the product (Evans et al., 2000).

There are three parts which make up the wheat kernel: the endosperm, the bran, and the germ. The endosperm is the largest part of the kernel and takes up eighty-three percent of the kernel's mass. The wheat bran is the outer coat of the kernel and, therefore, is a very good source of fiber. It comprises about 14.5 percent of the kernel's mass. The wheat germ is the sprouting section or embryo of the wheat. It makes up about 2.5 percent of the total kernel mass.

Wheat genetics is more complicated than that of most other domesticated species. Some wheat species are diploid, with two sets of chromosomes, but many are stable polyploids, with four sets of chromosomes (tetraploid) or six (hexaploid). (Hancock, James, 2004)

The quality and qualification aspects of wheat as a global cereal are in the focus of theoretical and practical interest. It is an effort that qualification should be feasible from the least possible material reliably and as quickly as possible referring to the capability of being processed. The kernel structure of the wheat depends on the consistency of the inner part of the kernel. It have been cleared the biochemical background of the kernel hardness too. A protein called friabilin with 15 kDa molecular weight is responsible for the softening of the originally hard structure (in a paradox way for the softness). Under kernel hardness we understand a resistance against a given force. The relationship between wheat protein content and kernel texture is usually positive and kernel texture (hardness) influences the grinding-energy (e_g) during milling. Hard Wheat grains require more e_g than Soft Wheat.

In this study was tried to find the answer by carrying out tests of little material requirement on sample series containing 26 kinds of breadwheat to what quality correlation exists between the set of grains and its milling product.

MATERIAL AND METHODS

Twenty-five (registered wheat varieties) of bread with diverse technological qualities were used in this study. On the grain thousand kernel weight (TKW), bulk density (BD), hardness (HI), moisture content (wMC), ash (wAC), crude protein (CPC) and starch (SC), flour yield (FY) (Figure 1.) were determined. From the flour obtained this way moisture content (fMC), ash (fAC), wet (WG) and dry gluten (DG), hydration quotient (HQ), gluten index (GI) (Figure 2.), gluten spreading (GS), falling number (FN), damage of starch (SD matic), as well as water adsorbing-capacity (WAC) on valorigraph (P,L,W values) and characteristics of reology of dough were determined, too. We used twin correlation to determine the connection, the significant level was 5 %.

Figure 1. Brabender ® Quadrumat ® Senior (Brabender GmbH & Co. KG, Duisburg, Germany)

Figure 2. Glutomatic 2200 (Perten Instruments AB Huddinge, Sweden)

Table 1

Selected parameters of the samples (wheat)

Variety	SKCS Hardness Index	Starch (%/d.m.)	Crude protein (%/d.m.)	Flour yield (%)
FLAMURA	68,3	64,34	15,98	74,06
FUNDULRA	73,02	62,45	16,5	69,77
DROPIA	68,1	64,44	15,84	73,57
ALEX	72,68	65,34	15,5	72,73
CIPRIAN	63,22	62,65	16,84	71,3
BOEMA	66,27	65,85	15,23	73,01
CRINA	72,64	66,44	14,94	74,58
DELABRAD	76,99	64,15	15,54	72,79
DOR	74,68	65,46	14,83	73,45
FAUR	75,76	64,12	15,48	70,5
GLORIA	70,94	66	14,66	71,35
GRUIA	72,2	66,93	14,62	71,9
HOLDA	73,27	64,65	15,91	71,25
JIANA	67,97	64,42	15,22	71,69
JUPITER	80,06	65,55	14,79	73,91
TURDA	72,18	62,98	16,35	70,61
ARIESAN	52,97	64,14	16,32	71
DUMBRAVA	77,77	62,6	16,97	72,36
APULLUM	71,59	64,27	16,14	69,33
CAPELLE	51,61	65,89	13,12	68,42
GK ÉLET	78,96	65,7	15,17	74,27
GK ÖTHALOM	67,88	66,34	14,26	75,97
MV EMESE	75,64	65,26	15,31	74,05
PLAINSMAN	69,59	62,81	17,14	71,61
XIANG	63,18	60,14	19,41	70,65

Table 2.

Selected parameters of the samples (flour)

Variety	Water-adsorbing capacity (%)	Falling number (s)	Gluten index (%)	Wet gluten (%)	Dry gluten (%)	Gluten spreading (mm)
FLAMURA	65,45	418	87,76	31,88	11,18	0,6
FUNDULRA	67,4	417	59,04	31,63	11	1,6
DROPIA	65,8	383	79,31	32,63	11,35	0,6
ALEX	65	434	80,89	31,38	11,08	1,1
CIPRIAN	65,28	492	63,36	34,38	12	1,3
BOEMA	62,55	379	64,32	31,25	10,95	1,5
CRINA	65,7	335	61,34	29,75	10,18	1,8
DELABRAD	66,38	393	71,26	31,75	11,05	1,5
DOR	64,93	330	45,25	30	10,15	2,8
FAUR	63,45	387	63,22	32,25	11,1	1,5
GLORIA	65,73	428	66,84	29,63	10,33	1,6
GRUIA	62,43	447	65,61	29,88	10,43	1,9
HOLDA	66,78	395	39,1	33,38	11,45	3,4
JIANA	63,08	380	64,08	30,63	10,7	1,4
JUPITER	66,43	379	68,69	28,13	9,65	1,1
TURDA	65,86	369	46,08	33,13	11,38	3,5
ARIESAN	65,83	388	23,55	32,63	11,23	6,9
DUMBRAVA	66,25	406	73,62	34,88	12,15	1,6
APULLUM	66,08	390	39,17	32,88	11,05	4
CAPELLE	58,53	352	83,24	25,38	8,7	1,1
GK ÉLET	64,45	404	90,45	30,13	10,55	0,5
GK ÖTHALOM	61,58	369	92,23	27,38	9,65	0,8
MV EMESE	64,58	408	85,92	31,25	10,93	0,5
PLAINSMAN	66,03	386	99,48	33,38	12,15	0,5
XIANG	73,08	358	63,01	41,25	14,1	2

3. RESULTS AND CONCLUSION

The expected pairs of properties well-known from the practice, such as protein and starch contents (negative correlation) (Figure 4.), protein and gluten contents, valorigraphic dough softening and the value number, displayed very close (r>0,9) linearity. Close negative correlation occurred between gluten spreading and gluten index (Figure 3.), which we have not experienced so far. Grain-size and -volume, the water-absorbing capacity and different forms of proteins of flour, starch (Figure 5.) and gluten forms (with negative sign) (Figure 6.) displayed the close correlation (r=0,8-0,9) expected.

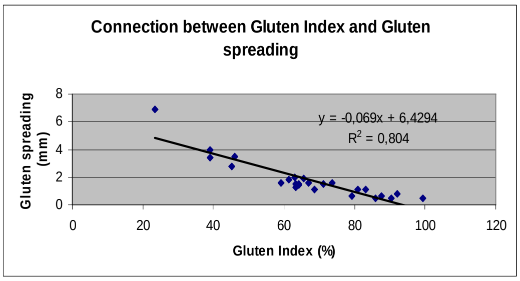

Figure 3. Connection between the gluten index and gluten spreading

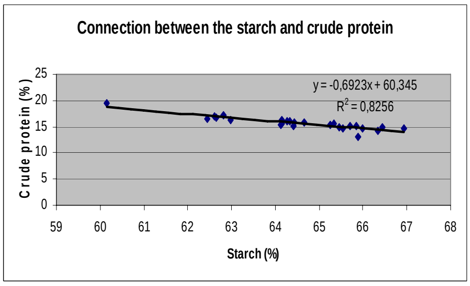

Figure 4. Connection between the starch and crude protein

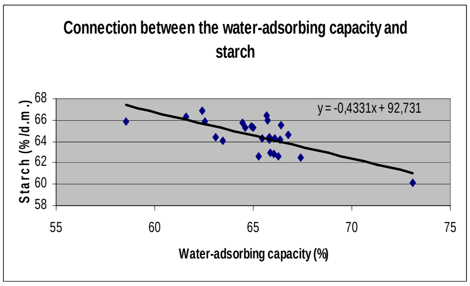

Figure 5. Connection between the water-adsorbing capacity and starch

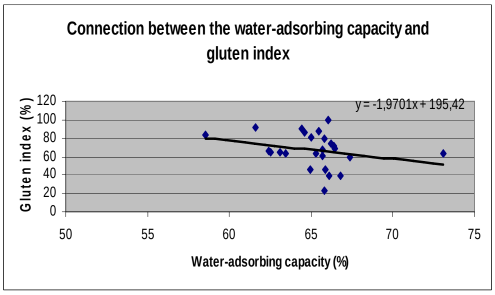

Figure 6. Connection between the water-adsorbing capacity and gluten index

The characteristics measured on the grain mass with a milling percentage referring to flour yield in flour milling correlated significantly but weakly (r=0,38-0,5) expect for ash and protein content. Protein and gluten contents were of positive whereas starch content was of negative effect on the water requirement of the desired dough consistency (r=0,38-0,8). The multiple variable regressin selected starch, and protein content, and the parameters of starch damage, gluten hydration (HV) and strength (GI) by a determination of 78-79%. The indexes expressing the gluten structure (HV, GI, spreading) with the indicators of the produced and processed dough in the valorigraph and the falling number were in medium-weak (r=0,38-0,8) correlation. Stepwise statistics selected the dry gluten and spreading features with an influence of 99%. The SKCS and glutomatic systems of gluten testing can be recommended for the practical wheat qualifications because it is possible to draw conclusions for the milling and baking suitability of wheat from their findings with great certainty. Both devices are of little material requirement, rapid and automated. The comparing of the two devices with baking performance can present itself as a further research task.

These connections found in this work will help to better understanding the wheat grain and flour quality technological aspects and provide useful information to breeders to develop new, high quality hard and soft wheat varieties.

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