

THE INFLUENCE OF THE PRECEDING PLANT AND FERTILIZATION ON THE WHEAT PRODUCTION

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Abstract

Obtaining some high quantity and quality production in the autumn wheat crop is closely related to the distribution of crops after the best preceding plants and the implementation of a proper fertilization.

For the autumn wheat, in particular, those crops must be taken into consideration that are harvested earlier than usual. These allow the earlier clearance of the plough land, facilitate the pursuing of the basic soil, mending and preparing the germinal foundation and cropping in the best period.

The most indicated preceding plants are the following: leguminous plants, flax, cole, mustard, technical plants and corn.

Having high quantity productions per hectare that are also economically efficient, also implies that wheat crops are fertilized with optimal dressing doses which must take into account the requirements of the wheat and also the degree of nourishment existent in the soil.

The importance of the preceding plant and fertilization, was analyzed in the case of the Four autumn wheat, in the conditions of the under cropping in monoculture, the wheat – corn and wheat – pea – corn rotation.

Key words: preceding plant, fertilization, monoculture, wheat, crop rotation

INTRODUCTION

The wheat subscribes to the crop rotation that implies special requirements determined by some of these aspects: the high percentage within the crop structure (33-36% of the cereal surface); high demands concerning the preparation of the soil and the optimal cropping session; high sensibility towards the grass extension and towards a large number of diseases that usually affect cereals; low capacity of exploiting the natural fertility of the soil as a result of the under developed radicular system that has a reduced capacity of using the nourishing substances in the soil.

The wheat-corn rotation is compulsory because the two crops cover 60% of the plough land.

Corn is considered to be a mediocre preceding plant, because at the time of the corn harvesting, the soil lacks water, but it can become a good preceding plant if there are harvested young and semi-young bastards that would clear the plough land early.

The introduction in the crop rotation of a leguminous plant, contributes to the improvement of the soil fertility, especially on the plough land, on those soils where it can be noticed a diminishing of the wheat production, after the wheat-corn succession.

The wheat crop in monoculture is low because it favours the extension of the grass and grows the attack of germs and pests.

The type of preceding plant used is an important criteria in establishing the fertilizer doses needed. Thus, after the leguminous plants the doses are reduced with 20-40 kg of nitrogen/hectare, while after the breeding plants, that are being harvested in the second semester of the summer, the nitrogen doses must be increased with 15-25%.

Those fertilizers containing nitrogen are applied in doses of 80-160 kg/hectare as follows:

- after the leguminous plants – 60-90 kg/hectare
- after the early breeding plants – 80-120 kg/hectare
- after the late breeding plants – 120-160 kg/hectare

The phosphorus fertilizers are used according to the mobile phosphorus composition of the soil, in doses of 60-80 kg P₂O₅/hectare, entirely administrated before the basic tillage.

MATERIAL AND METHODS

The study of the interaction between the preceding plant and the fertilizer dose in the case of the Faur autumn wheat, was performed at S.C.A. Leş, Bihor county, in the period 2007-2009.

Three kinds of preceding plants were used:

- a₁ – the monoculture of wheat
- a₂ – the wheat – corn rotation
- a₃ – the wheat - pea -corn rotation and three kinds of fertilization:
 - b₁ – unfertilized,
 - b₂ – fertilization with 50 kg a.s./hectare N,
 - b₃ – fertilization with 100 kg a.s./hectare N,
 - b₄ – fertilization with 150 kg a.s./hectare N.

In order to analyze the interaction between the preceding plant and the fertilization level (A×B), the control a₁b₃ (monoculture x N₁₀₀P₈₀kg a.s./hectare) was chosen as a witness.

RESULTS AND DISCUSSIONS

The study referring to the dual impact produced by the action of the preceding plant and the fertilization level brought to light the favourable effect of both factors.

Table 1 highlights the interaction between the preceding plant (A) and the fertilization level (B), two important factors in obtaining a high production, in which were used as control the monoculture a₁ and the fertilization level b₃ – fertilization with N₁₀₀P₈₀ a.s./hectare, along the period 2007-2009.

Table 1

The influence of the preceding plant and the fertilization level on the cropping levels in the Faur autumn wheat, Leş – Bihor (2007 – 2009)

Variants		Yield 2007 q/hectare	Yield 2008 q/hectare	Yield 2009 q/hectare	Average Seed yield 2007-2009 q/hectare
Monoculture	N ₀ P ₀	19.7	20.5	21.3	20.5
	N ₅₀ P ₈₀	36.8	37.6	38.4	37.6
	N ₁₀₀ P ₈₀	37.5	38.7	39.3	38.5
	N ₁₅₀ P ₈₀	39.6	40.5	40.8	40.3
Wheat- Corn	N ₀ P ₀	22.8	23.5	23.9	23.4
	N ₅₀ P ₈₀	42.1	42.8	43.2	42.7
	N ₁₀₀ P ₈₀	46.7	47.6	48.2	47.5
	N ₁₅₀ P ₈₀	51.5	52.4	52.7	52.2
Wheat- Pea - Corn	N ₀ P ₀	29.6	30.2	30.5	30.1
	N ₅₀ P ₈₀	44.8	45.4	45.7	45.3
	N ₁₀₀ P ₈₀	49.9	50.2	50.8	50.3
	N ₁₅₀ P ₈₀	55.1	55.8	56.2	55.7

Analyzing the average productions, obtained during the three years of study (2007 – 2009), at the gradations of the B factor, there can be observed that compared to the witness (monoculture x fertilization N₁₀₀P₈₀ a.s./hectare) the differences are negative in the case of the unfertilized variants, both in the case of monoculture, and in that of the wheat-corn rotation and wheat-pea-corn rotation. The production is superior in the case of the wheat-corn rotation and the wheat-pea-corn rotation, fertilized with N₅₀P₈₀, N₁₀₀P₈₀ și N₁₅₀P₈₀ a.s./hectare.

The analysis of the average production during the three year time, through the interaction of the two factors, emphasizes the favourable effect of the fertilization closely related to the preceding plant.

In table 2 aspects concerning the interaction between the crop rotations and the fertilizing level on the average production during the analyzed period of time (2007 – 2009) are presented.

Compared to the witness (monoculture x fertilization N₁₀₀P₈₀ a.s./hectare) the differences are negative in the case of the unfertilized variants, with 18.0 q/hectare in the case of monoculture, with 15.1 q/hectare in the case of wheat-corn rotation and 8.4 q/hectare in the case of wheat-pea-corn rotation.

Table 2

The aspects of the interaction between the crop rotation and the level of fertilization in the Faur wheat species, Leș Bihor (2007-2009)

Variants		Average Seed yield 2007-2009	Relative yield %	Dif. ±	Significance
Monoculture	N ₀ P ₀	20.5	53.2	-18.0	000
	N ₅₀ P ₈₀	37.6	97.6	-0.9	-
	N ₁₀₀ P ₈₀	38.5	100.0	-	-
	N ₁₅₀ P ₈₀	40.3	104.6	+1.8	-
Wheat – Corn	N ₀ P ₀	23.4	60.7	-15.1	000
	N ₅₀ P ₈₀	42.7	110.9	+4.2	-
	N ₁₀₀ P ₈₀	47.5	123.3	+9.0	xxx
	N ₁₅₀ P ₈₀	52.2	135.5	+13.7	xxx
Wheat – pea Corn	N ₀ P ₀	30.1	78.1	-8.4	00
	N ₅₀ P ₈₀	45.3	117.6	+6.8	xx
	N ₁₀₀ P ₈₀	50.3	130.6	+11.8	xxx
	N ₁₅₀ P ₈₀	55.7	144.6	+17.2	xxx

LSD 5%=4.62 LSD 1%=6.32 LSD 0.1%=8.57

The experiments show that the wheat can be harvested in monoculture, the production differences are positive, 1.8q/hectare compared to the witness, in the case of fertilization with N₁₅₀P₈₀. As a whole, the productions in monoculture are smaller, they do not exceed 40.3 q/hectare, under the influence of some big doses of nitrogen fertilizers (N₁₅₀).

The wheat-corn rotation is known to be as the most extended rotation in our country. On average, during the three years (2007-2009), the wheat production on a two-year rotation, with the help of fertilization with N₁₅₀P₈₀, was bigger with 9.0 q/hectare, compared to the control.

The production exceed is significant in the case of the wheat-corn rotation and the fertilization with N₁₅₀P₈₀, reaching 13.7 q/hectare.

The wheat-corn production is largely used, in comparison with the three year rotation, but it can lead to a diminish of the wheat crop, due to the fact that both species (wheat and corn) have in common over 10 germs.

In order to prevent the transmission of diseases from one species to another, the abolition of the wheat-corn succession is chosen and the introduction in the rotation of other cultures is selected. In this case we chose the introduction in the rotation of a leguminous plant: pea, that is a valuable preceding plant for the autumn wheat.

In the case of wheat-pea-corn rotation, there can be observed a positive difference even in the case of the fertilization with reduced nitrogen doses $N_{50}P_{80}$, of 6.8 q/hectare, compared to the control, reaching a significant difference of 17.2 q/hectare in the case of fertilization with $N_{150}P_{80}$.

Thus it can be noticed that the production of grains in the case of the autumn wheat, increases proportionally with the duration of the rotation and the fertilization level.

CONCLUSIONS

The researches done at the SCA Leș-Bihor, during a three year period, highlights the favourable effect of the preceding plant in the case of the crop rotation, summed up with the level of fertilization.

- Based on the results obtained at SCA Leș-Bihor, it is recommended that the harvesting of the wheat in a monoculture, should be realised only in strictly and compulsory conditions of usage of doses of $N_{150}P_{80}$.

- The wheat production, in the case of the wheat-corn two year rotation, is superior to the control, on condition that moderate doses of fertilizer $N_{100}P_{80}$ are being used.

- If a leguminous plant is introduced in the three year crop rotation, the obtained production is significant, on condition that fertilizer doses of $N_{100}P_{80}$ și $N_{150}P_{80}$ are being used.

- In order to obtain efficient production under the economical aspect it is necessary that the harvesting of the wheat is done in two and three year rotation and chemical fertilizers are being used.

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