THE INFLUENCE OF THE CROP ROTATION ON GLUTEN CONTENT IN WHEAT FROM CRIŞURILOR PLAIN

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Abstract

The paper is based on the research results carried aut during 2003-2005 in a long term trial with crop rotations and irrigation placed in 1990 in Oradea, on a preluvosoil, in a moderate wet area. The smallest contents of the wet and dry gluten were obtained in the wheat monocrop, both in nonirrigated and irrigated conditions. In the wheat-maize and wheat-maize-soybean crop rotation were the wet and dry gluten content increased very significant statistically in comparison with the wheat monocrop. In the irrigated variants, the values of the wet and dry gluten were smaller than the value registered in nonirrigated variants.

Keyword: gluten content, wheat, crop rotation, irrigation

INTRODUCTION

Gluten content of the wheat grains is a very important indicator for yield quality. The quantity of gluten is influenced first of all by climate conditions and by nitrogen content of the soil (Bîlteanu Gh, Bîrnaure V., 1979).

The paper present the influence of the crop rotation and irrigation in the conditions of the moderate wet area of the Criş Plain.

MATERIAL AND METHODS

The paper is base don the research obtained in the long term trial with crop rotation placed in 1990 in Oradea on preluvosoil. On ploughing depth the soil is low acid (pH= 6,8), humus content is low (1,75%), phosphorus (22,0 ppm) and potassium (845,4 ppm) have medium values; macroagregates hydrostability (47,5%) is high and bulk density (1,44 g/cm^3) is high, too.

The experiment dispositive includes:

Factor A: crop rotation

a_1 = wheat, monocrop

a_2 = wheat-maize

a_3 = wheat-maize-soybean

Factor B: water regime

b_1 = nonirrigated

b_2 = irrigated

The surface of the experiment parcele = 50 m^2. Number of repetition = 4. Place methods = blocks method. Cultivar used: Dropia

In the irrigated variant soil water reserve on 0-50 cm was maintained between easily available water content and field capacity determining the soil moisture fifteen to fifteen days and using the irrigation when the situation required.

Dry gluten and wet gluten were determined by usually methods.

RESULTS AND DISCUSSIONS

The rainfall registered during the vegetation period from spring to harvesting were of 110,7 mm in 2003, 177,6 mm in 2004 and 223,0 mm in 2005.

Influence of the crop rotation on wet gluten content

Crop rotation influenced very strong the wet gluten content of the wheat grain. Every year the smallest contents were obtained in wheat monocrop both nonirrigated and irrigated condition.

The year 2003 was the year with the biggest drught and values of the wet gluten were the biggest too.In wheat monocro, the values of the wet gluten were of 22,6% in nonirrrigated conditions and of 21,9% in irrigated conditions. The values registered in the whet-maize crop rotation (29,9% and 29%) and in the wheat-maize-soybean crop rotation (36,1% and 33,8%) were very significant statistically bigger than the values registered in the wheat-monocrop. (table 1).

The values of wet content registered in 2004 in whet-monocrop were of 20,4 % in nonirrigated conditions and of 19,6% in irrigated conditions. There were very significant differences in the wheat-maize and wheat-maize-soybean crop rotation; relative defferences were of 36% and 61% in nonirrigated conditions and of 38% and of 63% in irrigated conditions. This year were registered the biggest values of the wet gluten of the studied period.

Table 1

Influence of the cop rotation and irrigation on wet gluten content of wheat grain, Oradea 2003-2005

Crop rotation	Water regime				Average on the crop rotation
	Nonirrigated		Irrigated		
	%	%	%	%	
2003					
1. Wheat- monocrop	22,6	100	21,9	100	22,25^{Mt}
2. Wheat-maize	29,9	132	29,0	132	29,45***
3. Wheat-maize-soybean	36,1	160	33,8	154	35,45***
Average on the water regime	29,5^{Mt}	100	28,2^{o}	95,6	-

	Crop rotation	Water regime	Water regime x Crop rotation	Crop rotation x Water regime
LSD 5%	1,72	0,97	1,96	1,74
LDS 1%	2,96	1,82	3,12	2,81
LSD 0,1%	5,12	3,76	5,36	4,96

2004					
1. Wheat- monocrop	20,4	100	19,6	100	20,0^{Mt}
2. Wheat-maize	27,8	136	27,1	138	27,45***
3. Wheat-maize-soybean	32,9	161	31,9	163	32,40***
Average on the water regime	27,0^{Mt}	100	26,2^{o}	97,0	-

	Crop rotation	Water regime	Water regime x Crop rotation	Crop rotation x Water regime
LSD 5%	1,12	0,76	1,38	1,42
LDS 1%	2,06	1,58	2,96	3,12
LSD 0,1%	4,38	3,72	5,12	5,52

2005					
1. Wheat- monocrop	21,3	100	21,0	100	21,15^{Mt}
2. Wheat-maize	28,0	131	27,2	130	27,6***
3.Wheat-maize-soybean	34,2	161	33,0	157	33,6***
Average on the water regime	27,8^{Mt}	100	27,1^{o}	97,5	-

	Crop rotation	Water regime	Water regime x Crop rotation	Crop rotation x Water regime
LSD 5%	1,39	0,68	1,42	1,37
LDS 1%	2,42	1,26	2,92	2,86
LSD 0,1%	4,02	3,14	5,36	4,94

Average 2003-2005					
1. Wheat- monocrop	21,4	100	21,0	100	21,2^{Mt}
2. Wheat-maize	28,6	137	27,8	132	28,2
3.Wheat-maize-soybean	34,4	161	32,9	157	33,7
Average on the water regime	28,1^{Mt}	100	27,2^{o}	96,9	-

	Crop rotation	Water regime	Water regime x Crop rotation	Crop rotation x Water regime
LSD 5%	1,41	0,80	1,59	1,51
LDS 1%	2,48	1,55	3,00	2,93
LSD 0,1%	4,51	3,54	5,28	5,14

In 2005 in wheat-monocrop, the content of the wet gluten from grains were of 21,3 in nonirrigated conditions and of 21% in irrigated conditions.

Diferences registered in the wheat-maize and wheat-maize soybean crop rotation were very significant statistically, 31% and 61% in nonirrigated conditions, 30% and 57% in irrigated conditions respectivelly.

The average data of the period 2003-2005 show that the smallest content of the grain wet gluten. In whet-maize and in wheat-maize-soybean crop rotation were registered the differences very significant statistically in comparison with wheat-monocrop: 37% and 61% in nonirrigated conditions, 32% and 57% in irrigated conditions, respectivelly. (table 1).

Influence of the crop rotation on dry gluten content

In 2003 the values of the dry gluten content from wheat grain for monocrop were of 10,8% in nonirrigated and of 10,3% in irrigated conditions. The differences registered in wheat-maize crop rotation were significant statistically, 19% in nonirrigated conditions and 17% in irrigated conditions. In the wheat-maize-soybean crop rotation were distingue significant: 35% in nonirrigated conditions and 39% in irrigated conditions. (table 2).

The dry gluten content of the wheat grains in 2004 in the monocrop were of 9,8% in nonirrigated conditions aof 9,3% in irrigated conditions. The statistically significant of the differences vs. wheat-monocrop registered in the wheat-maize-soybean crop rotation have similar statistically significant with the differences registered in 2003: significant and distingue significant; the biggest values, 13,7% in nonirrigated conditions and 13,0% in irrigated conditions, were registered in wheat-maize-soybean crop rotation. (table 2).

In 2005, the smallest vaslues of the dry gluten were registered in wheat-monocrop, too: 10,2% in nonirrigated conditions and 9,4% in irrigated conditions. A similar situation with 2003 regarding statistically significant of the differences in comparison wheat monocrop was registered in 2005, too. The biggest values of the dry gluten, 14,0% in nonirrigated conditions and 13,3% in irrigated conditions, were registered in the wheat-maize-soybean.

In average on the studied period, the values of the dry gluten content of the grains wheat from monocrop were of 10,26% in nonirrigated conditions and of 9,66% in irrigated conditions. The values, registered in wheat-maize crop rotation were significant statistically bigger: (12,37% and 11,76%) and in wheat-maize-soybean were registered the biggest values (14,13% and 13,53%) and differences distingue significant in comparison with wheat-monocrop. (table 2).

Table 2

Influence of the cop rotation and irrigation on dry gluten content of wheat grain, Oradea 2003-2005

Crop rotation	Water regime				Average on the crop rotation
	Nonirrigated		Irrigated		
	%	%	%	%	
2003					
1. Wheat- monocrop	10,8	100	10,3	100	10,55^{Mt}
2. Wheat-maize	12,9	119	12,1	117	12,8**
3. Wheat-maize-soybean	14,7	136	14,3	139	14,5***
Average on the water regime	12,8^{Mt}	100	12,43^{-}	97,1	-

	Crop rotation	Water regime	Water regimex Crop rotation	Crop rotation x Water regime
LSD 5%	1,10	0,55	1,28	1,31
LDS 1%	1,96	1,32	2,08	1,84
LSD 0,1%	2,74	2,19	3,66	3,42

2004					
1. Wheat- monocrop	9,8	100	9,3	100	9,55^{Mt}
2. Wheat-maize	11,9	121	11,0	118	11,45***
3. Wheat-maize-soybean	13,7	140	13,0	140	13,35***
Average on the water regime	11,8^{Mt}	100	11,10^{o}	94,1	-

	Crop rotation	Water regime	Water regime x Crop rotation	Crop rotation x Water regime
LSD 5%	0,72	0,68	0,98	0,88
LDS 1%	1,24	1,04	1,84	1,72
LSD 0,1%	2,28	2,12	3,16	3,52

2005					
1. Wheat- monocrop	10,2	100	9,4	100	9,8^{Mt}
2. Wheat-maize	12,3	121	11,6	123	11,45***
3. Wheat-maize-soybean	14,0	137	13,3	141	13,65***
Average on the water regime	12,17^{Mt}	100	11,43^{o}	93,9	-

	Crop rotation	Water regime	Water regime x Crop rotation	Crop rotation x Water regime
LSD 5%	0,84	0,67	1,24	1,18
LDS 1%	1,29	1,06	2,43	1,94
LSD 0,1%	2,01	1,94	4,96	3,18

Average 2003-2005					
1. Wheat- monocrop	10,26	100	9,66	100	9,96^{Mt}
2. Wheat-maize	12,37	121	11,76	122	12,07**
3. Wheat-maize-soybean	14,13	138	13,53	140	13,83***
Average on the water regime	12,25^{Mt}	100	11,65^{-}	95,1	-

	Crop rotation	Water regime	Water regime x Crop rotation	Crop rotation x Water regime
LSD 5%	0,89	0,63	1,17	1,12
LDS 1%	1,50	1,14	2,12	1,83
LSD 0,1%	2,34	2,08	3,92	3,37

Influence of the irrigation on gluten content of the wheat grains

All the years, the values of the wet gluten from irrigation variant were smaller than the values registered in the nonirrigated variant and the relative differences were of 4,4% in 2003, 3% in 2004 and 2,5% in 2005.

Irrigation determined an unsignificant decreasse of the dry gluten from wheat grain in droughty years 2003 and significant decreases in 2004 and 2005. The relative differences of the dry gluten of the wheat grain from irrigated variant in comparison with nonirrigated variant had the next average values: 2,9% in 2003, 5,9% in 2004 and 6,1% in 2005.

CONCLUSIONS

After 14 years of the stationary research, the influence of the crop rotation on wet abd dry gluten is very evident. The smallest values of the wet and dry gluten from wheat grains were registered in wheat-monocrop both in nonirrigated and irrigated conditions.

Wheat-maize and wheat-maize-soybean crop rotations determined the increases of the wet and dry gluten in comparison with the values registered in the wheat-monocrop, the differences were very significant statistically every year both in irrigated and nonirrigated conditions. The biggest values of the wet and dry gluten were registered in the wheat-maize-soybean crop rotation.

In the irrigated variant, the values of the wet and dry gluten decreased significant in comparison with nonirrigated variant but n droghty years 2003 the differences registered between dry gluten from irrigated variant in comparison with nonirrigated variant are unsignificant statistically.

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