

THE INFLUENCE OF THE FORERUNNER PLANT, FERTILISATION LEVEL AND CLIMATIC CONDITIONS ON THE TOTAL WET AND DRY GLUTEN CONTENT OF WINTER WHEAT SEEDS

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Abstract. The quality of the cultivated plants depends on the employed cultivar and hybrid, climatic characteristics during the cultivation year and also, on the applied technology.

There are important references in scientific literature that emphasize the implication of different factors in influencing the quality of the obtained production. They underline the importance of nitrogen on the increase in protein content, on wet and dry mass gluten also on the amelioration of quality indexes of gluten. The authors mention the role of the ameliorative plant (pea) on the wheat quality and the important role of the regionalised wheat races on the quality of raw protein and gluten.

Keywords: forerunner plant, fertilization level, dry gluten, wet gluten, winter wheat seeds

INTRODUCTION

To justify some of these aspects that have consequences regarding the quality of the final production, we make some references to the specialised scientific literature. Hera (1986a,b) [5, 6] underline the importance of nitrogen for the increase of the protein content, wet and dry gluten and for the improvement of the quality indicators of gluten. The authors also mention the importance of the ameliorative plant (the pea) for the quality indicators of the wheat. Boldea (1986) [2] also mention the importance of the new species of wheat for the quality of raw protein and gluten.

Dinca (1971) [3], both notice the role of the precursory plant and of the fertilisation (especially the one with nitrogen) for wheat's quality which is obvious in a higher content of protein and wet and dry gluten, irrespective of the soil's fertility where the species was tested.

The production's quality is related to a series of physical and chemical characteristics of the plants which gives a positive mark to the applied agro technical measures for the correlation of this with the obtained production for the surface unit [4].

The role of the forerunner plant and of the fertilisation, especially with nitrogen on the wheat quality (materialised in a higher protein and wet as well as dry gluten wheat content) regardless the soil's fertilisation level which supported the cultivation of the experimental race, is underlined by several authors [1, 3, 8, 9].

The production's quality is a property connected to several physical and chemical characteristics of the plants and confers a positive note to the applied agro technical measures, having in sight the correlation of

quality with the obtained production on a surface unit [7].

MATERIALS AND METHODS

A multifactorial experiment (subdivided plots) was developed at Agricultural Research and Development Center (A.R.D.C) Oradea (Romania) on a brown luvisc soil with a loamy-clay texture (32.7 % clay in the 0-20 cm layer) with low fertility. The experiment took place between 2003 and 2004 characterised by climatic differences. 2003 was a normal, favourable year and 2004 was a less favourable year because it was a drier one. The forerunner's plant and fertilisation level as functions of climate were observed in the quality of winter wheat seeds.

Laboratory analysis of the obtained product's quality was performed taking in account the total, wet and dry gluten content of winter wheat seeds cultivar Dropia.

RESULTS

In Table 1 are presented the influence of the forerunner plant and the fertilisation level on the total wet gluten content of wheat seeds cultivated on brown luvisc soils for year 2003. Also, in Table 2 are showed the influence of the forerunner plant and fertilisation level on the total wet gluten content of wheat seeds cultivated on brown luvisc soils for year 2004.

In Table 3 are illustrated the influence of forerunner plant and fertilization level on the total content of dry gluten in wheat seeds cultivated on brown luvisc soils for year 2003, and in Table 4, the influence of forerunner plant and fertilization level on the total content of dry gluten in wheat seeds cultivated on brown luvisc soils for year 2004.

Table 1. The influence of the forerunner plant and fertilisation level on the total wet gluten content of wheat seeds cultivated on brown luvic soils, Oradea, Romania, 2003

Observed factor	Wet gluten		Difference ±
	g / 100 g d.w.	%	
a. Forerunner plant			
Wheat monoculture (Mt)	26.08	100	N/A
Corn (G - P)	38.19	146.4	+ 12.11
Pea (M - G - P)	43.14	161.0	+ 17.06
Pea (M - G - P - P)	40.66	155.9	+ 14.58
b. Fertilization level			
N ₀ P ₀ (Mt)	31.93	100	N/A
N ₁₂₀ P ₈₀	39.04	122.3	+ 7.11
N ₁₀₀ P ₈₀ + 10 t/ha manure	40.09	125.5	+ 8.16

Table 2. The influence of the forerunner plant and fertilisation level on the total wet gluten content of wheat seeds cultivated on brown luvic soils, Oradea, Romania, 2004

Observed factor	Wet gluten		Difference ±
	g / 100 g d.w.	%	
a. Forerunner plant			
Wheat monoculture (Mt)	22.40	100	N/A
Corn (G - P)	27.30	121.9	+ 4.90
Pea (M - G - P)	28.90	129.0	+ 6.50
Pea (M - G - P - P)	30.30	135.3	+ 7.90
b. Fertilisation level			
N ₀ P ₀ (Mt)	24.70	100	N/A
N ₁₂₀ P ₈₀	27.60	111.7	+ 2.90
N ₁₀₀ P ₈₀ + 10 t/ha manure	29.40	119.0	+ 4.70

Table 3. The influence of forerunner plant and fertilization level on the total content of dry gluten in wheat seeds cultivated on brown luvic soils, Oradea, Romania, 2003

Observed factor	Wet gluten		Difference ±
	g / 100 g d.w.	%	
a. Forerunner plant			
Wheat monoculture (Mt)	10.92	100	N/A
Corn (G - P)	16.41	150.3	+ 5.49
Pea (M - G - P)	19.01	174.1	+ 8.09
Pea (M - G - P - P)	15.87	145.3	+ 4.95
b. Fertilisation level			
N ₀ P ₀ (Mt)	13.68	100	N/A
N ₁₂₀ P ₈₀	16.18	118.3	+ 2.50
N ₁₀₀ P ₈₀ + 10 t/ha manure	16.80	122.8	+ 3.12

Table 4. The influence of forerunner plant and fertilization level on the total content of dry gluten in wheat seeds cultivated on brown luvic soils, Oradea, Romania, 2004

Observed factor	Wet gluten		Difference ±
	g / 100 g d.w.	%	
a. Forerunner plant			
Wheat monoculture (Mt)	6.90	100	N/A
Corn (G - P)	8.60	124.6	+ 1.7
Pea (M - G - P)	9.40	136.2	+ 2.5
Pea (M - G - P - P)	9.60	139.1	+ 2.7
b. Fertilisation level			
N ₀ P ₀ (Mt)	7.80	100	N/A
N ₁₂₀ P ₈₀	8.70	111.5	+ 0.9
N ₁₀₀ P ₈₀ + 10 t/ha manure	9.40	120.5	+ 1.6

DISCUSSIONS

The gluten content of the wheat seeds was positively correlated to the forerunner plant and fertilisation level (mineral or organo-mineral fertilisers).

It is worth mentioning the fact that even if the wet gluten content (Table 1 & 2) was superior in the favourable 2003 year as compared to the less favourable, dry year 2004, the cultivation of the wheat after corn or pea (crop rotation of 3 and 4 years) as opposed to monoculture determines substantial

increases of 12.11 – 17.06 g/100 g d.w. in 2003 as compared to 4.90-7.90 g/100 g d.w. in 2004.

Table 3 shows the important influence of the forerunner plant and fertilization level on the gluten (dry) content in 2003. As compared to the wheat monoculture (10.92 g/100 g d.w.) the cultivation of wheat after corn or pea determines substantial increases of this qualitative indicator which varies between 15.87-19.01 g/100 g d.w. Same table shows the positive role of the mineral and organo-mineral fertilisation on the dry gluten content. As compared to the unfertilized witness (13.68 g/100 g d.w.) the

mineral and organo-mineral fertilization determined increases up to 16.18 g/100 g d.w. in $N_{120}P_{80}$ and 16.80 g/100 g d.w. in $N_{100}P_{80} + 10$ t/ha manure.

In the dry 2004 year, same influences were noticed concerning the analysed factors (Table 4) on the dry gluten content, even if the values of the quantitative indicator were diminished.

Under these conditions, the forerunner plant was more important than the fertilisation level in respect to the values of the studied qualitative indicator. Thus, the cultivation of wheat in crop rotations determined increases that oscillated between 24.6-39.1 %, as compared with wheat monoculture where the values were around 6.90 g/100 g d.w. of dry gluten. The mineral or organo-mineral fertilization influenced the dry gluten content only with 11.5-20.5 % as compared to the unfertilised alternative.

One can conclude that there is a positive correlation of wet and dry gluten content and the analysed factors. The better the forerunner plant (pea) was together with a higher fertilization level (organo-mineral) the higher were the qualitative indicators of the wheat seeds.

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