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THE WESTERN CORN ROOTWORM (*Diabrotica virgifera virgifera* LeConte) - A NEW PROBLEM IN EUROPE

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ABSTRACT

The WCR is the most important pest of corn in the U.S.A. It was discovered in Europe in 1992 near the airport of Belgrade, Serbia. From then it spread through Serbia and invaded Croatia, Hungary, Romania and Bosna and Herzegovina. In 1996 about 60 000 sqkm were infested. Towards the west in Croatia the WCR reached Našice and Slav. Brod. Untill now great damages were registered only in Serbia on 11 000 ha of corn.

Comparing suitable factors for the WCR in the U.S.A. with climatic and other conditions in Croatia, we consider that this pest will acclimatise fast not only in Croatia but also in other regions of Middle Europe. We expect that the WCR, at least at the begin, will propagate and spread faster in Europe than in the U. S.

Some biotical and ecological data about this new insect in Europe and the possibilities of its control are given. The experiences obtained in Croatia in monitoring the WCR are stated and some suggestions for the monitoring in Slovenia given.

Key words: Croatia, Diabrotica, Western Corn Rootworm

IZVLEČEK

KORUZNI HROŠČ (Diabrotica virgifera virgifera /LeConte/) NOV PROBLEM V EVROPI

Koruzni hrošč je najpomembnejši škodljivec koruze v ZDA. V Evropi so ga prvič registrirali leta 1992 ob beograjskem letališču v Srbiji. Po tem se je razširil na Hrvaško, na Madžarsko, v Romunijo in v Bosno in Hercegovino. V letu 1996 je bilo okuženih 60.000 kvadratnih kilometrov. Zahodna meja na Hrvaškem je dosegla Našice in Slavonski Brod. Do sedaj so velike škode zabeležili le v Srbiji na 11.000 ha koruze. Pri primerjanju ugodnih dejavnikov za razvoj koruznega hrošča v ZDA z razmerami na Hrvaškem smo ugotovili, da se bo ta insekt hitro aklimatiziral ne samo na Hrvaškem, pač pa tudi v drugih regijah Srednje Evrope. Pričakujemo, da se bo koruzni hrošč vsaj na začetku širil v Evropi hitreje kot v ZDA. Podali bomo nekaj biotičnih in ekoloških podatkov o tej novi vrsti škodljivca v Evropi in o razvoju možnosti za njegovo zatiranje. Predstavili bomo nekatere izkušnje, ki smo jih pridobili pri opazovanju koruznega hrošča na Hrvaškem in predlagali monitoring v Sloveniji.

1 INTRODUCTION

The genus *Diabrotica* is spread in the nearctic region. Until 1992 species of this genus were not present in Europe. This genus is classified in the subfamily Galerucinae of the family Chrysomelidae (Coleoptera).

There are more then 300 species in the genus *Diabrotica*, 21 of them are pests of corn. In the U. S. A. species nuisible to corn are *Diabrotica undecimpunctata howardi* Barber (Southern corn rootworm), *D. barberi* Smith and Lawrence (Northern corn

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rootworm), *D. virgifera zeae* Krysan and Smith (Mexican corn rootworm) and *Diabrotica virgifera virgifera* LeConte (Western corn rootworm = WCR). Only in the late forties the WCR started to spread through the Corn Belt to the Atlantic coast. Now it is the most important pest species on corn in the U. S. A.

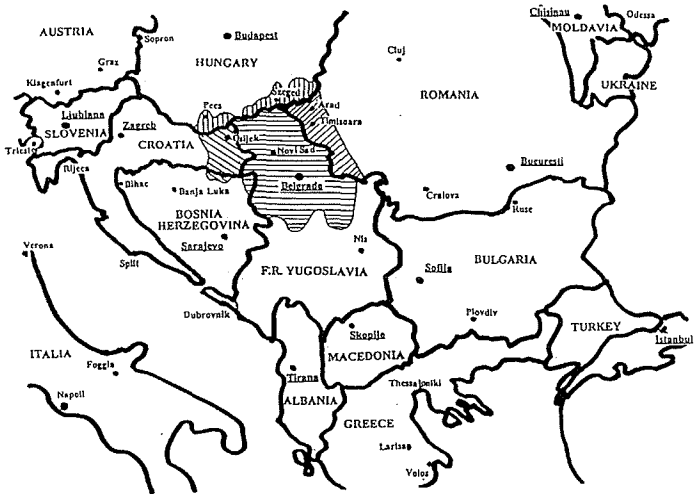
A more detailed survey on this pest was published after its first registration in Europe (Maceljski, Igrc Barčić, 1993)

2 APPEARANCE AND SPREAD IN EUROPE

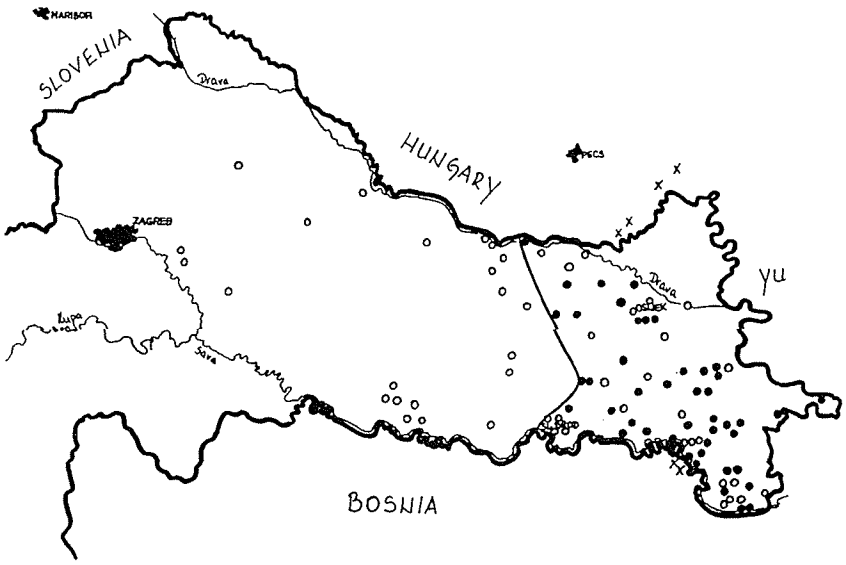
In the year 1992 the WCR was discovered in Serbia, in Surčin, near the airport of Belgrade. On some small plots big damages were registered. During the years 1993 and 1994 this insect spread on 200.000 ha (Kolektiv autora, 1995). In 1995 and 1996 its spread continued. Now the WCR is present on the whole territory of Vojvodina, and about 80 km to the south of the rivers Sava and Dunav. According to new informations great damages were registered in 1996 on 11.000 hectars.

In 1995 a monitoring of this insect started in the adjoining countries. In Hungary during July 1995 one specimen of the WCR was caught on a cucurbitacin trap. Lately, when pheromons were exposed, 15 beetles were caught. In the year 1996 about 900 beetles were caught on pheromon traps on a territory 50 km deep and 200 km long on the border with Serbia, Romania and Croatia. In Croatia in the year 1995 only one beetle was caught during a big monitoring action in which only cucurbitacin and yellow traps were used. This beetle was caught in Bošnjaci about 30 km from the serbian border. During 1996. 885 beetles were caught, 97,6% on pheromon traps. The infestation was found about 100 km to the west from the border with Serbia. In 1996. some beetles were caught in Romania and Bosna and Hercegovina also.

The current spread of the infestation in Europe is shown on picture 1, and the spread in Croatia on picture 2.



Picture 1. The current spread of the Western Corn Rootwoorm in Europe (IWGO-Newsletter, 16.02. 1996)



Picture 2. Distribution of monitors in 1996. in Croatia: full dots shows localities where the WCR was caught.

3 DESCRIPTION

The beetle is about 6 mm long and 2-2,5 mm wide. The basic colour is yellow. The females have a longitudinal dark band on each elitrae and the male have dark elitrae with protruding yellow patches. The larvae are yellowish with brown head. They reach 10-18 mm.

4 BIOLOGY

Eggs overwinter in the upper 15 cm of the soil. Between middle of May and middle of June hatching occurs. The larvae are feeding on corn roots and can completely destroy them. The development of larvae last about 30-45 days. They pupate in the soil. The first adults appears about July 1st. Adults are feeding on pollen, tassels, silk, kernels on cobs and leaves. They are good fliers and are spreading the infestation. Our experiences shows that the infested area can expand each year 50 to 100 km. The adults are most abundant at the end of July and the begin of August. Females lay eggs in the soil. In September the adults disappear as they can not overwinter.

Adults can be transfered by any vehicle, including aircraft, during the months of July, August and September. As the transfer of corn seed occurs later, there is no danger that this insect can be transfered by corn seed.

5 ECOLOGY

The WCR attacks only corn. It is damaging mostly corn grown in monoculture. From 1993. on a strong infestation of corn sown after soyabeans in some regions of the U. S. A. was surprisingly registered. The cause is still investigated.

Eggs can overwinter if temperatures 10 cm deep in the soil are higher than -10 °C. In a ten year period in Croatia the temperatures were always higher of this threshold. According to data from the U. S. A. the thermal threshold for the development of the WCR is 12,8 °C.

Comparing data from the U. S. A. with pertinent data for Croatia we (Maceljski, Igrc Barčić, 1994) have predicted that the WCR will acclimatise fast in Croatia so as in other regions of Central Europe. We consider that this pest will start to propagate and spread in Europe even faster than in the U. S. A.

6 CONTROL

Avoiding monoculture of corn is at this moment the best way to minimise damages in spite of new findings about great damages on corn sown after soyabeans. The investigations which strain of the WCR was introduced in Europe are in progress. In the U. S. A. the insect density of more than 1 adult per plant indicates the need to apply soil insecticides if corn is sown the next year on this plot. Among soil insecticides chlorpyriphos, carbofuran and terbuphos are mostly mentioned. In our conditions, where wireworms present major pests, it is necessary to find out the best possibility of combined control. New technics based on the principle "attract and kill" adults were introduced last year in the U. S. A. and in 1997. will be tried in Europe. The main constraints are connected with the application technique. No efficient possibility of biological control of the WCR was discovered until now. Promising possibilities are further efforts to classically select or genetically engineer resistant hybrids.

7 MONITORING

The hungarian sexual pheromones are by far the best possibility to discover and monitor the spread of the WCR. They attracts only males, but research to find pheromons for females started this year. The hungarian pheromon is very costly, but our experiences shows that it attracts about 20 times more beetles than the feeding attractant cucurbitacin which was supplied to us from the U. S. A. Trials with our own production of methoxycinnamaldehide conducted in Croatia indicates a good attractiveness of this chemical (Igrc, 1996), but this research will be continued.

8 MONITORING AND SUPPRESSION PROGRAMM IN 1997

Slovenian specialists will be mostly interested to know the programm of actions which will be conducted in Croatia. We plan to establish a double chain of monitors

with pheromons approx. 10 km to the west of the current line of the spread of WCR. After the first catch the number of pheromons surrounding this locality will be tenfold increased. According to the spread the chain will be moved to be always just before the current border line.

In the infested region pheromons will be placed in order to follow the increase of the density of the WCR. Some monitors will be placed along the main roads and railroads connecting the infested area toward west. We suggest that in Slovenia a dozen of pheromons should be placed along the roads and railroads going from east to west so as near international airports.
We will continue to investigate the biology and ecology of the WCR in Croatia, to search for a good and cheap attractant, try to find out the best possibility for a combined control of wireworms and the WCR, and an ecologically safe and economic method to control adults suitable to be applied in our conditions.

FAO will support some monitoring and control measures in all infested countries and a FAO/IWGO committee is founded to coordinate all actions. Our representative in this committee is Prof. Ph. D. Jasminka Igrc Barčić.

9 LITERATURE

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