QUALITY INDICES OF THE *TRITICUM DURUM* (THE PANDUR CULTIVAR) UNDER THE IMPACT OF DENSITY AND AGRI-FUND

INDICII DE CALITATE LA GRÂUL TRITICUM DURUM (SOIUL PANDUR) SUB INFLUENȚA DENSITĂȚII ŞI A AGROFONDULUI

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Abstract: *In the field, we measured the density of the plants at the beginning of winter and upon kernel formation, and in the laboratory we measured the physical indices 1000-grain mass and hectolitric mass, as well as quality indices such as protein, gluteic index, vitrosity, moist gluten, fall index, deformation index, etc.*

Determination of quality indices of the yield was done through methods accepted by quality standards and stipulated for bread-making wheat 812-ISO7970/2001.

The method we used was strip setting with overlapped agri-funds. The values of quality indices were measured in the laboratory and are compared through average values and present in tables and graphs.

Rezumat: *În câmp s-au determinat: densitatea plantelor la intrarea în iarnă şi la înspicare iar în laborator s-au determinat indicii fizici: MMB şi MH precum şi valorile însuşirilor de calitate:proteină, indice glutenic, sticlozitate, gluten umed, indicele de cădere, indicele de deformare, e*

Determinarea valorilor însuşirilor de calitate a producţiei s-a făcut prin metode acceptate de standardele de calitate şi prevăzute pentru grâul de panificaţie 812-ISO7970/2001.

Metoda folosită a fost aşezarea în fâşii cu agrofonduri suprapuse.valorile indicilor de calitate au fost determinate în laborator şi sunt comparaţi între ei prin valori medii fiind prezenţi în lucrare sub forma tabelarăşi grafică.

Key words : *triticum durum, densiti, quality, agri-fund*

Cuvinte cheie: : *triticum durum, densitate, calitate, agrofond*

INTRODUCTION

The quality of raw matter used in bread-making and in the pasta industry is of decisive importance for the quality of the products. Wheat quality is determined by the cultivar, technological conditions, and soil and climate conditions. Results in the Pandur durum wheat cultivar in the years 2006 and 2007 show that this is a valuable cultivar for the pasta industry from the point of view of its quality indices.

Wheat quality, no matter its destination, is a main factor in establishing its market value.

The quality feature values are strongly influenced by the technology applied (TABĂRĂ, 2005). Wheat quality for the pasta industry is given by gluten, gluteic index, vitrosity, protein content, fall index, deformation index, etc.

Proteins, among which gluten is the most important component, together with other substances in the grain, give the nutritious, technological, and processing value of the wheat (TODEA AND ROMAN, 2004).

MATERIAL AND METHOD

In order to check the quality indices, we organised an experiment whose results are analysed in this paper: we worked on the Pandur durum wheat cultivar developed at the I.C.A.A. Fundulea.

The experiment, of the bi-factorial type, was set in the field after the strip method for a Factor B – sowing density and after the randomised block method for Factor A – agri-fund.

In the field, we measured the density of the plants at the beginning of winter and upon kernel formation, and in the laboratory we measured the physical indices 1000-grain mass and hectolitric mass, as well as quality indices such as protein, gluteic index, vitrosity, moist gluten, fall index, deformation index, etc.

Determination of quality indices of the yield was done through methods accepted by quality standards and stipulated for bread-making wheat 812-ISO7970/2001.

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RESULTS AND DISCUSSION

The values of moist gluten content (GU%) are presented in Tables 1 and 2.

Table 1

Moist gluten content in the Pandur cultivar under the impact of agri-fund an of sowing density in the years 2006 and 2007 in the conditions of the Didactic Station in Timişoara

Density gg/m^2 Agrofond	Experimental years						
	2006			2007			
	200 gg/m^2	400 gg/m^2	600 gg/m^2	200 gg/m2	400 gg/m^2	600 gg/m^2	Moist gluten
$A_1 – N_{60}P_{60}K_{60}$	32.8	32.4	33.8	29.8	29.8	29.2	31.3
$A_2 – N_{90}P_{60}K_{60}$	33.2	33.0	33.2	30.8	30.8	31.2	32
$A_3 –N_{120}P_{60}K_{60}$	33.8	34.0	33.2	32.0	32.0	32.0	32.8
$A_4 – N_{150}P_{60}K_{60}$	33.8	33.6	33.2	32.8	32.8	31.6	32.9
$A_5 – N_{60}P_{60}K_{60}$ + Foliar	33.8	33.8	33.4	30.2	30.2	30.2	31.9
Density average	33.5	33.4	33.2	33.6	33.6	30.8	33
Year average	33.4			31.8			

Table 2

Conținutul mediu în gluten umed (GU%) sub influența agrofondului şi a densității de semănat la soiul Pandur în anii 2006-2007 în condițiile dela SDE Timişoara

Density gg/m^2 Agrofund	200gg/m^2	400 gg/m^2	600 gg/m^2	Moist gluten
$A_1 – N_{60}P_{60}K_{60}$	31.3	31.1	31.5	31.3
$A_2 – N_{90}P_{60}K_{60}$	32.5	31.9	31.7	32.0
$A_3 – N_{120}P_{60}K_{60}$	35.3	33.0	32.6	33.6
$A_4 – N_{150}P_{60}K_{60}$	36.5	33.2	32.4	34.0
$A_5 – N_{60}P_{60}K_{60}$ + Foliar	32.2	32.0	31.8	32.0
Density average	33.6	32.2	32.0	32.6

Climate conditions influence moist gluten content in the Pandur cultivar. We can see this in the average values of the gluten over the year 2006 (33.4%) and 2007 (31.8%).

Increasing nitrogen doses on a constant phosphorus fund ($P_{60}K_{60}$) results in an increase of the moist gluten content in the wheat grains of the Pandur cultivar.

Sowing density has a small impact on the moist gluten content (GU%).

We can notice a decreasing trend together with an increase of the sowing density from 200 gg/m^2 la 600 gg/m^2.

Gluteic index (IG) is presented in Tables 3 and 4. Analysing the values of the gluteic index we can see that it increases with the increase of the nitrogen dose. To note that fertilising with nitrogen increases the values of the gluteic index.

Table 3

Values of the gluteic index in the Pandur wheat cultivar under the impact of agri-fund and of sowing density in the years 2006 and 2007 in the conditions of the Didactic Station in Timişoara

Density gg/m^2 Agrofond	Experimental years						
	2006			2007			
	200 gg/m^2	400 gg/m^2	600 gg/m^2	200 gg/m2	400 gg/m^2	600 gg/m^2	Gluteic index
$A_1 – N_{60}P_{60}K_{60}$	28	28	28	69	63	66	47.0
$A_2 – N_{90}P_{60}K_{60}$	45	30	34	72	69	72	53.7
$A_3 –N_{120}P_{60}K_{60}$	50	72	32	70	84	84	65.3
$A_4 – N_{150}P_{60}K_{60}$	50	43	40	79	92	82	64.3
$A_5 – N_{60}P_{60}K_{60}$ + Foliar	33	34	26	72	70	71	51.0
Density average	41.2	41.4	32	72.4	75.6	75	59.2
Year average	36.7			74.3			

Under the impact of sowing density there is decrease of the gluteic index, therefore density increases from 200 gg/m^2 to 600 gg/m^2 (Table 4).

Table 4

Average values of the gluteic index in the Pandur cultivar under the impact of sowing density on different agri-funds in the years 2006 and 2007 in th conditions of the Didactic Station in Timişoara

Density gg/m^2 Agrofund	200gg/m^2	400 gg/m^2	600 gg/m^2	Gluteic index
$A_1 – N_{60}P_{60}K_{60}$	48.5	45.5	47.0	46.25
$A_2 – N_{90}P_{60}K_{60}$	58.5	49.5	53.0	51.25
$A_3 – N_{120}P_{60}K_{60}$	60.0	63.0	58.0	60.5
$A_4 – N_{150}P_{60}K_{60}$	64.5	67.5	61.0	64.25
$A_5 – N_{60}P_{60}K_{60}$ + Foliar	52.5	52.0	48.5	50.25
Density average	56.8	55.5	53.5	54.5

Vitrosity is an important quallity factor in the pasta industry durum wheat. Under the impact of nitrogen, vitrosity index decreases from 64% on a $N_{60}P_{60}K_{60}$ agri-fund, to 69% on a $N_{150}P_{60}K_{60}$ agri-fund.

Table 5

Values of the vitrosity index in the Pandur cultivar under the impact of agri-fund and of sowing density in the years 2006 and 2007 in th conditions of the Didactic Station in Timişoara

Density gg/m^2 Agrofond	Experimental years						
	2006			2007			
	200 gg/m^2	**400 gg/m^2**	**600 gg/m^2**	**200 gg/m^2**	**400 gg/m^2**	**600 gg/m^2**	**Vitrosity average**
$A_1 – N_{60}P_{60}K_{60}$	74	75	74	52	52	55	64
$A_2 – N_{90}P_{60}K_{60}$	76	76	76	55	53	55	65.16
$A_3 –N_{120}P_{60}K_{60}$	76	77	79	57	52	56	66.16
$A_4 – N_{150}P_{60}K_{60}$	78	77	79	58	62	58	69
$A_5 – N_{60}P_{60}K_{60}$ + Foliar	76	74	72	52	52	52	63
Density average	76	75.8	76	54.8	54.2	55.2	65.33
Year average	75.9			54.7			

Per years, the highest value of the vitrosity indexc was in 2006 (57.9%) compared to only 54.7% in 2007.

From the point of view of density, we can see that it had no impact at all on the vitrosity index.

Table 6

Valorile medii ale indicelui de sticlozitate la soiul Pandur sub influenţa densităţii de semănat pe diferite agrofonduri în anii 2006-2007 în condiţiile dela SDE Timişoara

Density gg/m^2 Agrofond	200 gg/m^2	400 gg/m^2	600 gg/m^2	Vitrosity average
$A_1 – N_{60}P_{60}K_{60}$	63.0	63.5	64.5	64
$A_2 – N_{90}P_{60}K_{60}$	65.5	64.5	65.5	65
$A_3 –N_{120}P_{60}K_{60}$	66.5	64.5	67.5	66
$A_4 – N_{150}P_{60}K_{60}$	68.0	69.5	70.5	70
$A_5 – N_{60}P_{60}K_{60}$ + Foliar	64.0	63.0	62.0	62.5
Density average	65.4	65.0	66.0	65.5

Another important bio-chemical component in the wheat caryopses is proteins. Their role is very complex, since they play different roles such as that of constitution substances, bio-catalysist, rserve substances in amino-acids, carriers of some bio-molecules, protective agents, antibodies, and hormones, and their presence in food is absolutely necessary since they represent the only source of essential amino-acids.

As such, their content in substances is partivularly important both nutritiously and technologically (milling, bread-making).

Protein is the main element in pasta wheat quality. The values of protein content under the impact of agri-fund and sowing density are presented in Table 7.

Average values of protein content in the Pandur cultivar under the impact of agri-fund and of sowing density in the onditions of the year 2006-2007 at the Didactic Station in Timişoara lead to the following conclusions: increasing nitrogen dose increases protein content – 15% on an agri-fund of $N_{60}P_{60}K_{60}$ and 17.3% on the maximum nitrogen dose agri-fund $N_{150}P_{60}K_{60}$. upon foliar fertilisation, the moment the spikes appoeared protein content increases on the average for the two years with 0.7%.

Table 7

Average values of protein content in the Pandur cultivar under the impact of the agri-fund and of sowing density in the years 2006 and 2007 in the conditions of the Didactic Station in Timişoara

Density gg/m^2 Agrofond	Experimental years						
	2006			2007			
	200 gg/m^2	400 gg/m^2	600 gg/m^2	200 gg/m2	400 gg/m^2	600 gg/m^2	Protein content
$A_1 – N_{60}P_{60}K_{60}$	16.9	15.9	15.7	14.1	14.3	13.3	15.0
$A_2 – N_{90}P_{60}K_{60}$	17.4	16.6	16.5	15.7	16.0	15.5	16.3
$A_3 –N_{120}P_{60}K_{60}$	16.2	16.3	16.6	18.2	16.9	16.2	16.7
$A_4 – N_{150}P_{60}K_{60}$	16.9	16.8	16.6	18.5	17.8	17.1	17.3
$A_5 – N_{60}P_{60}K_{60}$ + Foliar	16.3	17.1	16.1	14.6	14.2	16.1	15.7
Density average	16.74	16.54	16.3	16.22	15.84	15.64	16.20
Year average	16.53			15.90			

Climate conditions also influence protein content. Thus, in 2006, protein content in the Pasndur durum wheat cultivar was 16.53%, and in 2007 it was 15.90%.

Analysing the impact of sowing densities on protein content (Table 8) points out the fact that this factor has a small impact on protein content in the durum wheat. Results

concerning protein content under the impact of density show a decreasing trend together with an increasing of sowing density. This is due to the fact that for sa smaller dernsity plants beenfit from a larger spreading area and, therefore, more nitrogen favouring a higher density and a higher protein content.

Table 8

Average values of protein content in the Pandur cultivar under the impact of agri-fund and of sowing density in the conditions of the years 2006 and 2007 at the Didactic Station in Timişoara

Density gg/m^2 Agrofond	**200 gg/m^2**	**400 gg/m^2**	**600 gg/m^2**	**Protein content**
$A_1 – N_{60}P_{60}K_{60}$	15.5	16.1	14.5	15.0
$A_2 – N_{90}P_{60}K_{60}$	16.55	16.3	16.0	16.3
$A_3 –N_{120}P_{60}K_{60}$	17.20	16.6	16.4	16.7
$A_4 – N_{150}P_{60}K_{60}$	17.76	17.3	16.9	17.3
$A_5 – N_{60}P_{60}K_{60}$ + Foliar	16.45	15.70	16.1	15.8
Density average	16.50	16.20	16.0	16.2

CONCLUSIONS

Research during the years 2006 and 2007 and results obtained allow us to draw the following conclusions:

1. Quality indices, i.e. moist gluten, gluteic index, vitrosity, and protein content are strongly influenced by environmental conditions and by experimental factors (agri-fund and sowing density).

2. The Pandur durum wheat cultivar proved to be a valuable cultivar for the pasta industry due to its main quality indices.

3. Climate conditions influence moist gluten content in the Pandur durum wheat cultivar. We can see that in the average values of gluten in 2006 (33.45%) and in 2007 (31.8%).

4. To note the fact that nitrogen fertilisation increases gluteic index values. Under the impact of sowing density, gluteic index diminishes therefore there is an increase of density from 200 gg/m^2 to 600 gg/m^2.

5. Vitrosity is an important quality factor in the pasta industry durum wheat. Under the impact of nitrogen, vitrosity index decreases from 64% on an agri-fund of $N_{60}P_{60}K_{60}$ to 69% on an agri-fund of $N_{150}P_{60}K_{60}$.

6. Increasing nitrogen dose results in an increase of protein content in the Pandur durum wheat cultivar, as follows: 15% on a $N_{60}P_{60}K_{60}$ agri-fund, and 17.3% on the maximum nitrogen agri-fund $N_{150}P_{60}K_{60}$. Foliar fertilisation the moment pikes appear results in an increase of the protein content on the average for the two years of 0.7%.

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