Study of Some Production and Quality Index on Some Winter Wheat Varieties Created at ARDS Turda

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ABSTRACT

Wheat occupies the largest area under cultivation due to its importance. In the Transylvanian Plateau conditions at ARDS Turda were have been conducted a series of experiments which aimed to highlight the way that most effectively leverages wheat the pedo-climatic conditions in terms of the application of different doses of fertilizers. Thus we studied the 10 wheat varieties 3 varieties (Arieșan, Apullum and Turda 2000) created at ARDS Turda and the other on other research stations in Romania following the way they have used certain production - quality indicators. The 10 varieties were placed in polifactorial experience over two years in 2013 respectively 2014. Was used the balanced grid method in six repetitions which allowed them to study the application of two doses of fertilizer 250 kg/ha N 50 P 50 K 0 and 200 kg/ha N 66. In the autumn after sowing were applied 250 kg/ha N 50 P 50 K 0 for the first 3 repetitions and repetitions in spring 4.5 and 6 was applied fertilizer dose of 200 kg/ha N 66. In the two years 2013 and 2014 the 10 experimental varieties responded differently to environmental conditions and fertilizers as revealed in the interpretation of data using statistical models that varieties created in the conditions of ARDS Turda have the best balance in terms that the production quality.

Keywords: *yeld, quality index, winter wheat.*

INTRODUCTION

Wheat occupies an important place in world agriculture. Worldwide breeding programs registered considerable progress in terms of getting the varieties with high yield and quality traits to fully satisfied manufacturing industry and consumer demands. Choosing varieties depending on the climatic conditions that are associated with technology inflicted a decisive factor in the successful cultivation of wheat both in terms of production and quality. Bread-making industry and wheat markets have definite grain protein concentration requirements, because grain protein concentration directly influences water absorption of the flour and loaf volume ((Finney et al., 1987 citate by Săulescu et all 2005).

Aims: The purpose of this paper is to study the full potential of varieties of winter wheat created at ARDS Turda compared to other varieties in terms of production and quality following the application of different doses of fertilizer, basic fertilizer and additional fertilizing using N,P, type of fertilizer. This allows examination of the response of each genotype to apply nutrients but also to establish minimum and maximum limit of fertilizers

MATERIALS AND METHODS

The experimental model is balanced square grid method in 6 repetitions (3+3) with two levels of fertilization. The first three repetitions were fertilized in the fall with complex fertilizers NPK 50:50:0 and the last three repetitions were additionally fertilized in the spring with N 66 preceding the pea plant. We studied 10 varieties of winter wheat seeded in 7 m^2 plots that before harvesting were made the front and rear eliminations resulting harvested area of 5 m^2. The obtained yields are reported to ha. Each experimental variant was individually harvested. For each variant was established production, moisture, protein content, gluten content, respectively Zeleny index. The varieties studied were as follows: Arieşan, Dropia, Apullum, Faur, Glosa, Turda 2000, Dumbrava, Voroneţ, Delabrad şi Miranda.

RESULTS AND DISCUSSION

From the analysis of the results it is found that all tested varieties react favorably to fertilization with increases of production and there are differences between varieties reaction to fertilization. Besides the influence of fertilizers in increasing wheat production, which contributes to increases of protein content, and in particular nitrogen fertilizers improves the quality of the harvest. In table 1.1. are presented mean yields of experience for each variety studied in two experimental years 2013 respectively 2014 and average yields of experience for each level of fertilization. From the results yields obtained in 2014 were higher than those obtained in 2013 for each studied variety. From the mean productions of the two experimental years the additional fertilizer N 50 P 50 K 0 + N 66 brought an increase of production for each studied varieties.

In table 1.2. are presented analysis of variance for the two levels of fertilizer in 2013 The 10 studied varieties (factor V) shows the differences between the two levels of fertilization 250 kg/ha N50 P50 K0 and 250 kg/ha N50 P50 K0 + 200 kg/ha N66.

Influence of the fertilizer production is shown in Table 1.3. For first level of fertilizer N50 P50 K0 250 kg/ha applied in the fall at the 10 studied

Tab.1.1. Experiment mean production (t/ha) of winter wheat at ARDS Turda 2013 - 2014

Year	Varieties	Mean production (t/ha)	Varieties	Level of fertilizers	Mean production (t/ha)
2013	ARIESAN	6.52	ARIESAN	N50 P50 K0	6.91
	DROPIA	6.42	ARIESAN	N50 P50 K0 + N66	7.80
	APULLUM	6.37	DROPIA	N50 P50 K0	6.36
	FAUR	6.58	DROPIA	N50 P50 K0 + N66	8.20
	GLOSA	6.97	APULLUM	N50 P50 K0	6.90
	TURDA 2000	5.43	APULLUM	N50 P50 K0 + N66	8.28
	DUMBRAVA	7.12	FAUR	N50 P50 K0	6.24
	VORONET	6.57	FAUR	N50 P50 K0 + N66	8.40
	TURDA 95	6.52	GLOSA	N50 P50 K0	5.03
	MIRANDA	6.42	GLOSA	N50 P50 K0 + N66	6.66
2014	ARIESAN	8.18	TURDA 2000	N50 P50 K0	7.15
	DROPIA	8.15	TURDA 2000	N50 P50 K0 + N66	8.25
	APULLUM	7.68	DUMBRAVA	N50 P50 K0	6.45
	FAUR	8.62	DUMBRAVA	N50 P50 K0 + N66	8.06
	GLOSA	7.68	VORONET	N50 P50 K0	5.87
	TURDA 2000	6.23	VORONET	N50 P50 K0 + N66	7.90
	DUMBRAVA	8.30	TURDA 95	N50 P50 K0	6.54
	VORONET	7.92	TURDA 95	N50 P50 K0 + N66	8.75
	TURDA 95	8.18	MIRANDA	N50 P50 K0	6.91
	MIRANDA	8.15	MIRANDA	N50 P50 K0 + N66	7.80

wheat varieties were recorded lower differences to control (Ariesan) of - 1.40 t/ha for Turda 2000 respectively - 1.33 t/ha for Delabrad variety assured statistically very significant negatively. For other varieties did not recorded differ assured statistically. For the second level of fertilization 250 kg/ha N50 P50 K0 aplied in the fall + 200 kg/ha N66 aplied in the spring Dumbrava recorded a superior diference of production to control (Ariesan) of 0,67 t/ha statistically assured distinct significantly positive mean while the increase of production of 0,67 t/ha for Glosa and 0,50 t/ha for Miranda

Tab.1.2. Analysis of variance for the two levels of fertilizer for some varieties of winter wheat at ARDS Turda 2013

Variation source	Square summ	Liberty degrees	Square mean	Probe F	Square summ	Square mean	Probe F
		N50 P50 K0			N50 P50 K0 + N66		
Varieties (V)	11.56800	9	1.28533	9.304	4.25333	0.47259	10.071
Repetition(R)	0.00200	2	0.00100		0.24867	0.12433	
S x R	1.97800	18	0.10989		0.84467	0.04693	
Erorr 1	1.97800	18	0.10989		0.84467	0.04693	
Total	13.54800	29			5.34667		

Tab.1.3. Influence of fertilizer level through production on some winter wheat varieties at ARDS Turda 2013

Nr. crt.	Varieties	t/ha	%	Dif.	Signf	t/ha	%	Dif.	Signf
		N50 P50 K0				N50 P50 K0 + N66			
1	Arieşan	6.37	100.0	0.00	Control	6.67	100.0	0.00	Control
2	Dropia	6.00	94.2	-0.37	-	6.83	102.5	0.17	-
3	Apullum	6.03	94.8	-0.33	-	6.70	100.5	0.03	-
4	Faur	6.53	102.6	0.17	-	6.63	99.5	-0.03	-
5	Glosa	6.77	106.3	0.40	-	7.17	107.5	0.50	*
6	Turda 2000	4.97	78.0	-1.40	000	5.90	88.5	-0.77	000
7	Dumbrava	6.90	108.4	0.53	-	7.33	110.0	0.67	**
8	Voroneţ	6.30	99.0	-0.07	-	6.83	102.5	0.17	-
9	Delabrad	5.03	79.1	-1.33	000	6.53	98.0	-0.13	-
10	Miranda	6.30	99.0	-0.07	-	7.07	106.0	0.40	*
	LSD (p 5%)	0.57				0.37			
	LSD (p 1%)	0.78				0.51			
	LSD (p 0.1%)	1.06				0.69			

Tab 1.4. Analysis of variance for the two levels of fertilizer for some varieties of winter wheat at ARDS Turda 2014

Variation source	Square summ	Liberty degrees	Square mean	Probe F	Square summ	Square mean	Probe F
		N50 P50 K0			N50 P50 K0 + N66		
Varieties (V)	15.05367	9	1.67263	13.209	18.62534	2.06948	35.795
Repetition (R)	0.43400	2	0.21700		0.20600	0.10300	
S x R	2.27933	18	0.12663		1.04067	0.05781	
Erorr	2.27933	18	0.12663		1.04067	0.05781	
Total	17.76700	29			19.87200		

Tab. 1.5. Influence of fertilizer level through production on some winter wheat varieties at ARDS Turda 2014

Nr. crt.	Varieties	t/ha	%	Dif.	Signf.	t/ha	%	Dif.	signf
		N50 P50 K0				N50 P50 K0 + N66			
1	Arieşan	7.43	100.0	0.00	Control	8.93	100.0	0.00	Control
2	Dropia	6.73	90.6	-0.70	0	9.57	107.1	0.63	**
3	Apullum	6.37	85.7	-1.07	00	9.00	100.7	0.07	-
4	Faur	7.27	97.8	-0.17	-	9.97	111.6	1.03	***
5	Glosa	5.73	77.1	-1.70	000	9.63	107.8	0.70	**
6	Turda 2000	5.07	68.2	-2.37	000	7.30	81.7	-1.63	000
7	Dumbrava	7.40	99.6	-0.03	-	9.20	103.0	0.27	-
8	Voroneţ	6.57	88.3	-0.87	00	9.27	103.7	0.33	-
9	Delabrad	6.70	90.1	-0.73	0	9.27	103.7	0.33	-
10	Miranda	6.83	91.9	-0.60	-	10.47	117.2	1.53	***
	LSD (p 5%)	0.61				0.41			
	LSD (p 1%)	0.84				0.57			
	LSD (p 0.1%)	1.14				0.77			

Tab. 1.6. Influence of year through production on some winter wheat varieties at ARDS Turda 2013

Nr. crt.	Varieties	t/ha	%	Dif.	Signf.	t/ha	%	Dif.	Signf.
		2013				2014			
1	Arieşan	6.52	100.0	0.00	Control	8.18	100.0	0.00	Control
2	Dropia	6.42	98.5	-0.10	-	8.15	99.6	-0.03	-
3	Apullum	6.37	97.7	-0.15	-	7.68	93.9	-0.50	00
4	Faur	6.58	101.0	0.07	-	8.62	105.3	0.43	*
5	Glosa	6.97	106.9	0.45	*	7.68	93.9	-0.50	00
6	Turda 2000	5.43	83.4	-1.08	000	6.23	76.2	-1.95	000
7	Dumbrava	7.12	109.2	0.60	***	8.30	101.4	0.12	-
8	Voroneţ	6.57	100.8	0.05	-	7.92	96.7	-0.27	-
9	Delabrad	5.78	88.7	-0.73	000	7.98	97.6	-0.20	-
10	Miranda	6.68	102.6	0.17	-	8.65	105.7	0.47	**
	LSD (p 5%) 0.34 LSD (p 1%) 0.45 LSD (p 0.1%) 0.59								

Tab.1.7. Production and quality index of winter wheat varieties at ARDS Turda 2014

Nr. crt.	Varieties	N50 P50 K0					N50 P50 K0 + N66				
		Prod. t/ha	Humid. %	Prot. %	Glut. %	Zeleny %	Prod. t/ha	Humid. %	Prot. %	Glut. %	Zeleny %
1	Arieşan	7.43	13,8	7,7	13,9	11,9	8.93	13,9	11,8	23,1	39,6
2	Dropia	6.73	14,2	8,7	16,1	17,9	9.57	14,1	11,6	22,7	37,7
3	Apullum	6.37	14,5	7,8	14,1	12,5	9.00	14,0	11,1	21,7	34,1
4	Faur	7.27	14,6	7,8	14,2	12,5	9.97	14,0	10,5	20,3	29,7
5	Glosa	5.73	14,2	8,4	15,5	15,2	9.63	13,8	11,2	21,9	33,8
6	Turda 2000	5.07	13,3	9,7	18,4	21,7	7.30	13,8	13,8	27,8	52,5
7	Dumbrava	7.40	14,9	7,2	12,8	8,3	9.20	14,1	11,0	21,3	33,1
8	Voroneţ	6.57	13,6	8,5	15,7	14,7	9.27	14,4	10,9	21,2	30,8
9	Delabrad	6.70	13,5	8,4	15,5	14,6	9.27	13,8	10,6	20,5	30,8
10	Miranda	6.83	14,4	7,5	13,6	9,3	10.47	14,5	9,2	17,4	20,2

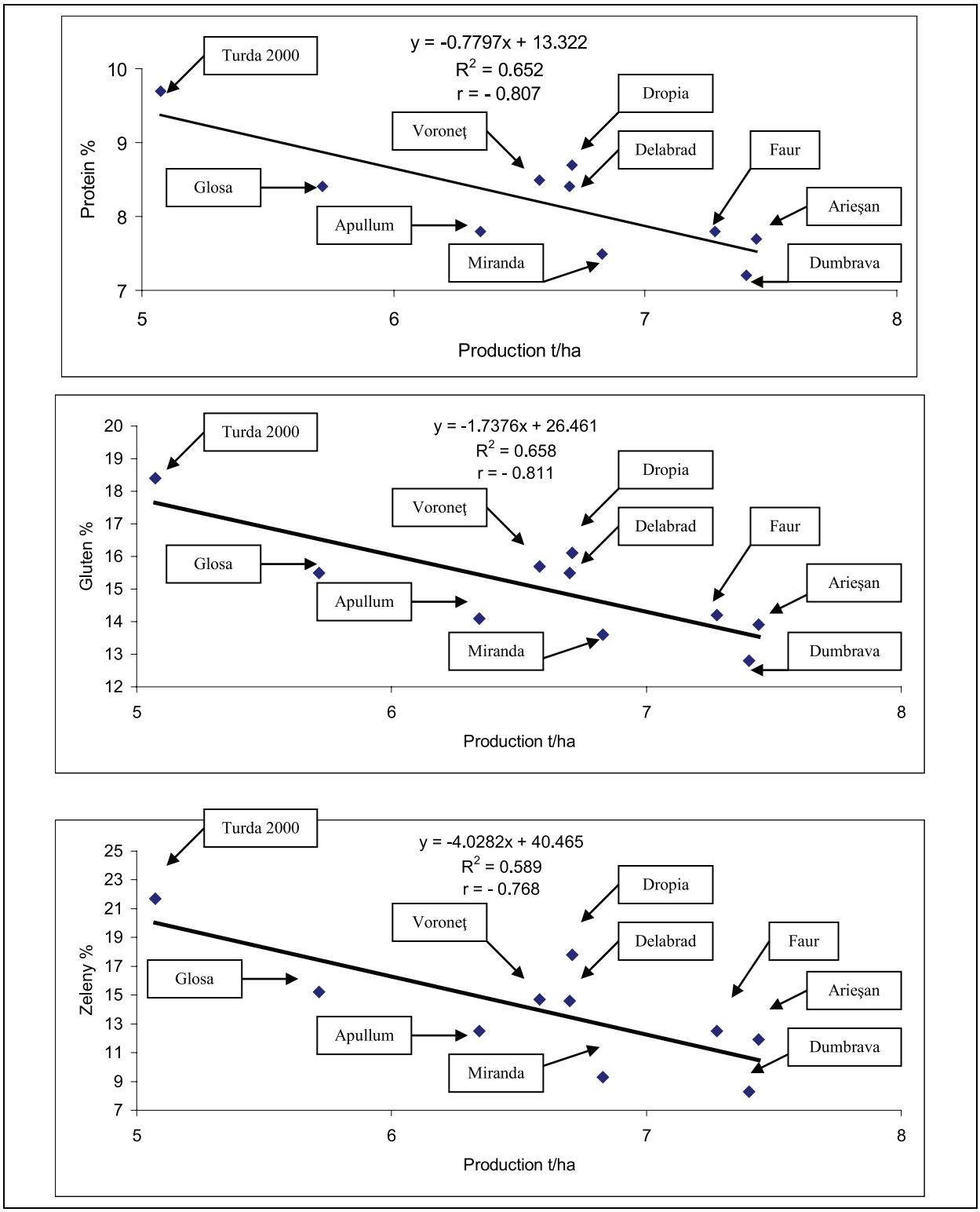

Fig.1. Correlation between production and protein content, gluten content and Zeleny index for the basic fertilization N50 P50 K0 for winter wheat crop at ARDS Turda 2014

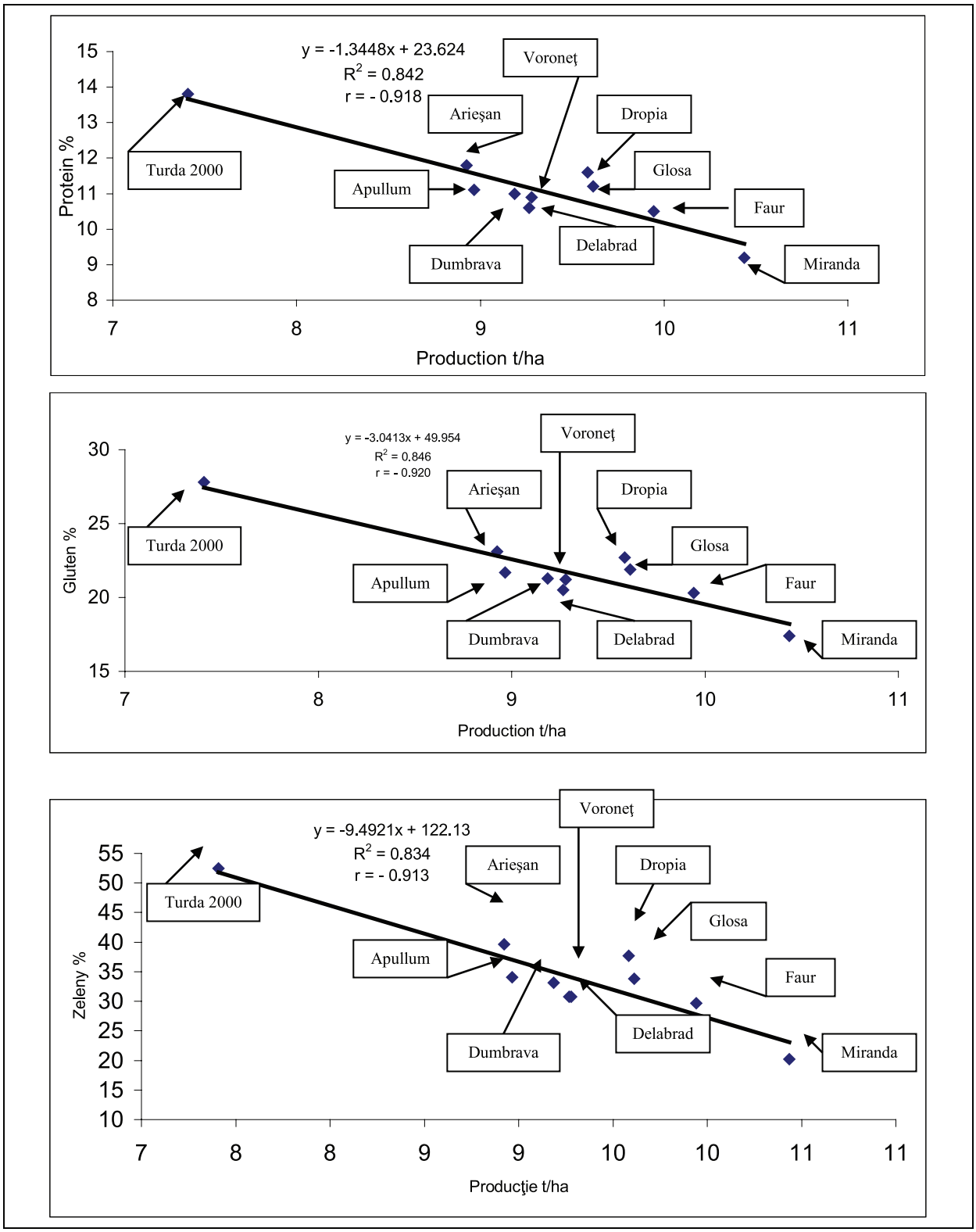

Fig.2. Correlation between production and protein content, gluten content and Zeleny index for the basic N50 P50 K0 and suplimentary fertilization + N66 for winter wheat crop at ARDS Turda 2014

recorded statistically assurance significantly positive. Variety Turda 2000 recorded a difference of -0.77 t / ha statistically very significant negative compared to control (Ariesan).

Experimental year 2014 was more favorable in terms of yealds from the wheat crop as call data are presented in table 1.4. and 1.5 at the two levels of fertilization. Analysis of variance for wheat production in the two levels of fertilization is shown for 2014 in table 1.4.

As in experimental culture recorded in 2013 production of wheat by applying additional fertilizer in the spring has led to increases of production for the year 2014 (table 1.5). Applying fertilizer only in autumn after sowing yield differences for Glosa (- 1,70 t/ha) and Turda 2000 (-2,37 t/ha) compared to the control showed a statistically assurance highly significant negative. For Apullum production difference - 1.70 t/ha and Voroneţ - 0.87 t/ha recorded statistical distinct significantly negative and for Dropia difference of - 0.70 t/ha respectively Delabrad - 0.73 t/ha has statistical assurance significantly negative to control.

For additional fertilization in the spring only variety Turda 2000 which has a difference of production of - 1.63 t/ha being provided statistically highly significant negative. The increase of production for Faur (1,03 t/ha) and Miranda (1,53 t/ha) resulted statistically insurance very significant positive. Varieties Dropia with 0,63 t/ha and Glosa 0,70 t/ha increase of production recorded a statistically assurance distin significantly to control.

The influence of year to the wheat crop yields obtained in the two experimental years is shown in Table 1.6. Environments yields obtained from the two levels of fertilizer in 2013 Dumbrava obtained a production increase of 0.60 t/ha being provided statistically highly significant positive and Glosa an increase of 0.45 t/ha being provided statistically significant positive. Turda 2000 and Delabrad varieties recorded negative differences -1.08 t/ha respectively - 0.73 t/ha have been very significant negative assurance to control. In 2014 variety Miranda ensured statistically distinct significantly with a production increase of 0.47 t/ha followed by variety Faur with aproduction increase of 0.43 t/ha secured statistically significant to control. Turda 2000 variety production by negative difference - 1.95 t/ha was provided statistically highly significant negative and varieties Apullum respectively Glosa - 0.50 t/ha each, were ensured statistically distinct significantly negative from the control.

For the year 2014 the wheat crop experimental studies have conducted a series of quality tests for each species studied at two levels of fertilizer (table 1.7.) We determined protein (%) respectively gluten content (%) and Zeleny index (%).For the fertilizer core protein content ranged from 7.2 % (Dumbrava) and 9.7% (Turda 2000). The highest content of gluten was registered to varieties Turda 2000 18,4 %, Dropia 16,1 % and Voroneţ 15,7 %. Varieties with the highest Zeleny index were Turda 2000 21,7 %, Dropia 17,9 % and Voroneţ 14,7 %.

Applying additional spring fertilization Turda 2000 variety had 13.8% protein, 27.8% gluten and 52.5% Zeleny index. Variety Ariesan had 11.8% protein, 23.1% and 39.6% gluten Zeleny index. The protein content was between 9.2% and 13.8%, gluten between 17.4% and 27.8% and Zeleny index between 20.2% and 52.5%.

Figure 1 shows the correlation between yields and protein content, respectively gluten Zeleny index for basic fertilization applied to wheat in the fall N50 P50 K0 ARDS Turda 2014. Correlation between production and some qualitative index for basic fertilization applied in the fall on winter wheat crop resulted the followed relation coefficients r = - 0,807 for production and protein, r = 0, 811 for production and gluten respectively r = - 0, 768 for production and Zeleny index.

Correlation between yields and protein content, respectively gluten Zeleny index for basic fertilization applied to wheat in the fall N50 P50 K0 and suplimentary fertilization applied in the spring N 66 at ARDS Turda 2014 are presented in figure 2.

For additional fertilizer application in the spring correlations between production and some quality indices resulted the following values for the coefficients of relations r = -0.918 for protein and production, r = - 0.920 production and gluten respectively r = - 0.913 for production and Zeleny index.

CONCLUSIONS

Low yields and poor quality of crops is often the result of poor technology as well as insufficient or lack of fertilization, crop rotation failure and

not least the improper use of genotypes for the area that are grown.

The analysis of the yelds of winter wheat crop cultivated at ARDS Turda is observed for both years 2013 and 2014 that additional fertilization brings an increase of harvest.

Recorded yields of winter wheat in 2013 were higher for additional fertilization applied in the spring for Dumbrava and Glosa varieties and in 2014 fertilizing the same level high yields were obtained for varieties Glosa, Miranda, Turda 2000 and Dropia.

For the mean production that were obtained in the experimental years 2013 2014 the highest yields were obtained in 2014.

Regarding the relationship between production and some quality indices at the two levels of fertilization in experimental variety Turda 2000 registered in 2014 containing 9.7% protein, 18.4% gluten and 21.7% Zeleny index for fall fertilization. Applying additional spring fertilization highest protein content was registered by varieties 2000 13,8 %, Arieşan 11,8% and Dropia 11,6 %; gluten by varieties Turda 2000 27,8 %, Arieşan 23,1 % and Dropia 22,7 %, respectively zeleny index by varieties Turda 2000 52,5 %, Arieşan 39,6 % and Dropia 37,7 %.

The correlation between production and quality indices have shown that some additional fertilization results in an increase in quality. For the basic fertilization correlation coefficient for the relationship between production and protein was r = - 0,807, production and gluten r = - 0,811 respectively production and zeleny index r = - 0,768. For additional fertilization relation r coefficient increased by almost a point as production and protein proteina r = - 0,918, production and gluten r = - 0,920 respectively r = - 0,913.

Corelaţiile dintre producţie şi unii indici calitativi au arătat că fertilizarea suplimentară duce la o creştere a calităţii. Pentru nivelul fertilizării de bază coeficientul de relaţie pentru corelaţia dintre producţie şi proteină a fost de r = - 0,807, pentru producţie şi gluten r = - 0.811 ira pentru producţie şi indicele zeleny r = - 0,768. În cazul fertilizării suplimentare coeficientul de relaţie r a crescut cu aproape un punct astfel pentru producţie şi proteina r = - 0,918, Producţie şi gluten r = - 0,920 respectiv producţie şi indicele zeleny r = - 0,913.

From the results it can be seen that the varieties created at ARDS Turda the quality elements studied these were superior to other varieties.

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