GAINS AND LOSSES INDUCED BY AGROCHEMICAL APPLICATIONS

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Introduction

Agrochemical applications are essential technological means in growing field crops. The most critical technological points in production of grain crops are agrochemical interventions, so that it is essential to reveal and study soundly their impacts (Ágoston-Pepó, 2005; Czövek et al., 2006). Chemical applications are seen by the public to be both harmful to crops and environment, however appropriate treatments are securing high yields and help to reduce serious weed infestations in our ecosystems (Hegedűs et al., 2002; Jolánkai, 2005; Szentpétery et al., 2005 a and b; Tanács et al. a and b).
The aim of our tial was to evaluate the effects of ascending nitrogen applications as well as to study how plant protection treatments can influence crop yield and weed infestation of wheat crop. In this paper results of the effect of N fertilizer and pesticide applications on grain yield of winter wheat are presented from a single year (2006) of a long term trial study. Results of the previous years was published by Kismányoky (2005).

Material and methods

The study was conducted in a field experiment set up by the Department of Plant Production and Soil Science of the Georgikon Faculty of the University of Pannonia, Keszthely (Hungary). The bi-factorial trial was arranged in split plot design with three replications. The soil was Ramann-type brown forest soil (Eutric Cambisol) containing 41% sand, 32% silt, and 27% clay. The available phosphorus content of this sandy loam soil was low (AL- P_2O_5: 60-80 $mgkg^{-1}$), the potassium content medium (AL-K_2O: 140-160 $mgkg^{-1}$) and the humus content fairly low (1,6-1,7%), with a pH_{KCl} value of 7,3. In the experiment the effect of different rates and application methods of N fertilization as well as different variants of pesticide application was studied. The studied winter wheat cultivar was Mv Suba.

Pesticide treatments:

CH0: Control
CH1: Herbicide
CH2: Herbicide+Fungicide
CH3: Herbicide+Fungicide+Insecticide

Applied pesticides:

- *Buvisild BR* (22,5 % carbendazim+7,5 % cooperoxiquinolat – fungicide, seed dressing)
- *Granstar 75 DF* (75 % tribenuron metil - herbicide)
- *Artea 330 EC* (80 g/l ciproconazol+250 g/l propiconazol - fungicide)

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- *Fury 10 EC* (100 g/l zeta-cipermetrin - insecticide)

Fertilizer treatments:

	ΣN kgha^{-1}	N			P_2O_5 kgha^{-1}	K_2O kgha^{-1}
		Autumn	Spring1	Spring2		
N0	0	0	0	0	0	0
N1	40	0	40	0	100	100
N2	80	40	40	0	100	100
N3	120	40	40	40	100	100
N4	160	40	60	60	100	100

The trial was run in 2006 within a series of winter wheat monoculture since 2003. Analysis of variance was used to test the statistical significance of the treatments. During the growing season weed monitoring was done by Balázs-Ujvárosi method two times, 31st of May and 18th of July. In the result's table Bayer-codes are used indicating weed species.

Results and discussions

The experimental treatments – both the increasing rate of fertilizers and the increasing intensity of pesticide application – had significant effect on the grain yield of wheat. In case of fertilizer application each N rates resulted in a further significant yield increase when averaged over the pesticide application.

The effect of herbicide between the variants CH0 and CH1 was 0,37t ha^{-1} (109,5%), further pesticide treatments (CH2, CH3) also raised the yield level (CH2: 110,5%, CH3: 113,8% comparing to CH0 100%) when averaged over the fertilizer treatments. The effect of fungicide was not as big as we had expected in the 4th year of continuous wheat cropping. The yield increasing effect of the fertilization comparing to N0 control plots was bigger than the effect of the pesticides. The difference between N0 and N1 variants was 1,537t ha^{-1} (158% growth), and the higher N doses also had a significant effect (CH2 178%, CH3 192% CH4 200%) comparing to the control plots (N0) when averaged over the pesticide treatments. The highest yield was 2,5 times bigger, than the lowest variant (2,17 t ha^{-1}). The greatest yield, 5,47t ha^{-1} was registrated by the combination of the highest fertilization and highest pesticide level (CH3 x N4) (Figure 1.). It can concluded from the results, that without using fertilisers and pesticide a good yield can't be reached, but with an adequate dose of N-P-K combinated with a needed, but not more than necessary pesticide maintenance (in our experimental field this year it was herbicide treatment) we can have an optimal yield.

The composition of weed species was also influenced by the experimental treatments. More species were found in the herbicide treatment plots (CH1) than in the control ones. There were no statistically proved differences between the weed canopies at the first observation time (31st May). At the second monitoring (18th June) there were significant differences between CH0 and CH1 in weed canopy.