THE EFFECT OF THE FERTILIZATION AND CULTIVAR ON SOME QUALITY TRAITS AT THE WINTER WHEAT

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Abstract

In the environmental conditions of the agricultural years 2005/2006, 2007/2008 and 2008/2009 on a chernozem soil, it was studied the influence of fertilization on protein content, wet gluten, dry gluten, starch, the volume and the bread weight at 12 wheat varieties.

Analyzing the influence factors investigated on the interaction of quality indicators, it appears that the highest percentage of crude protein was recorded at the $N_{120}P_{80}K_{80}$ X Crina cultivar variant with a value of 15.73%; the highest dry and wet gluten content was recordet at the $N_{120}P_{80}K_{80}$ X Boema variant with a value of 33.80 and 8.62% respectively; the maximum starch content was found at the $N_0P_0K_0$ X Moldova 83, of 66.42%; the largest volume of the bread was recordet at $N_{120}P_{80}K_{80}$ X Beti and $N_{120}P_{80}K_{80}$ X Iaşi 2 of 501 cm^3 and the highest bread weight of 146.0 g at $N_{120}P_{80}K_{80}$ X Beti variant.

Key words: wheat, fertilizer, cultivar, protein, starch, gluten.

In the last decades the exacerbation of the agricultural production had contributed to the improvement of the production quantity and quality and to a better stability of the production capacity in the context of equilibration the fertilizers doses especially with N (Herzog et Richner, 2005; Favre, G., 2006).

In the process of obtaining wheat cultivars is very important establishing the production capacity, the resistance to pathogens and the baking quality. The baking quality is a very complex propriety and it is influenced by many factors that must be analyzed carefully.

The wheat caryopsis contain o big number of components, but the most important are starch and protein. The pentrozans and the lipids are very important in the baking qualities, but especially for the ear germination and for the vitrescene sticlozitate (Kleijer, G., 2002; Ryser, J., s.a., 1987; Hera, Cr. Şi colab.,1988; Negrilă, Maria, , Negrilă, E., 1995).

MATERIAL AND METHOD

The research was made at S.C.D.A. Podu-Iloaiei during 2005-2009 on a chernozem soil with a pH of 6.8, 3.56% humus, 0.16% total Nitrogen, 12 ppm P_2O_5 and 169 ppm K_2O.

The climatic condition from the agricultural years 2005-2006, 2007-2008 and 2008-2009 were favorable for the winter wheat regarding the temperature and the precipitation. The agricultural year 2006-2007 was unfavorable for the experiments because of the absence of precipitation and high temperatures and the results cannot be taken in consideration.

In this paper we present the average of the results obtained in the three agricultural years regarding the baking quality of the wheat caryopsis from the 12 wheat cultivars observed during the research. The analyses were made at S.A. Şoimul S.R.L. from Tulcea district.

RESULTS AND DISCUSSIONS

The protein analysis from the wheat caryopsis is very important, the proteins being divided in four classes: albumin, globulin, glialin and gluten. The glutein and glialin have an unique capacity to form a viscous network having a very important role upon the rheological propriety of the dough.The wheat starch is composed of polysaccharides and have a important role as gelling agent viscous ant and water binding being an endless source of sugars ensuring the growth of the leavens.

Analyzing the influence of fertilization upon some quality wheat indices (*table 1*) it can be observed a increase of the gross protein content at the fertilization with $N_{120}P_{80}K_{80}$ with a difference of 2.68% than the control variant ($N_0P_0K_0$) and with a difference of 1.24% than the fertilization with $N_{60}P_{80}K_{80}$. This increase of protein content is because of the doubling of the N dose from 60 kg/ha to 120 kg/ha.

Determination of the gluten quantity existing in a flour it allows to establish if that flour is good

for bread manufacture. The fertilization with $N_{120}P_{80}K_{80}$ had determined the increase of the wet gluten with 6.72% and of the dry gluten with 1.14%. The starch content decreased with 3.04% when it was fertilized with the dose $N_{120}P_{80}K_{80}$ compared to $N_0P_0K_0$. The fertilization had determined important increases of the volume and bread weight. At the fertilization with $N_{120}P_{80}K_{80}$ the bread volume increased with 4.5 than the control variant. This results are permitting us to appreciate the fertilizers role especially those with Nitrogen at the improvement the bread manufacture quality of the wheat.

Table 1

The influence of the fertilization upon some quality indices at the winter wheat. The average from 2005-2009

Fertilizers NPK	Gross protein (%)	Wet gluten (%)	Dry gluten (%)	Starch (%)	Bread volume (cm^3)	Bread weight (g)
$N_0P_0K_0$ Mt.	12.26	24.10	6.86	65.10	430.75	138.25
$N_{60}P_{80}K_{80}$	13.70**	27.58**	7.54**	63.18	477.75***	142.50***
$N_{120}P_{80}K_{80}$	14.94***	30.82***	8.00***	62.06^{O}	489.83***	142.75***
DL 5%	0.90	1.19	0.41	3.01	4.90	1.52
DL 1%	1.11	2.23	0.56	5.69	9.12	2.93
DL 0.1%	2.22	4.41	1.09	8.23	18.11	3.44

The results from *table 2* accentuate the influence of the cultivar upon some quality indices at wheat. From the table it results that the high protein content was recorded at the Gruia cultivar with a value of 14.15%, the biggest content of dry and wet gluten was recorded at Boema cultivar with a value of 30.13% respectively 8.07%, the biggest content of starch was obtained at Moldova 83 cultivar with a value of 64.27%, the biggest bread volume has the crina cultivar of 477 cm^3 and the biggest bread weight was obtained at the cultivars Beti and Gruia of 143,6 g.

Table 2

The influence of the cultivar upon some quality indices at the winter wheat. The average 2005-2009

The cultivar	Gross protein (%)	Wet gluten (%)	Dry gluten (%)	Starch (%)	Bread volume (cm^3)	Bread weight (g)
Beti	13.89	27.51	7.66	63.27	473	143.6
Boema	13.07	30.13	8.07	64.03	472	139.6
Crina	13.49	25.14	7.04	63.76	477	141.3
Dropia	14.41	28.58	7.72	63.39	473	141.3
Eliana	13.93	25.14	7.03	63.40	451	140.6
Faur	13.95	28.65	7.57	63.23	473	140.3
Flamura 85	14.00	27.53	7.39	63.17	427	137.6
Gabriela Mt.	13.55	27.56	7.48	63.25	455	141.0
Gruia	14.15	28.62	7.46	62.89	470	143.6
Iaşi 2	13.06	27.13	7.38	63.97	476	140.6
Izvor	13.15	27.79	7.58	63.73	473	142.6
Moldova 83	12.97	26.25	7.28	64.27	469	141.3
DL 5%	0.11	0.23	0.07	0.69	5.10	1.54
DL 1%	0.23	0.47	0.12	1.41	10.43	3.15
DL 0.1%	0.41	0.85	0.23	2.55	18.87	4.71

The interaction between the researched factors (*table 3*) had shown that the biggest protein content was obtained at $N_{120}P_{80}K_{80}$ X Crina with the value of 15.73%. Regarding the wet and dry gluten the values were 33.80% and 8.62 % at the interaction $N_{120}P_{80}K_{80}$ X Boema. The biggest starch content was obtained at the interaction $N_0P_0K_0$ X Moldova 83 with a value of 66.42%.

The biggest bread volume was obtained at the interaction $N_{120}P_{80}K_{80}$ X Beti at Iasi 2 cultivar on the agrofond of 201 cm^3.

The biggest bread weight of 146 g was obtained at the interaction $N_{120}P_{80}K_{80}$ X Beti.

CONCLUSIONS

The wheat cultivars from Romania have generally a very good bread manufacture quality;

The results of our research are very useful in chosen the best cultivars for the bread manufacture process;

The fertilization with NPK is determine the increase of quality indices (protein, wet gluten) from the good propriety to the best one;

The best interaction was realized at $N_{120}P_{80}K_{80}$ X Beti cultivar with a protein content of 15.22%, 31.125 dry gluten, 8.44 wet gluten, bread volume 501 cm^3 and bread weight 146 g.

Table 3

The influence of the interaction between fertilization and cultivar upon some quality indices. The average on 2005-2009

Fertilization NPK	Cultivar	Gross protein (%)	Wet gluten (%)	Dry gluten (%)	Starch (%)	Bread volume (cm^3)	Bread weight (g)
$N_0P_0K_0$ Mt.	Beti	12.92	25.30	7.13	64.41	431	140
	Boema	12.11	24.70	6.99	64.73	435	137
	Crina	11.90	21.14	5.92	66.12	453	138
	Dropia	13.11	25.44	7.42	63.82	436	139
	Eliana	12.34	22.90	6.41	65.90	416	138
	Faur	12.62	24.33	6.92	64.62	436	137
	Flamura 85	12.30	24.40	6.83	64.21	398	136
	Gabriela Mt.	12.33	23.88	6.92	64.29	418	138
	Gruia	12.90	26.11	7.31	64.88	433	141
	Iaşi 2	11.13	22.41	6.48	66.38	439	137
	Izvor	12.09	25.11	7.11	65.42	436	139
	Moldova 83	11.44	23.52	6.98	66.42	438	139
$N_{60}P_{80}K_{80}$	Beti	13.55	26.11	7.42	63.11	487	145
	Boema	13.25	31.90	8.60	63.13	485	140
	Crina	12.85	26.40	7.32	64.04	483	144
	Dropia	14.80	28.15	7.77	62.21	486	142
	Eliana	13.84	25.34	7.09	63.11	466	143
	Faur	13.92	28.51	7.72	63.42	485	141
	Flamura 85	14.30	26.30	7.36	63.17	437	139
	Gabriela	13.40	25.20	7.11	63.33	468	142
	Gruia	14.44	28.32	7.10	62.61	483	145
	Iaşi 2	13.93	29.11	7.83	63.11	489	142
	Izvor	13.11	29.88	7.99	63.18	486	145
	Moldova 83	13.09	26.11	7.26	63.77	478	142
$N_{120}P_{80}K_{80}$	Beti	15.22	31.12	8.44	62.31	501	146
	Boema	13.85	33.80	8.62	64.24	498	142
	Crina	15.73	28.14	7.88	61.13	497	142
	Dropia	15.33	32.15	7.99	61.16	499	143
	Eliana	15.62	27.20	7.61	61.19	473	141
	Faur	15.33	33.13	8.09	61.66	498	143
	Flamura 85	15.40	31.90	7.98	62.13	447	138
	Gabriela	14.92	33.60	8.41	62.14	480	143
	Gruia	15.11	31.44	7.99	61.18	495	145
	Iaşi 2	14.12	29.88	7.83	62.44	501	143
	Izvor	14.25	28.39	7.66	62.59	498	144
	Moldova 83	14.41	29.12	7.61	62.63	491	143
DL 5%		0.20	0.39	0.11	1.10	6.60	2.20
DL 1%		0.30	0.57	0.16	1.65	9.90	3.30
DL 0.1%		0.40	0.83	0.21	2.20	13.20	4.40

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