RESEARCH CONCERNING THE BEHAVIOUR OF SOME WINTER WHEAT CULTIVARS WITH DIFFERENTIATED FERTILISATION IN THE FLOODING VALLEY OF THE MUREŞ RIVER

CERCETĂRI PRIVIND COMPORTAREA UNOR SOIURI DE GRÂU DE TOAMNĂ ÎN CONDIŢII DE FERTILITATE DIFERENŢIATĂ ÎN LUNCA MUREŞULUI

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Rezumat: *Cercetările s-au efectuat în zona foarte favorabilă pentru grâul de toamnă destinat panificaţiei şi au avut ca obiectiv îmbunătăţirea structurii de soiuri şi reacţia la fertilizare a acestor soiuri cu efecte asupra recoltei şi a însuşirilor de calitate. S-au efectuat culturi comparative cu 10 soiuri create în România, Serbia şi Ungaria. Soiurile studiate au fost: Alex, Ciprian, Dropia, Flamura 85, Faur, Krystina, Lilijana, Mina, Mv Marsall şi M.V. Palma. Nivelurile de fertilizare au fost: $N_0P_{80}K_{80}$, $N_{80}P_{80}K_{80}$ şi $N_{100}P_{80}K_{80}$. Experienţele au fost bifactoriale, organizate după metoda parcelelor subdivizate, cu trei repetiţii. Tipul de sol pe care s-au efectuat cercetările a fost un aluviosol carbonatic, gleic. Planta premergătoare a fost cultura soiei. La recoltare s-au efectuat determinări privind: masa hectolitrică, conţinutul de proteină, conţinutul de gluten umed, indicele de deformare, indicile de calitate „Gluten index"şi indicele de cădere. Rezultatele obţinute aduc o valoroasă contribuţie la stabilirea structurii de soiuri pentru arealul menţionat şi referitor la otimizarea fertilizării în vederea obţinerii de recolte mari, cu însuşiri superioare de panificaţie.*

Abstract: *Research was carried out in an area that is very favourable to bread-making winter wheat and aimed at improving cultivar structure and fertiliser response with effect on yield and quality features. We set comparative crops with 10 cultivars developed in România, Serbia, and Hungary. The studied cultivars were Alex, Ciprian, Dropia, Flamura 85, Faur, Krystina, Lilijana, Mina, Mv Marsall, and M.V. Palma. Fertilisation levels were $N_0P_{80}K_{80}$, $N_{80}P_{80}K_{80}$ and $N_{100}P_{80}K_{80}$. Experiments were of the bi-factorial type and organised after the sub-divided plot method with 3 replications. The soil type on which research was carried out was carbonatic, gleyed aluvisoil. Soy was the pre-emergent crop. Upon harvesting, we measured hectolitre volume, protein content, moist gluten content, deformation index, gluten quality index, and fall index. Results contribute to the establishment of a cultivar structure for the mentioned area and of fertilisation improvement with a view to obtain high yields with superior bread-making features.*

Keywords: *wheat, comparative cultivar crops, fertilisation, quality*
Cuvinte cheie: *grâu, culturi comparative cu soiuri, fertilizare, calitate.*

INTRODUCTION

The Flooding Mures River Plane is, due to its soil and climate features, part of the very favourable area for the cultivation of winter wheat for bread-making. In this area, depending on the cultivated cultivars and on the technological level, people obtain, in favourable years, crops of 4-6 t/ha, with quality indicators at the level pf bread-making industry requirements.

In this area, they cultivate a large number of cultivars from both Romania and abroad, mainly from Serbia and Hungary.

MATERIAL AND METHODS

The type of soil on which we carried out the experiments has a low alkaline reaction (pH =8), a medium humus supply (3.0%), a high nitrogen content (0.230%), a good and very

good phosphorus and potassium supply (P (ppm) 74.5; K (ppm) 212.

The experiment was a bi-factorial one, set after the subdivided plot method, with three replications, in which Factor A was represented by the agri-fund ($N_0P_{80}K_{80}$, $N_{80}P_{80}K_{80}$) and Factor B was represented by the cultivar (Alex, Ciprian, Dropia, Flamura 85, Faur, Krystina, Ljiljiana, Mina, Mv Marssal, Mv Palma).

We determined crop response curves and we carried out analyses concerning the hectolitre volume, protein content, moist gluten, and fall index.

RESULTS AND DISCUSSION

Table 1 presents crop results showing that on the average for the 10 cultivars, by fertilising with N_{80}, on a constant fund of $P_{80}K_{80}$, winter wheat yield increased with 80.0%, and that by doubling nitrogen to N_{160}, the increase in yield was 112.0%. Yield differences of 2146 kg/ha (N_{80}) and 2903 kg/ha (N_{160}) are statistically ensured as very significant.

In all the cultivars, on the average for the three fertilisation levels, we obtained over 400 kg/ha, and on the fund fertilised with $N_{160}P_{80}K_{80}$ yields were above 5000 kg/ha, reaching over 6000 kg/ha in the Faur cultivar.

Figures 1 and 2 present yield response curves in the 10 cultivars to fertilisers and regression functions, showing that in all cultivars the curves maintained ascending, proving their very intensive character.

Figure 3 shows the evolution of the hectolitre volume depending on the studied factors.

Table 1

Yield results

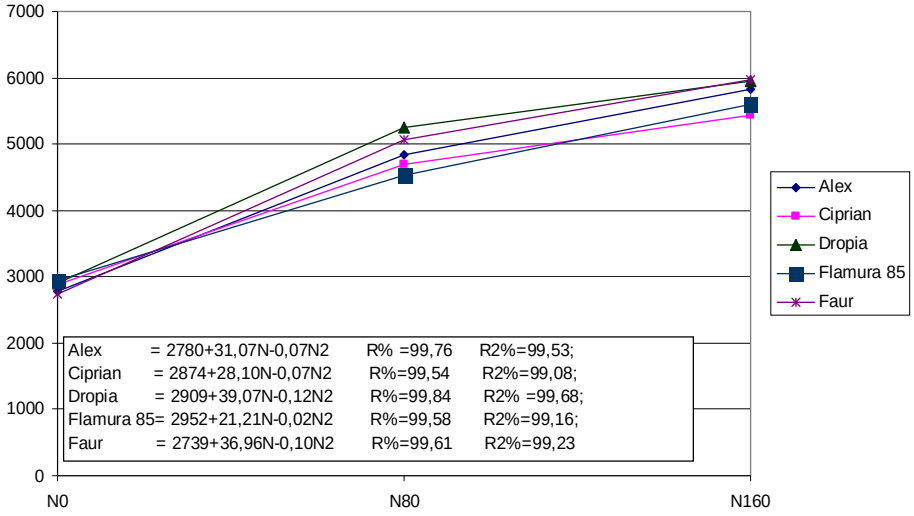
Factor A Rate of N	Factor B – Cultivated cultivar										Averages of the Factor A			
	Alex	Ciprian	Dropia	Flamura 85	Faur	Krystina	Lilijana	Mina	Mv Marsall	Mv Palma	Yield kg/ha	%	Difference Kg/ha	Significance
N_0	2780	2874	2909	2739	2531	2531	2663	2754	2450	2340	2657	100		
N_{80}	4817	4638	5235	4513	5644	4951	4836	4591	4466	4346	4803	180	2146	XXX
N_{160}	5956	5432	5963	5801	6046	5547	5564	5410	5277	5411	5640	212	2903	XXX

DL 5% = 145 kg/ha DL 1%= 199 kg/ha DL 0.1%= 271 kg/ha

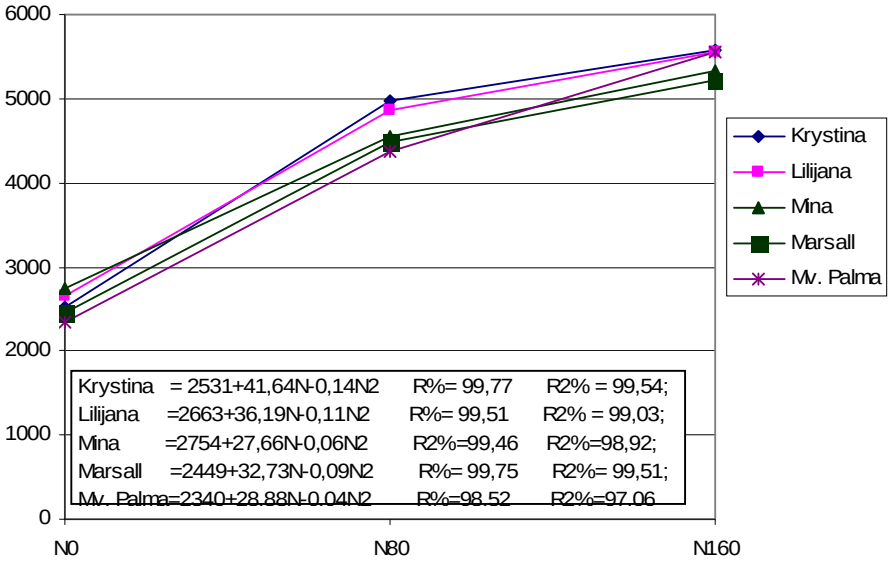
Averages of the Factor B

Cultivar	Alex	Ciprian	Dropia	Flamura 85	Faur	Krystina	Lilijana	Mina	Mv Marsall	Mv Palma
Yield kg/ha	4517	4314	4702	4351	4740	4343	4354	4251	4064	4032
%	100	95	104	96	104	96	96	94	89	89
Difference kg/ha		-203	185	-162	223	-174	-163	-266	-454	-485
Significance		00	X	0	XX	0	0	000	000	000

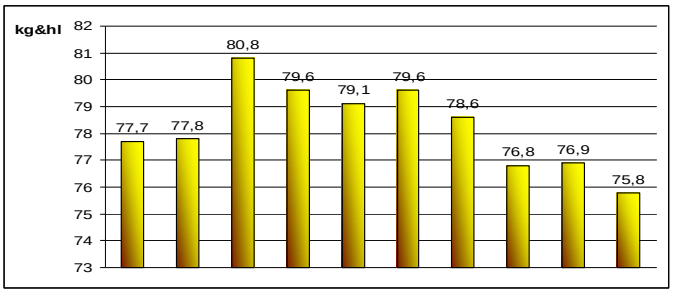
DL 5%= 144 kg/ha DL 1%= 194 kg/ha DL 0.1%= 254 kg/ha



Figures 1. Crop response curves upon fertilisation of cultivars developed in Romania



Figures 2. Crop response curves upon fertilisation of cultivars developed or imported

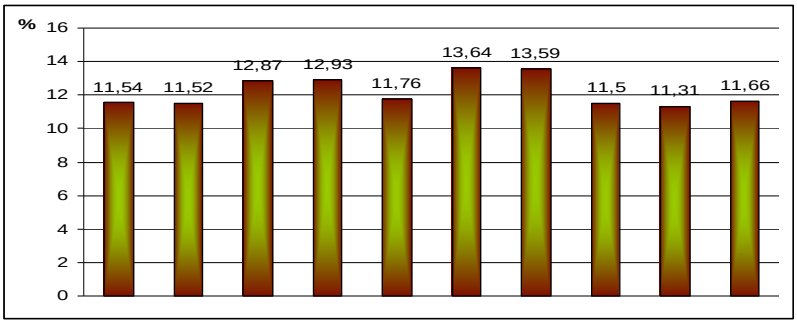


Cultivar	Alex	Ciprian	Dropia	Flamura 85	Faur	Krystina	Lilijana	Mina	Mv Marsall	Mv Palma		X N	Dif.
N_0	77.0	76.9	80.5	78.8	79.0	79.1	78.0	76.0	77.2	75.3		77.8	
N_{80}	77.8	78.8	81.8	80.9	79.4	80.2	79.7	76.7	76.9	75.5		78.8	1,0
N_{160}	78.5	77.9	80.1	79.2	79.1	79.7	78.1	77.7	76.7	76.8		78.4	0,5
X	77.7	77.8	80.8	79.6	79.1	79.6	78.6	76.8	76.9	75.8			
Difference		0.08	3.1	1.9	1.4	1.9	0.9	-1.1	0.8	-1.9			

Figure 3. Evolution of hectolitre volume (kg/hl) depending on cultivar and nitrogen rate applied on the fund of $P_{80}K_{80}$ in 2008

This means that in all cultivars and on all three agri-funds hectolitre volume reached values higher than 75 kg/hl, the minimal value for the bread-making wheat.

Figure 4 shows the evolution of raw protein.

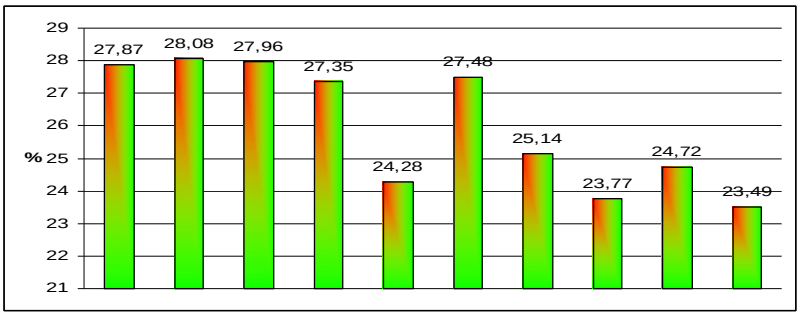


Cultivar	Alex	Ciprian	Dropia	Flamura 85	Faur	Krystina	Lilijana	Mina	Mv Marsall	Mv Palma		X N	Dif.
N_0	10.58	10.84	11.55	11.42	10.29	12.44	12.05	10.30	10.44	10.32		11.02	-
N_{80}	11.16	11.42	12.88	13.40	11.20	13.70	14.71	11.20	11.10	11.70		12.24	122
N_{160}	12.88	12.30	14.18	13.98	13.80	14.80	14.02	13.02	12.40	12.96		13.43	2.41
X	11.54	11.52	12.87	12.93	11.76	13.64	13.59	11.50	11.31	11.66			
Difference		-0.02	1.33	1.39	0.22	2.10	2.05	-0.04	0.23	0.12			

Figure 4. Evolution of raw protein (%) depending on cultivar and nitrogen rate applied on the fund of $P_{80}K_{80}$ in 2008

The result: a positive impact of nitrogen fertilisers on protein content which increased on the average for the 10 cultivars from 11.02 % (N_0) to 12.24% (N_{60}) and 13.43% (N_{160}).

Figure 5 shows moist gluten content.



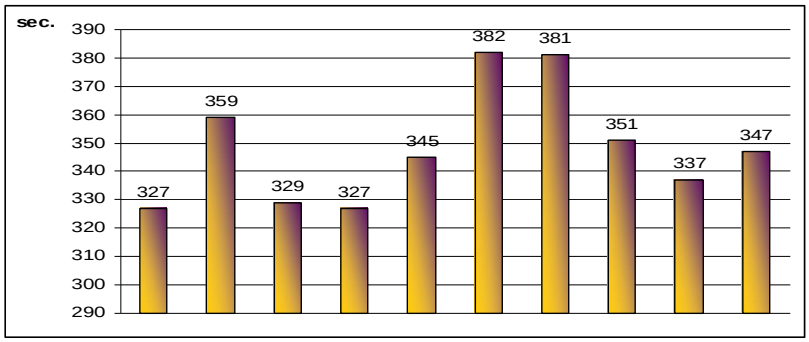
Cultivar	Alex	Ciprian	Dropia	Flamura 85	Faur	Krystina	Lilijana	Mina	Mv Marsall	Mv Palma		X N	Dif.
N_0	26.42	27.13	27.70	26.16	22.18	26.44	23.20	23.10	23.16	23.00		24.85	
N_{80}	28.86	28.72	27.90	27.10	24.16	27.10	24.86	24.12	25.15	23.32		26.13	1.28
												27.07	2.22
N_{160}	28.34	28.40	28.30	28.80	26.50	28.90	27.36	24.20	25.86	24.16			
X	27.87	28.08	27.96	27.35	24.28	27.48	25.14	23.77	24.72	23.49			
ifference		0.21	0.09	-0.52	3.59	0.39	-2.73	-4.10	-3.15	-4.38			

Fig.5. Evolution of moist gluten (kg/hl) depending on cultivar and nitrogen rate applied on the fund of $P_{80}K_{80}$ in 2008

We can see that in all the variants the values were higher than 22.0%. Nitrogen fertilizers had a positive impact on moist gluten content which increased from 24.85% on the control fund to 27.97% on the fund fertilised with $N_{160.}$

Fall index depending on cultivar and fertiliser is shown in Table 6.

All cultivars cultivated on the three fertilisation agro-fond yielded amounts that make winter wheat a favourable bread-making crop.



Cultivar	Alex	Ciprian	Dropia	Flamura 85	Faur	Krystina	Lilijana	Mina	Mv Marsall	Mv Palma		X N	Dif. Sec.
N_0	309	318	320	305	363	402	382	306	348	354		340	
N_{80}	319	352	314	336	329	417	418	366	310	364		352	12
												356	16
N_{160}	355	409	353	342	374	328	344	382	354	324			
X	327	359	329	327	354	382	381	351	337	347			
Difference		32	2	0	27	55	54	24	10	20			

Figure 6. Evolution of fall index (sec) depending on cultivar and nitrogen rate applied on the fund of $P_{80}K_{80}$ in 2008

CONCLUSIONS

1. In the studied area – Pecica – all 10 cultivars yielded 5-6 t/ha, if specific cultivation technology is observed.

2. Nitrogen fertilisers applied in rates of N_{80}-N_{160} on a fund of $P_{80}K_{80}$ are well valorised by the 10 cultivars, yield response curves maintaining ascending in the studied field.

3. Analysed quality indicators meet bread-making wheat in all experimental variants.

4. Nitrogen fertilisers had a positive impact on quality indicators, particularly on protein and gluten contents.

LITERATURE

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