Behavior of Premium Wheat Varieties in the Southern Area of Romania and Improvement of the Technological Management of their Implementation

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Abstract: The aim of the study was to determine the various ways of fertilization of wheat, in accordance with characteristics of the chosen varieties, pre-plant and the pedo-climatic conditions specific to the Burnas Plain. Through the research, the quantitative and qualitative increase of the wheat production, the differentiation according to the biological material used (variety) was pursued, all based on the use of 5 variants of fertilization, emphasizing also the costs involved by each of them - parallel input-output for the economic efficiency of culture. The results obtained from the experiments carried out during this period offer, as a novelty element, multi-level comparisons between the Romanian wheat varieties and the Austrian premium varieties provided by SC Probstdorfer Saatzucht Romania SRL [1]. The researches took place in the Burnasului Plain, within the S.C.D.A. Teleorman (Drăgănești-Vlașca), on soils of the molisuri type, cernoziom cambic type, with medium, clay-clay texture. The research that led to the production of production results is extremely different, depending on the environmental conditions (among which the climatic ones had the greatest impact) on the influence of the fertilizers and the wheat varieties used in the study. Production results show that any of the fertilization variants yields significant wheat yields. With the exception of the Biovin 150kg treatment only, when production increases by 15.48-23.31% compared to the untreated control (maximum 896 kg / ha in 2014-2015), all other fattening systems (N80, P80 and complex - N80 + P80 + Biovin 150) are statistically assured in the favorable years (2014-2015, 2015-2016.) with increases of 40-75% - 2373.33 kg / ha at N80, 2863.33 kg / ha at P80 and 2869.33 kg / ha at the complex in 2014-2015. The data showed that, as a whole, Romanian varieties are better responding to this differentiated fattening (N80, P80, Biovin 150) compared to premium varieties. Regarding the application of the NPB (N80 + P80. + Biovin 150) complex, both Romanian and premium varieties offer similar production increases.

Keywords: *wheat; premium varieties; fertilizers; production; economic efficiency.*

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1. Introduction

Considering that cereals - wheat, rice, corn, barley, oats, rye play a particularly important role in human and animal nutrition, the general trend in all countries is to increase the production of these plants.

With regard to wheat, given its economic importance, the current trend is to increase world production. The most effective way to achieve this goal is to increase average production per hectare, especially in countries that now have the largest wheat-covered areas. These countries have large fields with a potentially high fertility potential, providing the right conditions for achieving average outputs far superior to current ones [2].

Another way to increase world wheat production is to cultivate land in arid areas by applying irrigation. Farming of degraded pastures covered with roots, as well as lands covered with bushes and shrubs of no economic value is also a source of ground for wheat crops.

Improving soils with excess moisture, sandy, salty, eroded soils provides opportunities for expanding wheat crops.

The introduction of mineral fertilizers into agricultural crops was determined by the results of plant nutrition research, so in the eighteenth century scientists such as Saussure, Boussingault and Liebig highlighted a relatively frequent imbalance between plant needs and the capacity of soils to meet the requirements in certain nutrients. Traditional manure, manure was found to be insufficient due to low phosphorus and even nitrogen content [5].

The application of fertilizer to cereal grain aims to achieve the economic optimum between the crop yield and the costs of fertilization.

The basic principles to be considered when setting up the fertilization strategy are:

- consumption requirements of culture;
- the evolution of nitrogen supplied by the soil during the growing season;
- the possibilities for plants to use the nitrogen supplied from the soil or from the fertilizers applied.

The global requirements of N (nitrogen), P (phosphorus) and K (potassium) to achieve optimal economic return vary from one year to the next. For 100 kg of berries, plus the corresponding straw production, wheat exports the following amounts of nutrients from the soil: 2,2-3,0 Kg N; 1,0-1,5 kg P₂O₅ and 1.6-3.2 kg K₂O for grain yields ranging from 2,500 to

5,500 kg / ha. The rate of absorption of nutrients depends on the development of culture and follows a characteristic curve:

- by the end of twinning (vegetative stage) the amount absorbed is low, on average 40 kg N / ha;

- starting with the spreading of the straw (beginning of April), the absorption of nitrogen intensifies and remains constant as the plant photosynthesize (baking in milk), being influenced by the growing conditions of the crop (the density of the stalk, the degree of soiling, the disease and pest attack, temperature evolution and precipitation distribution).

The possibilities of nitrogen use by plants in deep soil under normal growing conditions, the wheat culture has the ability to fully utilize the nitrogen supplied by the soil and present in the profile at a depth of 1-1.5 m, depending on the type of the soil. Nitrogen applied as a fertilizer is explored by the superficial soil culture, because in the case of a growing crop, the deep water flow is limited because the culture absorbs all the water from precipitation that penetrates the soil and the nitrogen is not trained on the profile [6].

2. Problem Statement

The objectives of the research are to provide data bases and concrete results related to the management [3] of premium wheat varieties, grain yields and qualities, which will allow for the realization of national soil research projects.

The specific objectives of the paper are:

- achieving a transition to a competitive agriculture in the south of Romania, especially obtaining higher yields, but also by bringing the wheat crop quality indices to the highest possible level - a higher value of wheat on the Romanian, European and world;

- determination of the specific nitrogen and phosphorus consumption in the wheat cultivated after rape, as well as the introduction into the study of a new fertilizer in a solid variant - the biovin;

- establishing the effect of N,P and solid biowaste chemical fertilizers on wheat production during the 2 years of research (2014-2016), the harvest index and the economic efficiency of each treatment variant used in the experimental fields;

- highlighting the most suitable Romanian and premium varieties for the research area (Burnasului Plain).

Factor A (the variety) has the equivalent of the third number of the batch number, respectively 0 - Glosa variety, up to 9 - the Philipp variety.

Factor B (fertilizer variants) - unfertilized, N80, P80, Biovin 150 and N80 + P80 + Biovin 150.

3. Research Methods

The aim of the study was to different determine fertilization wheat, in accordance with the characteristics of chosen varieties, with the pre-plant and with the pedological and climatic conditions specific to the Burnas Plain [5].

Through the research, the quantitative and qualitative increase of the wheat production, the differentiation according to the biological material used (variety) was pursued, all with the use of five modes of fertilization, with emphasis on the costs involved by each of them - parallel input-output for the efficiency of culture economic.

4. Findings

Resulting from nitrogen fertilization

Determination of the influence of nitrogen fertilizers on the production of wheat in the first year of research (2014-2015).

The 2014-2015 agricultural year provided a wide range of abiotic factors favorable to crops, predominantly wheat, which we have in the study.

In a first step, we analyzed the production obtained in the first year of research for untreated and nitrogen fertilized (N80), but without considering each variety. Therefore, the average of all wheat varieties studied (10 varieties) was made on these two coordinates - untreated and nitrogen-fed [4].

It is conclusive that the nitrogen fertilized variant produces a 61.75% production increase, ie 2373.33 kg / ha, which makes this increase a very positive one.

Table 1.1. Production results obtained at SCDA Teleorman in 2014-2015 - single-factor analysis, depending on nitrogen treatment (original)

Treatment	Average production (kg/ha)	Witness ratio (%)	Difference(kg/ha)	Meaning
Witness untreated	3843,33	100,00	–	Witness

N80	6216,67	161,75	2373,33	***
			DL5% = 1198,99	
			DL1% = 1594,66	
			DL0,1% = 2074,25	

Based on Table 1.1. the graph in Fig. 1.1, in which it is exemplified the way of assigning the productions obtained on all the research groups, depending on the application of nitrogen or its lack.

Fig. 1.1. Comparison of the wheat yields obtained in 2014-2015, unifactorial analysis - blank variants and N80 (original)

Taking as the average value of the production of the untreated lots (3843.33 kg / ha), it becomes evident that the N80 influence is even higher, even exceeding the confidence interval provided by the confidence interval $DL5\% = 2644,34$; 5042,32 kg / ha.

In Table 1.2. data processing was continued through bifactorial analysis, following both the influence of the fattening mode and that of each wheat variety.

Table 1.2. Production results obtained at SCDA Teleorman in 2014-2015 - bifactorial analysis, variety and applied treatment (original)

Soy	Treatment	Average production (kg/ha)	Witness ratio (%)	Difference kg/ha	Meaning
Witness (general average)= 5030,00					
Glosa	Witness - untreated	3906,67	77,67	-1123,33	o
	N80	7166,67	142,48	2136,67	* * *
Boema	Witness - untreated	3973,33	78,99	-1056,66	o
	N80	6413,33	127,50	1383,33	* *
Delabrad	Witness - untreated	3693,33	73,43	-1336,66	o o
	N80	5746,67	114,25	716,67	
Faur	Witness - untreated	3860,00	76,74	-1170,00	o
	N80	7000,00	139,17	1970,00	* * *
Izvor	Witness - untreated	3400,00	67,59	-1630,00	o o
	N80	6666,67	132,54	1636,67	* *
Josef	Witness - untreated	2946,67	58,58	-2083,33	o o o
	N80	4946,67	98,34	-83,33	
Ludwig	Witness - untreated	4760,00	94,63	-270,00	
	N80	6213,33	123,53	1183,33	*
Atrium	Witness - untreated	4086,67	81,25	-943,33	
	N80	6113,33	121,54	1083,33	*
Capo	Witness - untreated	3773,33	75,02	-1256,66	o
	N80	5786,67	115,04	756,67	
Philipp	Witness - untreated	4033,33	80,19	-996,66	o
	N80	6113,33	121,54	1083,33	*
				DL5% = 973,48	
				DL1% = 1302,47	
				DL0,1% = 1710,45	

Based on the information in the table above, the bifactorial graphic representation of Fig. 1.2. This time it was taken as the average witness of the whole experience, ie the value of 5030 kg / ha.

Fig. 1.2. Comparison between wheat yields obtained in 2014-2015, bifactorial analysis - varieties and fertilization (original)

Looking at each wheat variety and guiding us by the different color of the graphical bars (untreated red, green for the N80), we can see that most varieties fail without fattening to produce productions that include them within the range Reliable $\square$ DL5% = 4056,52 $\square$ 6003,48 kg / ha. The only exception to this is the Ludwig variety.

On the other hand, fertilization with a dose of 80 kg nitrogen / ha brings very positive significant increases for Glosa and Faur, significant positive for Boema and Izvor and distinctly significant for Ludwig, Atrium and Philipp.

The analysis is based on a correlation ratio ($r^2 = 0.9379$) which is very statistically significant.

Results obtained from fossil fertilization

Table 1.3. The production results obtained at SCDA Teleorman in 2014-2015 - single-factor analysis, depending on the phosphorus treatment (original)

Treatment	Average production (kg/ha)	Witness ratio (%)	Difference (kg/ha)	Meaning
Witness - untreated	3843,33	100,00	–	Witness
P80	6706,67	174,50	2863,33	* * *
				DL5% = 1047,34

$DL1\% = 1392,96$

$DL0,1\% = 1811,89$

The influence of phosphorus on wheat production, on the average of the 10 varieties, was a very significant positive, surpassing visibly that of nitrogen. The recorded production gain was 2863.33 kg / ha compared to the mean value of the control variant (untreated), which means an increase of 74.50%.

At the level of the first year of research, the differences between nitrogen and phosphorus are 490 kg / ha in favor of phosphorus, ie 12.75% in addition to the fertilized nitrogen.

Starting from Table 1.3. the graph in Fig. 1.3, where the difference between the non-fertilized and the P80 fattened variant in 2014-2015 can easily be seen.

Fig. 1.3. Comparison of the wheat yields obtained in 2014-2015, unifactorial analysis - blank variants and P80 (original)

The influence of phosphorus fertilization is very well provided statistically, and it goes far beyond the confidence interval, which exceeds 1816 kg / ha.

In fact, the whole analysis is based on a correlation ratio ($r^2 = 0.9152$) which is very significant statistically assured.

Continuing with data processing, bifactorial analysis was carried out, in which the way P80 fertilization acted on each wheat variety.

Table 1.4. Production results obtained at SCDA Teleorman in 2015-2016 - bifactorial analysis, variety and applied treatment (original)

Soy	Treatment	Average production (kg/ha)	Witness ratio	Soy	Treatment
Witness (general average)= 3903,48					
Glosa	Witness - untreated	3718,33	95,26	-185,14	
	Biovin150	4350,00	111,44	446,52	*
Boema	Witness - untreated	3720,00	95,30	-183,48	
	Biovin150	4120,00	105,55	216,52	
Delabrad	Witness - untreated	3740,00	95,81	-163,48	
	Biovin150	4293,33	109,99	389,85	
Faur	Witness - untreated	3718,33	95,26	-185,14	
	Biovin150	4394,33	112,57	490,85	*
Izvor	Witness - untreated	3370,00	86,33	-533,48	o
	Biovin150	4166,33	106,73	262,85	
Josef	Martor – netratat	3271,67	83,31	-631,81	o o
	Biovin150	4130,00	105,80	226,52	
Ludwig	Witness - untreated	4085,00	104,65	181,52	
	Biovin150	4011,00	102,75	107,52	
Atrium	Witness - untreated	3726,67	95,47	-176,81	
	Biovin150	4050,00	103,75	146,52	
Capo	Witness - untreated	3418,67	87,58	-484,81	o
	Biovin150	4131,00	105,83	227,52	
Philipp	Witness - untreated	3475,00	89,02	-428,48	o
	Biovin150	4391,50	112,50	488,02	*
				DL5% = 412,19	
				DL1% = 551,49	
				DL0,1% = 724,23	

The production fluctuation of each variety, depending on the fertilization variant, is exemplified in Fig. 1.4.

Fig. 1.4. Comparison of wheat yields obtained in 2015-2016 bifactorial analysis - varieties and fertilization (original)

The highest values of the biomass use index for autumn wheat (Fig. 1.4) were recorded in Faur varieties (4394.33 kg / ha), Philipp (4391.50 kg / ha) and Glosa (4350 , 00 kg / ha), these three varieties being the only ones that exceed the upper part of the confidence interval given by the limits $\square$ $DL5\% = 3491,30 \square 4315,67$ kg / ha.

It is also noted that all varieties treated with biovar exceed the overall average of the whole experience, which was taken as a control (3491.20 kg / ha).

5. Conclusions

As a result of the researches carried out, we propose at the end of the paper two types of syntheses:

1. Conclusions of research results especially for research and which we consider to contribute to the improvement of agricultural science, specific knowledge.

2. A summary of applicative information for farmers in the Teleorman area (Burnasului Plain) and other adjacent areas.

Starting from the purpose of the paper, which has allowed to model the fertilization of the wheat culture according to the nature of nutrients, varieties and climatic conditions, we have come to the following conclusions:

1. The polyfactor experience comprises 3 factors:

□ the first of them is the variety:

- The varietal statistical survey reveals insignificantly the varieties Glosa, Faur, Ludwig, Atrium and Philipp.

- We emphasize that the significance of these varieties is calculated in relation to the average of the experience - the average yield of the 2-year experience, which is 4672 kg / ha.

- In relation to the above-mentioned media, none of the varieties are significantly detached due to the large variation in harvests in the years of study (variation determined by different climatic conditions from one year to another).

□ the second factor is fertilization:

- The 2-year average of fertilization levels highlights the positive effect of phosphorus and nitrogen, while biovin does not bring production supplements.

- The annual variation increased the dispersion of variables, resulting in very wide thresholds of calculated confidence intervals.

- Productions play within the boundaries of trust, and not outside, so the impact of the very unlikely or unlikely is missing from this causal justification.

□ the third factor is the year, with different environmental conditions:

- Climate conditions have significantly influenced the decline in wheat production.

- The best year for wheat was 2015-2016, with an average yield of 5646 kg / ha.

- Compared to 2015-2016, the harvest fell by almost 1000 kg / ha in 2014-2015. The decrease is significant and highlights the danger of the abiotic factor, including wheat crops, considered more stable than other crops.

2. With regard to nitrogen fertilization, according to the calculations we can say that:

□ Nitrogen (N80) remains the minimum amount of nitric nutrition, yielding an average of 2400 kg / ha relative to the untreated control.

□ In the N-varieties relationship, the best reaction to the N80 was Glosa, Boema, Faur, Izvor, Ludwig, Atrium and Philipp.

□ We also point out that the Ludwig, Atrium and Philipp varieties have best used the natural fertility of the varieties and that, in the absence of nitrogen inputs, they should be used with priority.

3. For phosphorus fertilization, the calculations show that:

□ Phosphorus is at the limit of crop survival, including the Teleorman area. The logic of statistical computation is accepted and our premonition has been awaited. The production increase brought by this element varied with years between 2863 kg / ha and 1341 kg / ha. This results in an average of 1950 kg / ha, ie a production yield of 25 kg of wheat per hectare per kg of P₂O₅.

□ Phosphorus has therefore become very effective and should not be absent from autumn fattening.

□ All varieties respond positively to phosphorus, almost none resembling the confidence interval of the experience.

4. We have an experience of "minimal states" and from the observations made but not yet demonstrated, the intuition of the use of higher doses of nitrogen, especially for the premium varieties we use, on the one side to increase the photosynthesis index, in order to keep the protein index and soil fertility index high. In this sense, we have developed working hypotheses and predictions for new experiences in progress.

5. We recommend farmers to look for buyers who also pay for quality, because the grain in the area exceeds 14% protein and approaches 30% wet gluten, so they are excellent breads for breeding.

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