

[0162] MANAGEMENT OF MEXICAN CORN ROOTWORM (COLEOPTERA:CHRYSOMELIDAE)

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An adult management program for the Mexican corn rootworm (*Diabrotica virgifera* Krysan and Smith) has been conducted in Texas, USA since 1995. The program has focused on establishing scouting and treatment protocols that can be used by producers, extension agents, and crop consultants to manage corn rootworm populations. Rootworm populations are monitored through traps and plant counts. By working with a private company, traps were developed that made it easier to monitor rootworm abundance. Treatment thresholds were set at 100 cumulative beetles per trap. If treatment thresholds are exceeded, a semiochemical-based insecticide is used to control the adults. This insecticide contains a feeding stimulant that is specific to *Diabrotica spp.*; therefore, no non-target or beneficial organisms are impacted by the treatment. The management program has been very successful in Texas. At one site in central Texas, the corn that was treated due to corn rootworm infestations was reduced from 810 ha (2000 acres) in 1995 to only 39 ha (95 acres) in 1998. The use of soil insecticides in the area was also reduced to ¼ to ½ of the conventional rate, which greatly reduces to amount of chemicals used in corn production. Due to the success of the adult program at this site, additional sites around Texas were added in 1998 and 1999. The purpose of these additional sites was to introduce the control program to others around the state and to refine the program protocols to each site. By 1999, adult control programs in Texas were being conducted at 5 sites involving 24 producers and approximately 4000 ha (9900 acres).

Index terms: rootworm, *Diabrotica*, areawide management, corn.

[0164] MANAGEMENT OF *DIABROTICA SPECIOSA* IN BRAZIL

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Diabrotica spp. is a serious pest in the Americas. Two species, *Diabrotica speciosa* and *Diabrotica viridula*, occur in Brazil, where *D. speciosa* is predominant. This pest is distributed in both South and Central America. The adults feed on the leaves of vegetable crops, beans, soybean, sunflower, banana, cotton and corn. The larva damage the corn root and potato tubers. The damage caused by the larva in corn roots interferes in the absorption of nutrients and water and it reduces the stability of the plants, causing lodging under severe wind and rainfall conditions. The eggs of this insect are yellowish-white and they are deposited on the soil around the base of plants. The larvae reach 10 mm in length, are white in color with brown heads a dark plate in the last abdominal segment. The adults beetles measure about 6 mm in length, are green color with six yellow stains with a black tibia and a brown head. The life cycle ranges from 24 to 40 days. There is little information available about the management of this pest. The sampling method most commonly used for larva of *D. speciosa* is sifting the soil on a black plastic, where the larva can be identified. Other methods, such as the Berlese's funnel and flotation can also be used. Preliminary results indicate that an average density of 3,5 to 5 larvae per plant causes damage to corn root, corresponding to the value of 4,2 on the scale of Hills & Peters (1971), while a density of about 30 larvae corresponds to a 5,7 on the same scale. In Brazil, the control of the larva of *D. speciosa* in corn is almost exclusively with the use of chemical insecticides, but it is rarely employed. In no-tillage systems, the best results in the control of the larvae with insecticides have been obtained with granular forms tebufirimfos, phorate, chlorpyrifos or spraying with chlorpyrifos, both applied in furrow. In situations where control was not used at planting, the application of terbufos and tebufirimfos granules in the row and chlorpyrifos sprayed on the base of the plants and incorporated into the soil with a cultivator have been the most efficient for larvae control. Although in other countries there is reference to resistant cultivars of corn to other species of *Diabrotica*, in Brazil, research seeking genetic resistance to this pest is incipient. The occurrence of the biological control has been reported through the use of natural enemies, *Celatoria bosqi*, *Centistes gasseni*, and the fungus *Beauveria bassiana* and *Metarhizium anisopliae*. Preliminary results indicate that soil moisture is one factor to be considered in the management of *D. speciosa*. A greater occurrence of larva has been observed in experimental areas in soils with higher moisture content. Soil preparation methods have also been shown to influence the population dynamics of this insect. A larger occurrence of larva has been found in areas prepared with the moleboard plow than in no-tillage.

Index terms: corn rootworm, soil insect, insecta, control, *Zea mays*

[0163] MANAGEMENT OF WESTERN CORN ROOTWORM IN EUROPE

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The western corn rootworm (WCR) was first detected (larval damage) in a cornfield near Belgrade, Yugoslavia, in 1992 (Baca 1993). It is likely to have arrived in Yugoslavia in the early to mid 1980's (Edwards et al. 1998). By 1999 it had spread over about 150,000 km² in Europe (Bulgaria, Bosnia-Herzegovina, Croatia, Hungary, Romania and Yugoslavia). WCR beetles were trapped in 1998 and 1999 in Italy, near Venice airport. WCR spread in Europe has continued in all directions from the original infestation point. The greatest movement was observed on the plains, in valleys with some movement in hilly regions. The population build up in infested areas depends on corn growing practices (continuous or rotation, insecticide application) and on soil properties (moisture, type of soil). By late 1999, an economic population of WCR was well established in Yugoslavia, while larval damage below the economic threshold was observed in Bosnia-Herzegovina, Croatia, Hungary and Romania. Countries around the infested area operated traps as part of the WCR NET networking activity (supported by FAO), but they have not detected any WCR beetles. It is expected that other countries in the region (Austria, Slovakia, Ukraine) will be infested and an economic WCR population will build up in Bosnia-Herzegovina, Croatia, Hungary and Romania in coming years. Its biology in the infested regions is almost the same as that of middle Indiana, USA. The spread and population buildup of the western corn rootworm (WCR) requires that multiple management strategies be developed for the control of this corn pest (crop rotation, soil pesticide application, control of adult WCRs). The concept of SLAM[®]-based areawide pest management of WCR is being developed in the USA (Chandler, 1998) and has been adapted in Hungary as part of UN FAO TCP 6712 Project, that included the following in Hungary: - selection of suitable area and fields; - adaptation of application techniques; - field scouting of WCR for decision making; - post treatment scouting and evaluation to determine outcomes. SLAM-based areawide management of WCR resulted in efficacy rates of over 90% (5 days after treatment) with a slow decrease after 10 and 15 days in 1998 and 1999. The concept of areawide management has proven to be an effective way to manage WCR and should be considered a viable control strategy in Europe. Details on population level, treatments will be discussed in the lecture. Spiders (Theridiidae and Agelenidae) as predators of WCR adults were proved in cornfields in Hungary (Tóth et al. 2000).

Index terms: *Diabrotica virgifera virgifera*, spread, biology, control, Europe.

[0165] TRANSGENIC MAIZE FOR MANAGEMENT OF DIABROTICINE PESTS

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Several crops have been developed for resistance to major insect pests. Maize has been transformed for resistance to *Diabrotica virgifera virgifera*, the western corn rootworm. This Diabroticine pest is the major maize insect pest in North America. The use of transgenic deployed resistance genes offers a safe and environmentally strategy for management of this insect. The performance of transgenic maize will be discussed and compared and contrasted to use of conventional management tools.

Index terms: *Diabrotica virgifera virgifera*, corn rootworms, transgenes.