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Diabrotica virgifera virgifera LeConte: What Has Been Done and What Will Be Done in Italy?

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The western corn rootworm (WCR) *Diabrotica virgifera virgifera* LeConte, is considered a threat in Italian maize cropping systems due to the biological characteristics and the climatic and agronomic conditions favouring its development and establishment. This project describes the measures implemented since 1995 to monitor the potential introduction of WCR into Italy and to prevent the spread from nearby Serbia. The most effective measure was the monitoring program which used sex pheromone traps, produced by the Plant Protection Institute of Budapest in sensitive areas (maize fields near airports, customs areas, tourist facilities, etc.) in Northeastern Italy. This activity allowed for identification of newly and accidentally introduced specimens near the International Airport in Venice in 1998. All strategies, restrictions and obligations, which were implemented in Italy, in order to eradicate or at least to delay Diabrotica WCR dispersal, are discussed.

Keywords: *Diabrotica virgifera virgifera,* Italy, monitoring, eradication.

In Italy, the western corn rootworm (WCR) *Diabrotica virgifera virgifera* Le Conte, problem was first addressed in 1995, after the first organized workshop by IWGO. The information available regarding the biology and behaviour of this species, compared with the climatic and agronomic conditions of regions in Italy, made it clear that WCR is considered a real threat to maize cropping systems in Italy (Furlan, 1997). This point has been confirmed by recent studies (Edwards et al., 1998). Protection of Italian maize cropping systems cultivations in the future depended on early detection of the introduction of WCR in Italy. In order to eradicate this species, or at least to prevent the spread of WCR, the implementation of control strategies are essential. Therefore, monitoring activities as well as the dissemination of information about the species, were immediately implemented.

Materials and Methods

What Has Already Been Done in Italy?

In order to meet the above objectives monitoring of sensitive areas was considered essential. Systematic monitoring started in 1995 with the use of chromotropic traps; unfortunately this trap design is not suitable for monitoring newly introduced populations (Tóth et al., 1996). Therefore, no reliable information was obtained. Once sex pheromone traps became available, monitoring WCR populations was conducted using these traps.

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These sex pheromone traps (PANEL design in 1997, CLOAK design in 1998) were produced by the Plant Protection Institute of Budapest (Dr. Miklós Tóth). The monitoring program was established in northeastern Italy *(Fig. 1)* with 12 sites in 1997 and 20 sites in 1998 (1 to 10 traps per site). Maize fields were selected based on fields where maize is grown continuosly (monocultures) and also in potential introduction areas (such as nearby airports, customs areas, etc.). In 1998, the first 7 specimens of WCR were trapped between 21 July and 13 August in Tessera, a site near the Marco Polo International Airport in Venice (Furlan et al., 1998). The identification of the specimens as *Diabrotica virgifera virgifera* LeConte was confirmed by specialists in USA and Hungary (Dr. J. Krysan, Washington DC, USA; Dr O. Merkl, Budapest, Hungary).

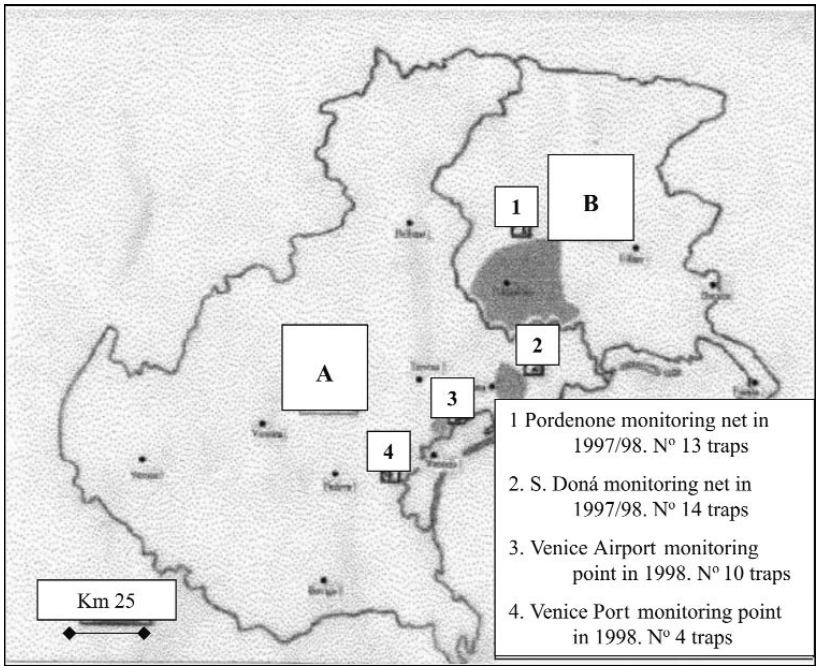

Fig. 1. Location of the WCR sex pheromone traps in North-Eastern Italy – Veneto (A) and Friuli Venezia Giulia (B) – in 1997–1998
3: traps which captured males 1, 2, 4: no captures

Results

What Will Be Done in Italy?

Possible future WCR damage to maize cropping systems in Italy may be caused by:

a) the establishment of a conspicuous population in the area where the first specimens were captured, as well as the spread of this pest into surrounding areas;

b) further accidental introduction by vehicles from regions where high populations are already present (eastern European countries, USA);

c) progressive natural expansion of WCR populations into northeastern Italy from eastern Europe.

Therefore the strategies to avoid future damage to Italian maize cultivation should be as follows:

Venice area

Since very few specimens were captured, it is assumed that a newly introduced population had been discovered. Therefore, the immediate implementation of control methods might eradicate or delay the dispersal of WCR in Italy. Since rapid dispersal of this pest is possible, easily reaching the vital areas planted with maize in the Po valley, suitable strategies in 1999, monitoring and treatment therefore, should be implemented. This step can decrease the likelihood of successful mating; egg laying in maize monocultures will be reduced. Maize monocultures have proven to be the key component in the increase of WCR populations in Europe (Camprag et al., 1998). Since the presence of a WCR population, adapted to soybean-maize rotation, is still limited to a restricted area of Indiana and Illinois, USA (Edwards et al., 1996), it is reasonable to consider that the adults which arrived in Italy have a life cycle strictly contingent upon continuous maize cultivation. Experiments conducted in the US have shown that significant reductions in WCR adult populations (close to 100%) can be obtained through the implementation of a postemergence insecticidal treatment (Chandler and Sutter, 1997; Chandler, 1998). On the contrary, soil insecticides have proven to have little to no effect on reducing WCR populations, despite the fact that these insecticides can be useful in reducing root damage where high larval populations exist (Sutter et al., 1991; Gray et al., 1992). In order to complete eradication, a trap network (grid 1 x 1 to 5 x 5 km) should be placed in the safety area just on the outskirts of the focus area so that the first individuals detected are promptly identified and postemergent insecticides applied immediately.

Therefore, a proposal for an eradication attempt or strategies for delaying WCR distribution in Italy can be summarized as follows:

Focus area: 3–5 km beyond area where WCR adults occurred in 1998 *(Fig. 2).*

– monitoring population by using sex pheromone traps (trapping grid 1 km x 1 km)

– if 1 or more adults are captured: treat all maize within focus area; if no adults are captured early in the season, treatments will start at the beginning of July;

– continuous maize cultivations prohibited;

Safety area: 5–10 km beyond focus area

– monitoring population by using sex pheromone traps
(trapping grid at least 5 km x 5 km)

– if 1 or more adults are captured on a particular trap:

(a) treat maize fields within 1 km of that trap

(b) place additional pheromone traps further away from the focus area and continue the procedure as stated above.

These strategies have become the guidelines of the proposal forwarded by the Ministerial work group appointed to prepare a Decree for control regulations against WCR.

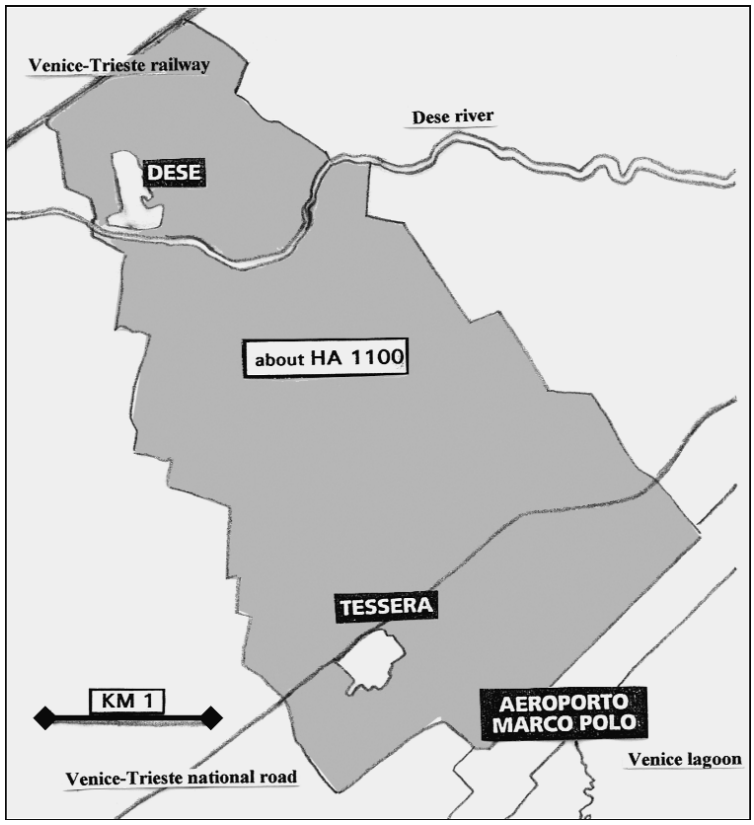

Fig. 2. WCR focus area near the International airport in Venice

While waiting for the final draft of the compulsory Ministerial Decree, the Veneto region has issued a specific Ordinance (1/99) which gives the following restrictions and obligations for the focus area:

– restrictions on planting maize in fields where corn was cultivated in 1998;

– restrictions on moving fresh corn or soil in which corn was grown the previous year, outside of the focus area;

– restrictions on threshing corn before October 10th;

– obligation to apply chemical treatment against WCR adults on corn.

(modality and time of application will be decided by the Plant Protection Service).

The feasibility of implementing these restrictions and obligations, which imply costs for corn growers, will be assured by a regional fund of approximately 135.000 Euro. If traps in the safety area capture adults, it is recommended that corn growers with fields around the trapping area should also apply insecticides.

As far as points b and c are concerned, a specific monitoring program, based on the same criteria taken into account during recent years, will be implemented.

Literature

Camprag, D., Keresi, T., Baca, F. and Stankovic, R. (1998): Effect of continuous corn cropping on the incidence and harmfulness of *Diabrotica virgifera virgifera* Le Conte. Drustvo za zastitu bilja Srbije, Beograd 1998, 74–82.

Chandler, L. D. and Sutter, G. R. (1997): High clearance sprayer methods for application of corn rootworm (Coleoptera : Chrysomelidae) semiochemical-based baits. Southwest. Entomol. 22, 157–166.

Chandler, L. D. (1998): Comparison of insecticide-bait aerial application methods for management of corn rootworm (Coleoptera : Chrysomelidae). Southwest. Entomol. 23, 147–159.

Edwards, C. R., Barcic, J. I., Berger, H. K., Festic, H., Kiss, J., Princzinger, G., Schulten, G. G. M. and Vonica, I. (1998): Overview of the FAO western corn rootworm management program for Central Europe. Planzenschutzberichte 57, 3–13.

Edwards, C. R., Bledsoe, L. W. and Obermeyer, J. L. (1996): The dramatic shift of the western corn rootworm, *Diabrotica virgifera virgifera* Le Conte (Coleoptera : Chrysomelidae) to maize in rotation with soybeans in Indiana. Proc. XX Internat. Cong. Entomol., Paper No. 15-082, pp. 469.

Furlan, L. (1997): *Diabrotica virgifera virgifera* una potenziale grave minaccia per la coltivazione del mais in Italia. Informatore Fitopatologico 7–8, 7–10.

Furlan, L., Vettorazzo, M., Ortez, A. and Frausin, C. (1998): *Diabrotica virgifera virgifera* has already arrived in Italy. Informatore Fitopatologico 12, 43–44.

Gray, M. E., Felsot, A. S., Steffey, K. L. and Levine, E. (1992): Planting time application of soil insecticides and western corn rootworm (Coleoptera : Chrysomelidae) emergence: implications for long term management programs. J. Econ. Entomol. 85, 544–553.

Sutter, G. R., Branson, T. F., Fisher, J. R. and Elliot N. C. (1991): Effects of insecticides on survival, development, fecundity, and sex ratio in controlled infestations of western corn rootworm (Coleoptera: Chrysomelidae). J. Econ. Entomol. 84, 1905–1912.

Tóth, M., Sivcev, I., Manojlovic, B., Tóth, V., Újváry, I., Hatala-Zsellér, I. and Ilovai, Z. (1996): Preliminary results with pheromone and floral attractant baited traps for monitoring the western corn rootworm *Diabrotica v. virgifera* in the Fed. Rep. of Yugoslavia and Hungary. IWGO, Newsletter, Vol. XVI, 2, 24.