

RESEARCH CONCERNING THE INFLUENCE OF SOWING PERIOD AND SOWING DENSITY ON THE PROTEIN, GLUTEN AND STARCH CONTENT OF AUTUMN WHEAT IN WESTERN ROMANIA

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Abstract: *The paper presents the results obtained in the last two years of experience, about the content of gluten, protein and starch of winter wheat cultivated in Western Romania, specifically at the Teaching Resort of University of Agricultural Science and Veterinary Medicine of Banat Timisoara, located in the Plain Banato-Crisan, Plain subunit Berecsău Bega-Timis interfluve. Researches were conducted on a chernozem soil, low gleyed, formed on decarbonated loessoid deposits. The goal of the research is to establish an adequate seeding technology under current climate conditions, based on frequent situations in which, for various reasons we can't saw in the optimal sowing period. Wheat is a grass, originally from the Fertile Crescent region of the Near East, but now cultivated worldwide. The material investigated is the variety Alex (Lovrin 50), variety created by S.C.D.A Lovrin and approved in 1994. Variety Alex is the representative variety for the western part of the country and has the largest expansion in the mentioned area. Among the quality analysis performed in the University laboratory, the content of gluten, protein and starch of winter wheat have an important influence on the wheat quality. Gluten content ranged between 22,65%, obtained in the first year, and 32,66%, obtained in both years. Protein content ranged between 13,36%, obtained in the first year, and 15,19%, obtained in the second year. Starch content ranged between 51,90%, obtained in the second year, and 53,51%, obtained in the second year.*

Keywords: *wheat, sowing period, sowing density*

INTRODUCTION

The results of this study are part of a PhD program, having as theme: " Research on sowing technology of winter wheat in Western Romania ", funded by the European Social Fund, the Pilot Program PhD Research Scholars Support Contract from the POS DRU/6/1.5/S/21 USAMVB Timisoara, under the leadership of the distinguished university professor Paul Pîrsan.

Testing the wheat quality is an important and useful activity, because wheat is the only cereal from which the bread is made, the most important product of the human diet.

Timisoara has a temperate continental climate, typical of the south-eastern Pannonian Basin, with some Mediterranean influences (Adriatic variant). Its general features are marked by diversity and irregularity of atmospheric processes. Being predominantly influenced by the maritime air masses from the North-West, Timisoara receives more precipitation than most cities in the Romanian Plain. Number of days with rain in Timisoara is of 142. As for the temperature, Timișoara enjoys a warm climate with mostly mild winters and hot summers.

In Table 1 and Table 2 are presented the rainfall and temperatures in the studied years, reported to the multiannual average.

Table 1

Rainfall recorded in the Timisoara area

Average rainfall(mm)	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
2008	21	9	61	45	49	157	46	25	51	17	53	55
2009	27	24	48	22	23	45	112	41	4	10	106	42
Multiannual average	39,1	38,3	33,9	46,8	63,1	79,6	62,4	51,4	42,1	42,2	49,4	52,6

Table 2

Temperature recorded in the Timisoara area

Average temperature (°C)	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
2008	0.9	3.7	7.7	12.4	17.8	21.6	21.9	22.6	15.4	12.3	7.1	3.6
2009	-1.1	1.4	6.6	15	18	20.1	23	23,7	20,0	12,3	8,3	4,3
Multiannual average	-1,6	1,1	5,8	11,2	16,3	19,4	21,1	20,4	16,5	11,0	5,6	0,8

The first year of experience was characterized by a warm autumn, the average temperature being around 7-8°C, with 2-3 °C higher than the multiannual average temperature. The registered precipitations were over 50mm in every month, October being the driest month in autumn. Timisoara enjoyed a mild winter with small amount of precipitations. The spring recorded an average of 13 °C temperature and 31mm rainfall. The summer was hot and wet, with over 20 °C temperature and with 112 mm rainfall in July.

The autumn of the second year of experience was even warmer, with an average over 8 °C and with a large amount of precipitations in November (106mm). October was the driest month of the autumn also this year, recording only 10mm rainfall. In the winter were recorded temperatures over 0 °C, and small amount of precipitations. In the spring the average temperature was over 13 °C, but the average rainfall was over 60mm. The summer was hot and with a small amount of precipitations, the averages were over 20 °C temperature and 47mm rainfall.

MATERIAL AND METHODS

The purpose of the research is to determine the influence of sowing time and sowing density on the quality of wheat.

The material investigated is the variety Alex (Lovrin 50), variety created by S.C.D.A Lovrin and approved in 1994, representative for the west of the country.

The research was conducted at the Teaching Resort of USAMVB Timisoara Trials were of the polifactorial type with three repetitions, in the study were taken the following factors:

- Sowing date, with four variations;
- Sowing density, with four variations.

It is common knowledge that wheat needs about 40-50 days from emergence till the first days of winter with a sum of temperatures of 450-500 °C. Every delay of the sowing over the optimum period determines a decrease of the production with 30-50 kg/ha for every day in November.

To realize an optimum density of the crop, it is necessary to pay attention to the sowing density, which is influenced by the variety, twinning degree and certain technological factors.

After harvesting was conducted laboratory analysis to determine the gluten, protein and starch content.

RESULTS AND DISCUSSIONS

The following tables contain the results obtained during the two years of experience.

Table 3

Gluten content obtained in the year 2008-2009

Factorul A - Sowing period	Factorul B - Sowing density				Factor A average			
	400	500	600	700	X	%	Difference	Semnification
I	32.00	31.33	30.00	31.66	31.25	100	-	Mt.
II	32.66	31.36	31.01	32.33	31.84	102	0.59	-
III	34.00	32.22	32.05	22.65	30.23	97	-1.02	00
IV	29.33	28.66	28.00	29.00	28.75	92	-2.50	000

DL 5%=6.99; DL 1%=9.52; DL 0.1%=12.79

Factor B average				
X	32.00	30.89	30.27	28.91
%	100	97	95	90
Difference	-	-1.11	-1.73	-3.09
Semnification	Mt.	00	000	000

DL 5%=0.64; DL 1%=0.86; DL 0.1%=1.14

Table 4

Gluten content obtained in the year 2009-2010

Factorul A - Sowing period	Factorul B - Sowing density				Factor A average			
	400	500	600	700	X	%	Difference	Semnification
I	32.00	31.29	30.00	31.66	31.24	100	-	Mt.
II	32.66	31.36	31.25	32.33	31.90	102	0.66	-
III	32.02	31.23	31.05	31.65	31.49	101	0.25	-
IV	29.99	29.00	28.00	30.10	29.27	94	-1.97	000

DL 5%=0.7; DL 1%=1.42; DL 0.1%=1.88

Factor B average				
X	31.67	30.72	30.08	31.44
%	100	97	95	99
Difference	-	-0.95	-1.59	-0.23
Semnification	Mt.	0	00	-

DL 5%=0.7; DL 1%=1.42; DL 0.1%=1.88

The gluten occupies the spaces between the starch grains, and is the main component in determining the bakery quality of the wheat. It is highly influenced by the climatic condition, a high humidity and lower temperatures causing the formation of floury grains.

Gluten content ranged between 22,65%, obtained in the first year (Table 3), and 32,66%, obtained in both years (Table 3, Table 4).

The sowing period influenced the gluten content, the second sowing period showing 2% increase in gluten content compared to the control variant. The last sowing period had 8% decrease in the first year and a 4% decrease in the second year.

About the sowing density there was a constant decrease in both years with 2% to 8% compared to the control variant.

The proteins give the nutritive quality of the wheat grain. The protein accumulation is influenced by the climatic conditions, a low humidity and high temperature climate causing the accumulation of the proteins, even if the high temperature shortens the grain forming period.

Protein content ranged between 13,36%, obtained in the first year (Table 5), and 15,19%, obtained in the second year (Table 6).

Table 5

Protein content obtained in year 2008-2009

Factorul A - Sowing period	Factorul B - Sowing density				Factor A average			
	400	500	600	700	X	%	Difference	Semnification
I	14.63	14.62	14.66	14.56	14.62	100	-	Mt.
II	15.13	15.20	15.13	15.06	15.13	104	0.51	*
III	14.50	14.30	14.52	14.50	14.46	99	-0.16	-
IV	13.76	13.53	13.36	13.40	13.51	92	-1.11	000

DL 5%=0.7; DL 1%=1.42; DL 0.1%=1.88

Factor B average				
X	14.51	14.41	14.42	14.38
%	100	99	99	99
Difference	-	-0.09	-0.09	-0.13
Semnification	Mt.	-	-	-

DL 5%=0.43; DL 1%=0.58; DL 0.1%=0.78

The sowing period influenced the protein content, the second sowing period showing 3 – 4 % increase in gluten content compared to the control variant. The last sowing period had 7-8% decrease compared to the control variant.

About the sowing density there was no significant difference compared to the control variant.

Starch, accumulated specially in endosperm is also influenced by the climatic conditions, a low humidity and high temperature causing a high accumulation of the starch.

Starch content ranged between 51,90%, obtained in the second year (Table 8), and 53,51%, obtained in the second year (Table 8).

Table 6

Protein content in the year 2009-2010

Factorul A - Sowing period	Factorul B - Sowing density				Factor A average			
	400	500	600	700	X	%	Difference	Semnification
I	14.63	14.75	14.62	14.58	14.65	100	-	Mt.
II	15.13	15.16	15.19	15.12	15.15	103	0.50	-
III	14.53	14.54	14.33	14.46	14.47	99	-0.18	-
IV	13.78	13.47	13.61	13.43	13.57	93	-1.07	000

DL 5%=0.7; DL 1%=1.42; DL 0.1%=1.88

Factor B average				
X	14.52	14.48	14.44	14.40
%	100	100	99	99
Difference	-	-0.04	-0.08	-0.12
Semnification	Mt.	-	-	-

DL 5%=0.53; DL 1%=0.71; DL 0.1%=0.94

Table 7

Starch content in the year 2008-2009

Factorul A - Sowing period	Factorul B - Sowing density				Factor A average			
	400	500	600	700	X	%	Difference	Semnification
I	52.90	53.03	53.20	53.30	53.11	100	-	Mt.
II	52.20	52.28	52.19	52.20	52.22	98	-0.89	00
III	52.00	52.12	52.11	52.16	52.10	98	-1.01	000
IV	51.96	51.96	51.93	51.94	51.95	98	-1.16	000

DL 5%=0.57; DL 1%=0.79; DL 0.1%=0.98

Factor B average				
X	52.27	52.35	52.36	52.40
%	100	100	100	100
Difference	-	0.08	0.09	0.13
Semnification	Mt.	-	-	-

DL 5%=0.57; DL 1%=0.79; DL 0.1%=0.98

The sowing period had a negative impact on starch content, both years recording a decrease of 1-3% starch content compared to the control variant.

About the sowing density there was no significant difference compared to the control variant.

CONCLUSIONS

Research carried out pointed that the best quality for wheat under current climatic conditions was obtained in the first two sowing periods (1-30 October).

The sowing density had a significant impact only on the gluten content, concluding that the best sowing density for quality wheat is that of the control variant (12.5 cm).

Starch content in the year 2009-2010

Factorul A - Sowing period	Factorul B - Sowing density				Factor A average			
	400	500	600	700	X	%	Difference	Semnification
I	53.51	53.49	53.40	53.45	53.46	100	-	Mt.
II	52.68	52.76	52.72	53.78	52.99	99	-0.48	-
III	52.20	52.41	52.21	53.33	52.54	98	-0.93	00
IV	51.90	52.56	51.96	51.91	52.08	97	-1.38	000

DL 5%=0.54; DL 1%=0.73; DL 0.1%=0.96

Factor B average				
X	52.57	52.81	52.57	53.12
%	100	100	100	101
Difference	-	0.23	0.00	0.55
Semnification	Mt.	-	-	-

DL 5%=0.54; DL 1%=0.73; DL 0.1%=0.96

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