

## THE OCCURRENCE AND THE EFFECTS OF EUROPEAN CORN BORER (*OSTRINIA NUBILALIS* HBN.) CONTROL ON CORN CROP IN PRZEWORSK REGION IN 2001–2002

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**Abstract:** Research was carried out in 2001–2002, in the Plant Breeding Station of Mikulice near Przeworsk. The occurrence of European corn borer (*Ostrinia nubilalis* Hbn.) on corn, as well as the effects of its chemical control were assessed. It was found out that in 2001, caterpillars damaged 40.5% of plants, while in 2002 – 99.3% of plants. As a result of double lambda cyhalothrin application (Karate 025 EC), high pest reduction was achieved: 91.4% in 2001 and 88.9% in 2002. Corn yields increased by 1.8 t/ha in 2001 and 4.3 t/ha in 2002 in comparison with yields in untreated fields.

**Key words:** corn, European corn borer (*Ostrinia nubilalis*), occurrence, control

### INTRODUCTION

European corn borer (*Ostrinia nubilalis* Hbn.) is one of the most significant corn pests in warmer areas of corn crop in Europe and North America (Welling 1989). Since 1950s it has been damaging corn in south western Poland (Kania 1962), where it has spread to Opolskie, Dolnośląskie and Lubuskie provinces, as well as to the western area of Wielkopolska province. In the south east of Poland, it was first found to occur on corn in 1994 (Lisowicz 2001). In 2002, it occurred in Podkarpackie province, in the southern areas of Lubelskie and Świętokrzyskie provinces, and in the eastern part of Małopolskie province.

The aim of this research was to analyse the extent of corn damage by caterpillars of European corn borers, and to estimate the effects of chemical control of this pest.

### MATERIAL AND METHODS

The experiments were carried out in 2001–2002 in the Plant Breeding Station of Mikulice, in an experimental field in Krzeczowice near Przeworsk. The “Limko”

corn cultivar was used in the experiment. Plot experiments were settled in field blocks selected at random in four repetitions. Corn was sown on the following days: May 2nd, 2001 and April 28th, 2002.

The beginning and the end of egg deposition was observed in the checked area in which analyses were carried out twice a week on 50 plants in a field. The observations started according to leaf development growth stage scale provided by BBCH scale at 19, i.e. 9 or more leaves unfolded (Adamczewski and Matysiak 2002) until the last egg deposition was observed. The effect of pest control was assessed on plots in which the insecticide containing lambda cyhalothrin (Karate 025 EC) was applied. The insecticide application time is provided in the table 1. The first time 0.2 l/ha of the solution, whereas the second and the third time 0.3 l/ha of the solution was applied. The extent of plant damage in all the research areas was assessed with the use of the following analyses:

- in plant growth stage 69 (end of flowering) – % of damaged cob settings,
- in plant growth stage 85 (dough stage) – % of plants and % of damaged cobs and % of cobs gnawed at the base,
- in plant growth stage 89 (fully ripe) – % of stalks broken below the cob settlement.

For the carrying out of the analyses, 50 plants in every field underwent a detailed study. Subsequently crop yield was collected. The results of plant damage and the amount of crop yield in a given experimental area was analysed statistically and the significance of differences was calculated.

## RESULTS AND DISCUSSION

In 1990s in the south eastern area of Poland weather conditions and rainfall favoured the development of European corn borer and its feeding on corn. As a result of this in 1994, the percentage of plants damaged by caterpillars grew rapidly, and in the year 2000 it reached 75.3% (Lisowicz 2003).

In 2001 the meteorological conditions for egg deposition by European corn borer and initial population development were unfavourable. Daily mean temperature in June was low, only 15.3°C. Also frequent and heavy rainfalls took place which disturbed egg deposition. Weather conditions improved during the last days of June and in July, but egg deposition was interrupted by still frequent rainfalls and strong winds. In the year 2002, however, weather conditions favoured egg deposition. Daily mean temperature in June reached 17.5°C, and in July – 20.8°C. Rainfalls which were then scarce did not affect egg deposition. In 2001 egg deposition on plants was observed from July 2nd to 27th, whereas in 2002 from June 14th to July 8th.

The occurrence, damage and effects of chemical control of European corn borer on corn in 2001–2002 are presented in the table 1.

In 2001, as a result of unfavourable weather conditions for plant infestation and European corn borer population development, the percentage of plants damaged was much lower (40.5%) than in the previous year (Lisowicz 2001) and the percentage of cobs destroyed was 26.5%. From all the damaged plants 65.4% of cobs were destroyed. In 2002, in favourable weather conditions the occurrence of the pest increased rapidly and as a result 99.3% of plants, and 75.5% of cobs were dam-

Table 1. The effects of chemical control of European corn borer on corn crop in 2001–2002

No.	Plots	Date of application		% of damaged plants	% of destroyed cob settings	% of damage d cobs	% of cobs gnawed at the base	% of stalks broken below the cob settlement	Yield	
		first/second							t /ha	%
		I	II							
1.	check			40.5	1.5	26.5	5.0	5.9	10.1	100
2.	Karate 025 EC	5. 07		24.8	0.5	4.5	2.0	2.4	10.6	105
3.	Karate 025 EC		17. 07	9.6	1.2	6.9	2.5	0.0	11.0	109
4.	Karate 025 EC	5. 07	24. 07	3.5	0.3	5.2	1.0	0.0	11.9	118
LSD (0.0)				3.4	0.9	3.5	2.3	2.1	0.9	
1.	check			99.3	4.0	75.5	14.1	14.0	9.4	100
2.	Karate 025 EC	17. 06		70.2	1.2	50.5	2.5	7.0	10.6	113
3.	Karate 025 EC		8. 07	31.3	2.5	21.7	2.8	0.7	13.1	139
4.	Karate 025 EC	17. 06	8. 07	11.0	0.6	7.6	0.0	0.0	13.7	146
LSD (0.0)				3.9	1.2	4.6	2.7	2.4	1.2	

aged, and 76.0% of all the damaged plants had their cobs damaged, too. Other harm indicators also increased: the percentage of damaged cob settings, the percentage of the cobs gnawed at the base and the percentage of stalks broken below the cob settlement.

As a result of chemical control of European corn borer, the harm indicators and the grain of corn crops yield losses were reduced to a large extent.

In the experiments carried out in 2001, the chemical application carried out the first time decreased the number of damaged plants by 38.8%, the number of damaged cobs by 83.5%, and of cobs gnawed at the base by 60.0%, while the number of stalks broken below the cob settlement by 59.3%. The saved crop yield was 0.5 t/ha. The second insecticide treatment caused a higher reduction of the percentage of damaged plants which was 76.3%, and it showed a slightly lower efficacy in cob protection, nevertheless it provided full protection of stalks from breaking below the cob settlement. The result of this application was a saved crop yield of 0.9 t/ha. The best effects of European corn borer control were achieved by applying the insecticide twice. On plants protected in such a way there was a decrease in the number of damaged plants (by 91.4%) and damaged cobs (by 87.95%). Also, other indicators of effectiveness were the highest, and the increase of crop yields was 1.8 t/ha.

In 2002, when European corn borer infested 99.3% of plants in the checked area, the application of the insecticide carried out the first time was slightly less effective than in 2001, as far as the decrease in the numbers is concerned: the number of damaged plants (was increased by 29.3%), damaged cobs (the achieved effectiveness was 33.1%), the number of stalks broken below the cob settlement (reduced by 50%), but it well protected the plants from damaging the cob settings (70% effectiveness) and it decreased the number of cobs gnawed at the base (by 82.3%). As a result of this application, the corn crop yields increased by 1.2 t/ha. The application carried out the second time was more effective in eliminating all harm indicators except for the number of damaged cob settings because at the time it was applied some caterpillars were already infesting inside these organs. As a result of

this application 3.7 t/ha of corn crop yield was saved. An insecticide treatment applied twice lowered the following indicators numbers: damaged plants (by 88.9%), damaged cob settings (by 85.0%) and damaged cobs (by 89.9%), and it provided full protection from major damage indicators: cobs gnawed at the base and stalks broken below the cob settlement. The results of a double insecticide application corn crop yield of 4.3 t/ha were saved.

The effects of chemical control of European corn borer on corn achieved in year 2002 (which was the year of the most numerous occurrence of this pest in the research area since its appearance in 1994) were the highest in comparison with the ones achieved in previous years (Lisowicz 1998, 1999; Lisowicz and Jaworowski 2000).

## CONCLUSIONS

Because of highly marked reductions in corn production caused by caterpillars of European corn borer in south-eastern and south-western Poland there has arisen a need for a wider-integrated control extension (agrotechnical, chemical and biological) of this pest. In the future, when will be conditions to grow genetically modified organisms (GMO), one can grow corn hybrids resistant to European corn borer, and containing Bt resistance gene in areas which are most threatened by this pest.

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## POLISH SUMMARY

### WYSTĘPOWANIE I EFEKTY ZWALCZANIA OMACNICZY PROSOWIANKI (*OSTRINIA NUBILALIS* HBN.) NA KUKURYDZY W REJONIE PRZEWORSKA W LATACH 2001–2002

W latach 2001–2002, w Stacji Hodowli Roślin Mikulice k. Przeworska, wykonano badania w których oceniano występowanie oraz efekty chemicznego zwalczania omacnicy prosowianki na kukurydzy.

W wyniku badań stwierdzono, że w 2001 r. szkodnik ten opanował 40,5%, a w 2002 r. aż 99,3% roślin.

Jedno opryskiwanie insektycydem zawierającym lambda-cyhalotrynę (Karate 025 EC) wykonane w pierwszym terminie, w 2001 r. obniżyło procent roślin uszkodzonych o 38,8%, a w 2002 r. o 29,3%. Wielkości plonów uratowanych wyniosły odpowiednio: 0,5 t/ha i 1,2 t/ha. Zabieg wykonany w drugim (podstawowym) terminie wykazał wyższą skuteczność obniżając liczebność roślin uszkodzonych: w 2001 r. o 76,3%, a w 2002 r. o 68,5% i powodując zwiększenie plonu ziarna: w 2001 r. 0,9 t/ha a w 2002 r. 3,7 t/ha. Najwyższą skuteczność zwalczania szkodnika uzyskano wykonując dwukrotne opryskiwanie roślin. W 2001 r., w wyniku tych zabiegów liczebność uszkodzonych roślin została obniżona o 91,4%, a w 2002 r. o 88,9%, natomiast plony ziarna wzrosły odpowiednio: o 1,8 t/ha oraz o 4,3 t/ha.