THE EFFECT OF THE FERTILIZING LEVEL AND OF THE PRECEDING PLANT UPON THE WINTER WHEAT PRODUCTION IN THE WESTERN PLAIN

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Abstract

The winter wheat is one of the agricultural plants that reacts very well when fertilizers are applied to it in all our country's pedoclimate conditions.

In order to obtain high and quality wheat productions the preceding plant and the applied level of fertilization is extremely important, level manifested through the quantity of organic residues which remain in the soil and through the biological processes of decomposition.

The preceding plants for the winter wheat must correspond to the following requests: to free the soil early in summer so that it can be well prepareed for sowing, to leave the field clean, with no weeds, with improved chemical and physical features rich in organic and nutritious substances.

In order to emphasize the fertilization level and the role of the preceding plant in the autumn type of wheat culture the quantitative and qualitative production of the Faur type of wheat has been analyzed at the Leş-Bihor agricultural farm, in the conditions of a wheat mono culture and a two year rotation: wheat-corn, three year rotation wheat-corn-peas and wheat-corn-sun flower-peas

Key words: fertilization level, preceding plant, monoculture, culture rotation.

INTRODUCTION

The application of fertilizers represents the strongest lever in order to obtain increased and high quality wheat productions. The fertilization must be done rationally, taking into account the type of soil and its degree of supply with nutritious substances, the preceding plant and the type of wheat planted. (Diaconu et al.,1978).

Wheat is very pretentious in what the types of fertilizers are concerned due to the following particularities: its radicular system is weakly developed and it has a very low power of solubilization towards the compounds that are more soluble in the soil; although it has a long period of vegetation, the greatest part of the nutritious elements is extracted in a relatively short time, from strawing to the milk maturity: 70-92% N, 75-88%P_2O_5, 85-88%K_2O (Borcean et al.,2006).

The best results when applying chemical fertilizers are obtained when one uses all the application methods, before sowing, when sowing, during vegetation, through a judicious combination of the different forms and doses that must be applied according to the variable needs of the plants so that the latter be ensured with the necessary substances during the whole vegetation.(Oancea, 2005).

Rational types of rotations have been introduced in a large experimental net and in rotations repeated in time in order to establish the turn of the plants having in view their needs and their biological circle with mutual tolerance and pedoclimate conditions; we have also determined the dynamics of the nutritious substances in the soil, concluding that rotations are extremely necessary for production.(Davidescu,Davidescu, 2002).

The rotation is not only a rotation of more different plants and of the way they behave but it is also a series of successive estates of the soil. For example sugar beet and corn have the property to extract and consume a great quantity of water and mineral salts from the soil, leaving it into a lower fertility estate for the grain cereal types of culture. As a consequence the used bases of fertilizers shall vary according to the preceeding plant. (Berca, 2008).

The preceding plants for the winter wheat must respond to the following needs: to free the soil early in summer so that there is enough time to prepare the soil for the culture in the best conditions and for sowing at the optimum time; to leave the soil free of weeds with improved chemical and physical features and with a high content in organic substances and in nutritious substances. (Bîlteanu, 2003).

The good preceding plants for the winter wheat are: soy, sugar beet, fodder beet, the autumn potato, the sunflower, corn, the hemp for its seeds. All these preceding cultures must be harvested until 10th-15th of September so that there is an interval of at least 2-3 weeks until the sowing of the wheat. (Borza, Stanciu, 2010).

The wheat-corn rotation is the most common in our country and it represents a special economic importance. It must be though underlined that the wheat-corn production is significantly lower than the production obtained in a longer period rotation.(Bîlteanu, 2003).

The pea culture is a special preceding plant with a special value for the wheat due to the fact that it can be harvested early and it fixes atmospheric nitrogen. The production increases obtained in the wheat grown after the pea in comparison to the wheat grown after corn can be comprised between 9,7 and 17,73q/ha (Domuța et all., 2011).

In the two year rotation wheat-corn, the total number of weeds is inferior to the monoculture but from one experimental cycle to another it grows on all parts. In the three year rotation peas-wheat-corn the wheat culture does not contain as much weed as the monoculture. (Ciobanu, Domuța et al., 2003).

On drought conditions on the basis of a moderate gain in weight, the rotation is decisive, going even to a double production. If there is rainfall of 400, 450 or 500 mm this brings positive reactions to the culture's rotation. At a rainfall of 500-600mm the reactions are small, proving the fact that in a

monoculture as well as in a rotation culture 450-500 mmm of rainfall is enough for the wheat, especially if 50% of the rainfall happens during the vegetation period of the wheat. (Berca, 2011)

MATERIAL AND METHOD

The study related to the level of fertilization and to the preceding plant for the Faur winter wheat has been performed at S.C.A.Leş, Bihorcounty, during 2013-2016, in a four year rotation.

Four variants of preceding plants have been used

a_1-wheat monoculture

a_2- wheat -corn rotation

a_3 -wheat-corn-peas rotation

a_4- wheat-corn-sun flower-peas rotation

and three variants of fertilizations and a non fertilized variant:

b_1- non fertilized

b_2 – fertilization with $N_{75}P_{80}$;

b_3 – fertilization with $N_{90}P_{80;}$

b_4 – fertilization with $N_{120}P_{80}$.

The culture technology applied to the Faur type of wheat has respected the technological requirements specific to the wheat in the conditions of a brown luvic soil and the sowing has been performed during the optimum period, that is 10^{th} - 20^{th} October.

The application of the fertilizers with phosphorus has been performed in autumn, before the sowing and the nitrogen fertilizers have been applied fractionally, 1/3 of the nitrogen has been applied in autumn and 2/3 of the dose has been applied in spring.

The level of rainfall during the three years of culture has been different: 596,7 mm/m^2, have been registered in 2013, in 2014-599,9 mm/m^2, in 2015-576,5mm/m^2, and in 2016-728,7mm/m^2.

For the analysis of the interaction between the level of fertilization and the preceding plant (A×B), the variant a_1b_3 has been chosen as a witness (monoculture x $N_{90}P_{80}$kg s.a./ha).

RESULTS AND DISCUSSION

The study regarding the united action produced by the level of fertilization and the preceding plant has emphasized the favorable effect of the two factors through the level of the obtained productions.

Table 1 presents the interaction between the level of fertilization (A) and the preceding plant (B), two important factors for obtaining high productions, in which the monoculture a_1 has been used as a witness, and the

b_3- fertilization level – the fertilization with $N_{90}P_{80}$ s.a./ha, during the years 2013-2016.

Table 1

The influence of the fertilization level and of the preceding plant upon the winter wheat production in Leş-Bihor(2013-2016)

Rotation		**Production 2013 kg/ha**	**Production 2014 kg/ha**	**Production 2015 kg/ha**	**Production 2016 kg/ha**	**Average production 2013-2016 kg/ha**
Monoculture	N_0P_0	2260	2410	2350	2480	2375
	$N_{75}P_{80}$	3550	3630	3740	3750	3667
	$N_{90}P_{80}$	**3670**	**3770**	**3830**	**3880**	**3787**
	$N_{120}P_{80}$	3860	3900	4080	4120	3990
Wheat-corn	N_0P_0	2380	2450	2570	2690	2522
	$N_{75}P_{80}$	4180	4210	4050	4280	4180
	$N_{90}P_{80}$	4570	4650	4230	4720	4542
	$N_{120}P_{80}$	5150	5240	4890	5320	5150
Wheat-corn-peas	N_0P_0	2840	3050	2970	3180	3010
	$N_{75}P_{80}$	4450	4530	4210	4770	4490
	$N_{90}P_{80}$	4970	5120	4950	5280	5080
	$N_{120}P_{80}$	5210	5470	5120	5520	5330
Wheat-corn-sun flower-peas	N_0P_0	3150	3210	3220	3320	3225
	$N_{75}P_{80}$	4530	4660	4470	4680	4585
	$N_{90}P_{80}$	4950	5200	4980	5330	5115
	$N_{120}P_{80}$	5320	5540	5300	5610	5442

The use of chemical fertilizers in the wheat culture technology is decisive and the rotation of the cultures has got an important role in establishing the doses of fertilizers applied as the preceding culture can consume or bring a certain quantity of nutritious substances in the soil.

By cultivating wheat in a monoculture and by fertilizing it with $N_{90}P_{80}$ we have obtained an average production of (2013-2016) de 3787 kg/ha, in the rotation wheat-corn an average production of 4542 kg/ha, in the rotation wheat-corn-peas the average production was of 5080kg/ha, and for the rotation wheat-corn-sun flower-peas the average production was of 5115kg/ha.

For outlining the role of the culture rotation and the production increase in the wheat's culture technology we had as a witness the monoculture and the fertilization with $N_{90}P_{80}$ and the two year rotation corn-wheat fertilized with $N_{90}P_{80}$(table 2).

Table 2

The influence of the rotation upon the Faur type of wheat production on an agricultural base with chemical fertilizers

Rotation of cultures		**Average production 2013-2016 kg/ha**	**% compared to the monoculture**	**% compared to the corn-wheat rotation**
Monoculture	N_0P_0	2375	62.7	52.3
	$N_{75}P_{80}$	3667	96.8	80.7
	$N_{90}P_{80}$	**3787**	**100**	83.4
	$N_{120}P_{80}$	3990	105.4	87.8
Wheat-corn	N_0P_0	2522	66.6	55.5
	$N_{75}P_{80}$	4180	110.4	92.0
	$N_{90}P_{80}$	**4542**	119.9	**100**
	$N_{120}P_{80}$	5150	135.9	113.4
Wheat-corn-peas	N_0P_0	3010	79.5	66.3
	$N_{75}P_{80}$	4490	118.6	98.8
	$N_{90}P_{80}$	5080	134.1	111.8
	$N_{120}P_{80}$	5330	140.7	117.3
Wheat-corn-sun flower-peas	N_0P_0	3225	85.2	71.0
	$N_{75}P_{80}$	4585	121.1	100.9
	$N_{90}P_{80}$	5115	135.1	112.6
	$N_{120}P_{80}$	5442	143.7	119.8

During the four years of culture at a $N_{90}P_{80}$ level of fertilization the wheat cultivated in a monoculture has registered an average production of 3787 kg/ha, respectively 100%, in the rotation wheat-corn a production increase of 119,9%, is performed, in the rotation wheat-corn-peas the production increase is of 134,1%, and in the rotation wheat-corn-sun flower-peas the production increase is of 135,1%.

The production increase realised in comparison with the two year rotation wheat-corn in the case of fertilization with $N_{90}P_{80}$ is of 83,4% in the case of the monoculture, of 111,8% in the case of the wheat-corn-peas rotation and of 112,6% in the case of wheat-corn-sun flower-peas rotation.

CONCLUSIONS

The study related to the effect of the fertilizing level and to that of the preceding plant upon the autumn type of wheat in the conditions of the West Field from Leș-Bihor, emphasizes the important role of the preceding plant as well as its place within the rotation of the cultures depending on the weather conditions existent during the studied years.

In order to emphasize the level of fertilization and the role of the preceding plant for the Faur type of wheat we have analyzed the production

obtained when this type of wheat has been grown in a monoculture, then in a two year rotation wheat-corn, then in a three year rotation wheat-corn-peas and finally in a four year rotation wheat-corn-sun flower-peas during the period 2013-2016 having as a witness the monoculture and the fertilization with $N_{90}P_{80}$.

The difference of production between the wheat fertilized with $N_{90}P_{80}$ and cultivated in a monoculture and the wheat cultivated in the 2-3-4 year rotation is significant as in the monoculture the average production is of 3787kg/ha and it reaches 5115kg/ha in the wheat-corn-sun flower-peas rotation.

At a $N_{120}P_{80}$ level of fertilization in the monoculture the average production is of 3990 kg/ha, and in the rotation wheat-corn-sun flower-peas the average production is of 5442 kg/ha.

By comparing it to the wheat monoculture the introduction of the corn into a two year rotation leads to an increase of production of 119,1%, by using a three year rotation introducing the pea as a vegetable leads to an improvement of the soil's fertility and the production increase is of 134,1%, and it reaches 135,1% in the four year rotation.

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