EFFECTS OF SOME AGROTECHNICAL ELEMENTS ON YIELD FORMATION IN WINTER WHEAT PRODUCTION

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Introduction

The winter wheat is a significant arable land crop in Hungarian crop production. Nearly every farm and enterprise produces winter wheat. The agronomical and economical effectiveness of its cultivation and its improvement is vital to the farming of every enterprise. The agrotechnical factors play important roles in the development of crop, so the adequate selection of the biological basis is substantial (Pepó, 1999). When choosing the variety the field's ecological features, yield, resistance against diseases, stability and baking quality should be taken into consideration (Szabó, 1994; Kajdi, 1997; Kondora-Szabó, 1998; Békési, 2001; Kismányoky-Ragasits 2003). It is important that the variety has to have excellent yield- and quality stability and to be resistant or tolerant against the diseases that can occur under given circumstances (Pepó-Ruzsányi, 1990; Ragasits-Valent, 1999). By selecting the adequate field and using variety-specific fertilisation the yields of wheat can be efficiently increased and crop stability can be improved (Pepó, 1997).

Methods

The analyses of disease resistance and yields of Mv Magvas variety has been completed at Látókép at the Experiment Station of the University of Debrecen, Centre of Agriculture, Faculty of Agricultural Sciences, Department of Crop Production and Applied Ecology under modern agrotechnological circumstances at normal cereals row width, on 30+30 N-level, after pea and wheat forecrops by using extensive and intensive plant protection in the vegetation seasons of 2000/01., 2001/02., 2002/03. The experiment's soil was calcareous chernozem with good water management features. The average humus percentage of the topsoil was 2,76% and the soil is characterized by a medium (133 mg kg^{-1}) AL- soluble P_2O_5 and good (240 mg kg^{-1}) AL- soluble K_2O. Two plant protection technologies were used in the experiment. Extensive crop protection technology: two times during the three years at the state of 2-3 nodes and at the beginning of flowering. Both times contact sulphur containing chemical, Sulfur was used. No herbicides and insecticides were applied. In the case of intensive crop protection technology in the three years we protected the plants against pathogens as above but this time modern, systemic chemicals were used. At the state of 2-3 nodes the Tango and before the flowering Juwel has been sprayed. We did not protected the plants against pests and herbicides were applied once. For wheat production the growing period of 2000/2001 was average, 2001/2002 was dry and 2002/2003 was extremely dry.

Results and discussion

In our experiment we analyzed the effect of two forecrops and two types of plant protection technologies on the appearance of leaf diseases and crop production. Pea is a good forecrop for winter wheat, because it is considerate towards the water management and microbiological life of the soil, improves its nitrogen supply and decreases the appearance of mycoses and this way their yield decreasing effect too. The wheat is bad as a forecrop before itself, because of the one-sided soil use and in monoculture diseases and pests appear significantly with their yield lessening effect. The appearance of three plant diseases (mildew, leaf-blight, DTR) and their effects on crop have been examined in the experiment. The mildew infection appeared in

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every year after the peas in the rich crops more significant because it caused heavier infection in the wet microclimate. Leaf-blight and DTR are typical cereals diseases, so they reached higher infection level after wheat forecrop, because the centers of infection in the soil support their spreading. (table 1.) After wheat forecrop the infection was only a few percent higher, because only one year wheat was the forecrop and its negative effects had not emerged at that time and also the tillage of land was careful. The effect of forecrops on yields appeared only in the growing season of 2001/2002 when the crop after pea had yield surplus (850 kg ha^{-1}, 12%) which approached 15% defined in the agricultural literature. In the other years only a few 100-300 kg/ha surplus had been produced after pea. (table 2.) The effect of different forecrops not really emerged and the reason for that is the good water management of chernozem soil and sound tillage of land. The other examined factors were the two different plant protecting technologies. A contact sulphur containing chemical was used in the extensive technology, while in the intensive technology systemic chemicals were applied. In the case of the three plant diseases and in the three years we experienced that in the crops that have been sprayed with contact chemical the leaf diseases were more significant. In the crops of the extensive technology suffered higher value of infection in the forecrops and in the average of years the mildew infection with 8%, leaf-blight infection 8%, DTR infection 13%. Lower yields were produced in these crops, though the mildew had smaller effect on yields, but the leaf-blight and Drechslera tritici-repentis diseases had considerable yield decreasing effect.

Table 1.

The effect of forecrops and plant protection technologies on leaf disease of Mv Magvas

years	forecrops	powdery mildew (%)			leaf blight (%)			DTR (%)		
		extensive plant protection	intensive plant protection	avarage	extensive plant protection	intensive plant protection	avarage	extensive plant protection	intensive plant protection	avarage
2000/2001	pea forecrop	22	14	**18,0**	19	6	**12,5**	37	18	**27,5**
2001/2002		13	10	**11,5**	12	7	**9,5**	10	7	**8,5**
2002/2003		28	12	**20,0**	10	5	**7,5**	26	11	**18,5**
avarage		**21,0**	**12,0**	**16,5**	**13,7**	**6,0**	**9,8**	**24,3**	**12,0**	**18,2**
2000/2001	wheat forecrop	19	12	**15,5**	26	9	**17,5**	40	19	**29,5**
2001/2002		9	10	**9,5**	17	10	**13,5**	10	7	**8,5**
2002/2003		22	9	**15,5**	8	5	**6,5**	24	9	**16,5**
avarage		**16,7**	**10,3**	**13,5**	**17,0**	**8,0**	**12,5**	**24,7**	**11,7**	**18,2**
avarage		**18,8**	**11,2**	**15,0**	**15,3**	**7,0**	**11,2**	**24,5**	**11,8**	**18,2**

Table 2.
The effect of forecrops and plant protections technologies on the yields (kg ha^{-1}) of Mv Magvas variety

years	forecrops	extensive plant protection	intensive plant protection
2000/2001	pea forecrop	7509	8036
2001/2002		7829	7919
2002/2003		6980	7098
average		**7439**	**7684**
2000/2001	wheat forecrop	7318	8024
2001/2002		6867	7181
2002/2003		6563	6915
avarage		**6916**	**7373**
avarage		**7701**	**7840**

Conclusions

In the course of our examinations we stated, that the rate of powdery mildew infection was higher in the thicker population sown after pea forecrop in all three years.

The infection rate of leaf rust and DTR (Dreschlera tritici-repentis) was higher after wheat forecrop in all examined years. However, it was possible to parry the adverse effect of forecrops by intensive plant protection.

Due to the chernozem soil, that owns good water management feature and due to the good preparation of the seedbed, the effect of forecrops on yield quantity did not appear in the examined years. The quantity of the yield was in the cropyear of 2000/2001 and 2002/2003 only slightly larger after pea forecrop than after wheat.

In the course of intensive plant protection technology, we applied systemic pesticides, while in the course of environmentally sound technology we used contact pesticides of sulphur content. In those populations that were treated with extensive plant protection technology, infection rate was higher in all three years.

Yield quantities were somewhat lower in the course of applying extensive, environmentally sound technology, because diseases appeared in these populations to the higher degree. Powdery mildew does not, but leaf rust and Dreschlera tritici-repentis had significant yield decreasing effect. With appropriate, well-selected fungicides, we were able to keep every leaf diseases well in hand, and the rate of infection was almost independent of the influence of the cropyear.

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