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IWGO

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IWGO –NEWSLETTER XXVI / 1

EDITORIAL

After having edited the IWGO -Newsletter for more than twenty years (the first issue was released in October 1980), this issue will be the last hard copy version.

After having retired as IWGO – Convenor, after having leaded the group for 12 years, it is also time to adapt the NEWSLETTER to more modern means of publication.

The new IWGO Convenor, Dr. Ulrich KUHLMANN (more about the new convenor see in IWGO - MATTER on page 48) at the end of this journal), has decided, and I think it is a very good and necessary decision, to publish the NEWSLETTER by means of the internet.

In this the last hard copy of the NEWSLETTER, you will find the abstracts of talks presented by the FAO group during the 10th IWGO Meeting in Engelberg, Switzerland.

This part is followed by the list of participants and the abstracts of talks presented during the most recent IWGO meeting in Bratislava, Slovak Republic. The abstracts of the posters you will find on our new home page in the internet.

Finally, you find in the IWGO-MATTER some additional information about the new IWGO - Convenor, the meeting in Bratislava and the future of IWGO and me. Some pictures of the meeting in Bratislava you find at the end of this journal. (Also photos can be much easier (and cheaper) published on our new home-page.

In the future IWGO – NEWSLETTER – and also other IWGO – matter, such as announcing meetings, etc – can be found in the www:

http://www. IWGO.org

Yours

Harald K. Berger
(Convenor)

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Ulrich **KUHLMANN**, IWGO - Convenor

WHERE DO WE GO FROM HERE?

First of all I would like to express my thanks to Harald Berger who is responsible for creating such an active and well-recognized international working group on *Ostrinia* and other maize pests (IWGO). IWGO is certainly one of the most active working groups of the global International Organization of Biological Control (IOBC), which informs IWGO member's bi-annually through the IWGO Newsletter. During Harald Berger's IWGO convenorship, a new Subgroup focusing on the management of the western corn root worm has been established under the leadership Prof. C. Richard Edwards, Purdue University, W Lafayette, Indiana, USA. Over the last few years attendance at the IWGO Subgroup *Diabrotica* Meetings has vastly increased as the western corn rootworm has become a "political insect" in Europe. Certainly, all the meetings held so far have provided a valuable international platform for the exchange of experiences and ideas on the integrated management of *Ostrinia* and other maize pests through the use of chemical, cultural and biological control measures. Based on this activity our working group is considered as an international and independent expert group by different stakeholders and I believe this excellent profile needs to be maintained or even expanded, emphasizing its global character where it is needed. The IWGO *Diabrotica* Subgroup will continue to deal with the European invasion and should put more emphasis in the future on developing an integrated management tool for *Diabrotica* in Europe, instead of focusing on the monitoring programs. However, it is understood that the IWGO core group consists mainly of European members. In order to attract global participation for the "big IWGO Meetings" (every four years) further emphasis will be placed on (1) the integrated management of a number of insect maize pests, (2) up-to-date research themes, and (3) the discussion of management tools relevant for a maize-system management approach. In this context of global coverage of IWGO, I am glad that Prof. C. Richard Edwards is willing to support me as a Co-Convenor representing IWGO in North and South America. At this point I am considering nominating an additional Co-Convenor who could represent IWGO in Asia. A dialogue with other IOBC working groups will be established with the aim to avoid potential overlaps, but our good collaboration will be continued with international organizations such as FAO, EPPO and the European Commission. In addition, I would like to mention that the IWGO Newsletter will no longer be available in a printed version due to the high postage costs, but an PDF file will be sent to IWGO members or the IWGO Newsletter can be downloaded from our new Internet page www.iwgo.org. Over the next 6 months I will try to make an effort to install a new and interesting Internet portal on issues relevant for IWGO members. Please do not hesitate to contact me in case you have questions and suggestions.

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10th International IWGO – Workshop

8th FAO/TCP Meeting
9th EPPO ad hoc Panel
Engelberg, Switzerland; January 14 – 16, 2004

Abstracts of the papers presented by the FAO Network Group at the Xth IWGO – *Diabrotica* Subgroup Meeting in Engelberg, Switzerland; January 14 – 17, 2004

INTEGRATED PEST MANAGEMENT FOR WESTERN CORN ROOTWORM IN CENTRAL AND EASTERN EUROPE: FAO GTFS/RER/017/ITA PROJECT

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The first detection, spread and population build-up of Western Corn Rootworm (*Diabrotica virgifera virgifera* LeConte, WCR) in Europe resulted in broad regional cooperation activities among scientific communities, governmental organizations, countries and individuals in recent years. Regional activities (FAO TCP 6712 A project 1997-1999, EU-5 R&D Project 2000-2003, EU-5 Marie Curie Fellowship 2003-2005) and national inputs generated significant bulk of knowledge on WCR. The question is now how farmers in Europe have access to this new information, and how they can interpret and adapt available information to their regional/local farming conditions? This challenge is particularly high in Central and Eastern Europe. In a broader political and socio-economic context, this region is in a transition phase affecting the agricultural sector, i.e. the corn production in terms of management practices, people's participation and their role in corn production phase, and their access to the market. Currently an extremely wide range of farm sizes and management structures are present in the region. However, the Central and Eastern European countries are restructuring their agricultural sector, new roles of stakeholders are emerging and new skills are required for decision making in rapidly changing environment. Farmers in this region are more exposed to the risk caused by WCR as very limited services are provided for farmers and for national institutions. The involvement of people and communities in developing their future strategies is particularly weak in systems of former top-down operation.

Prior activities (WCR monitoring, pilot farmers training) conducted in the region under Letters of Agreement with the Food and Agriculture Organization of the United Nations served for developing a broad IPM program from 2000 to 2002. This new program was elaborated and submitted while the project documents were officially signed by the representatives of donor (Government of Italy), of FAO and of the Recipient Governments (Bosnia-Herzegovina, of Bulgaria, Croatia, Hungary, Romania, Serbia and Montenegro and Slovak Republic) and entered into force on 16 July 2003. The overall development objective of this three-year project is:

"Corn production in Europe protected from losses in production caused by WCR through the development and implementation of IPM strategies by farmers, based on sound understanding of local agro-ecosystems and protection of local biodiversity as the main element of sustainability of agricultural production".

Thematic working areas of the project are:
- Participatory research and training in farmer field schools;
- WCR monitoring and IPM development;
- Bio-diversity studies;
- Socio-economic and policy studies.

Immediate objectives of the project are:
- To establish a participatory training and research program in farmer field schools;
- To achieve better understanding of WCR spread and biology in Europe;
- To achieve better understanding of different components of local agro-biodiversity;
- To obtain better understanding of socio-economic aspects.

The project implementation has already started in the 2003-year corn-growing season. National Project Leaders (NPLs) and National Training Coordinators (NTCs) in each country were responsible for the local implementation under the Regional Coordinator with assistance of national and international consultants and with the technical and operational backstopping from relevant FAO Units. The Regional Steering Committee is the governing body of the project. The project has made a significant progress in the first year. Developing of farmers training and research as well as of participatory WCR monitoring activities will be presented by NPLs and NTCs (see other abstracts).
Activities were carried out under the FAO GTFS/RER/017/ITA project.

ORGANIZATION OF FARMERS FIELD SCHOOL IN BOSNIA AND HERZEGOVINA

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Western Corn Rootworm (*Diabrotica virgifera virgifera* Le Conte) is registered in B&H first time 1997. From that year until now WCR is registered almost at 1/3 of B&H territory. It has specially spread in the North and East part of B&H where about 70% of our cornfields are. There are only some smaller corn areas in Central and Western part of B&H, which are not infested by WCR. There has been permanent monitoring process from 1997 and it is primary concentrate on pest spreading and pests population density arising. There have not been registered economic damages caused by WCR until now but increasing of pest population density almost reaches critical value. It means that in case of repeated corn sowing possibilities for economic damages arise.
WCR is new pest in B&H and there has not been much knowledge about it. When it is first time noted on our territory, we immediately start farmers training about WCR. In the beginning training included lectures and visits to corn fields as well as further training which were more concentrate on visits to WCR infested corn fields. This training grew into Farmers Field School (FFS) during 2003 trough FAO Pilot Project in B&H. Training during this year has showed great farmers interest to learn more about this pest and ways for corn protection as well as for further training. We started FFS quit late in 2003 but we had success to realize 95% of jobs planed trough Project. Also we solved many problems, which showed during this first year of Project. We established 4 farmers groups with 12-15 farmers in each of them on different territories of B&H during 2003. First of all we chose locations where we should do monitoring, then we chose one facilitator for each location and each facilitator established one farmer group and worked with that farmers group during whole corn season. This work was mainly done trough ordinary groups meetings, which was organized by facilitator every 10-15 days. There were 13-14 meetings of each farmers group. National Program Leader and National

Training Coordinator took part during first meeting of each farmers group and also visited each group once more during season. This second visit was organized with intention to check and solve troubles, which appeared during monitoring. Also we organized and gave farmers chance to visit each other and exchanged their experiences. In our opinion this working method showed very good results. Farmers visit to farmers in Croatia was even more useful. Our main goal in this Project was to give farmers in B&H chance to learn more: about WCR, about methods, which could stop WCR spreading and population arising and also about methods for WCR possible suppressing. But we have to point that our farmers also learned more about field experiments and how important they are. Farmers also learned more about other agricultural matters: how important is optimal sawing time, crops rotation, right choosing of culture-hybrid, irrigation, and weed protection.
We can conclude that results, which we got trough this Project during 2003, were very good specially if we talk about Project implementation, organization, farmer's interest for Project and farmers participating in field experiments.

Key words: *Diabrotica*, farmer field school (FFS), training, field study,

The work was supported conducted under the GTFS/RER/017/ITA Project.

PARTICIPATORY TRAINING WITH FARMERS FOR IPM OF WESTERN CORN ROOTWORM IN HUNGARY: TRAINING METHODS & OUTCOMES

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In Hungary farmers are often approached by seed and chemical companies, private extension specialists offering solutions in pest control, and therefore farmers' knowledge and decision is often only based on this information. For this reason their knowledge is one-sided, and they often consider chemical control as the only solution in pest control, and in particular against the invasive western corn rootworm (*Diabrotica virgifera virgifera* LeConte). Moreover, farmers are not closely connected to ongoing research projects on alternative control strategies for IPM in maize, resulting in a lack of information transfer, what makes farmers reluctant to accept those strategies. Farmer Field Schools are a tool to overcome this problem as they focus on the education of farmers, by using non-formal education and participatory approach. The aim of such approach is to enhance farmers' knowledge and to make them thinking about several solutions for pest control and management in maize including the whole agro-ecosystem.

In Hungary, totally eight Farmer Field Schools were organised in 2003 under the ongoing GTFS/RER/017/ITA project in regions where western corn rootworm populations are well established. About 120 farmers were participating in trainings, and 50% of farmers were present on more than 60% of the meetings. The training of farmers started in March, and the last (evaluation) meeting was in October or November. The farmers expressed their interest for continuing this type of training for the future, including the winter time period.

The studies were mainly focusing on:

- The effect of crop rotation on the WCR population;
- The efficacy of soil and foliar insecticide application on WCR population and damage (based on farmers interest);

- WCR population shift to other crop stands than maize and its importance for crop rotation.

In all FFS the training focused to learning the morphology, biology and damage of maize pests and how to monitor population build-up of pests. Farmers were trained to focus on the biodiversity in the corn stand, and they were leaded towards understanding the role of different elements of the agro-ecosystem.

When the training program started, such approach was strange for the farmers, and they were asking for immediate solutions for their different problems in maize production. As the program was running and developing, they started to ask questions based on their observations. With participatory methodology several question were answered by them. Furthermore farmers became more open minded, started to come up with new ideas what we have to focus on, and where starting to find own solutions for their specific problems on their own farm. Next year farmers' research can be established based on the farmers' ideas and needs and FFS will be increased up to 18 groups.

In summary, the farmer field schools are a good tool that can contribute to develop long term management options in maize production, since farmers will be able to search for alternative solutions on their specific local requests and problems, and will understand and accept the idea of integrated pest management in maize. As farmer field schools against western corn rootworm are running in many Central and Eastern European countries, their outcome will help to reduce the pest populations and economic damages in the region.

Supported by FAO GTFS/RER017/ITA Project

EVOLUTION OF WCR IN ROMANIA IN 2003, ESPECIALLY IN TIMIS COUNTY, ROLE OF FARMERS IN MONITORIZING THIS PEST IN FFS ACTIVITIES

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The western corn rootworm (*Diabrotica virgifera virgifera* LeConte) was found in 1996 in Romania and after 7 years, from the first registration, the pest is present in almost half of the country. The population of *Diabrotica virgifera virgifera* has increased strongly, year by year, as indicating by pheromone traps captures reported by Central Laboratory of Quarantine. It is presented the pest spreading in Romania, especially in Timis county, role of farmers in monitoring this pest in FFS activities.

The populations of pest has increased strongly, year by year, as indicating by pheromone traps captures reported. In a FAO WCR NETWORK project PR 19713/2001 and PR 21261/2002, the Western Corn Rootworm, was surveyed in Timis district, regarding the symptoms of attacked plant (gooseneck) in field, number of larvae/plants, number of adults/plants, in cornfields with and without continuous corn, number of adults/pheromone trap and yellow sticky traps. Efficiency of different pheromone traps it is presented.

It was done a comparison between WCR and the most important corn pests, till now in Romania. The actual IPM strategies, which should be adopted in Romania, based of the improvement of knowledge of small farmers, in an FFS concept, which is an attempt to control WCR and other corn pest in connection with AESA and preserving of natural environment, is

presented. Farmers training for special purpose (WCR monitoring) was done by themselves in own fields, checking the pheromone and AM yellow sticky traps for recording *Diabrotica virgifera* capture.

The higher fly is situated between first decade of July and second decade of August, exist some variations of number of the WCR adults in the maxim fly period, because the attract power is lower after 30 days or after rain, the pheromone traps attracted a higher number of WCR adults compare with yellow sticky traps.
Under the PROJECT "GTFS/RER/017/ITA"

PRINCIPLES AND THE EXPERIENCE OF THE FFS APPROACH IN CROATIA

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«Farmers field school» (FFS) is a model of the education of farmers based on the practically oriented field study program conducted by group of farmers on the experimental field. In 2003, FAO project «Integrated pest management for western corn rootworm (WCR) in Central and Eastern Europe» started. Within the frame of the mentioned project, based on FFS methodology, three FFS groups in Croatia were formed. Two groups were located in highly infested area of Croatia; one group was located on the west line of the spread of the pest. Each group was meeting together with facilitator every 10 days. Work in each group was conducted in 3 subgroups. Groups were conducted small studies on their experimental fields. Following studies were conducted: a) Impact of different hybrids on WCR population density and damages; b) Impact of different previous crops on WCR population density and damages; c) WCR population density and biology.
Every 10 days farmers together with facilitator observed plant development stage, presence of the weeds, natural enemies; other pests and all data related to the WCR and conducted study. At the end of the season farmers collected all data from experimental field, analyzed their study and made final conclusions. Study results in Topolje and Tovarnik showed to farmers that between 3 hybrids, which were used in trials, no high difference in the WCR larval population and damages occurred. Farmer's could conclude that used hybrids didn't show different tolerance on WCR larval attack. In Tovarnik hybrid Bc566 showed highest root damage than other 2 hybrids. In Topolje hybrid Bc 544 showed lower root damage than other 2 hybrids. Also on all 3 treatments number of beetles on yellow sticky traps didn't differ. Some of used hybrids are not very common in the region of Slavonija and Baranja because they have short vegetation (FAO group 400). Farmer's could see that in extreme climatic conditions yield on FAO 400 hybrids didn't differ from yield on FAO 500 and FAO 600 hybrids. Farmer's from Tovarnik were able to see from the results of the 2nd study that WCR larvae were present on corn roots only if corn was previous crop. They also didn't find WCR larval damages on corn roots if sunflower or wheat were the previous crops. They found WCR adults on all three observed fields. On corn after corn and corn after sunflower number of beetles was similar while on corn after wheat number of beetles was lower than on previous 2 fields. Farmers from Rugvica region found WCR adults in the field where WCR wasn't present in 2002. They found beetles in both, continuous cornfield and in cornfield after wheat. They also found beetles in both fields located in previously infested area. They didn't find WCR larvae and larval damage.
Except of the main study farmers together with facilitator and with resource persons discussed different special topics as were: plant nutrition, corn production, natural enemies and their impact on WCR population density, other corn pests, problems of weeds in corn etc.

FFS from Croatia were conducted in-country and regional exchange visits. The main principle of the exchange visit is for the farmers to exchange their experiences in FFS work and in a wide range of their problems related to the WCR and corn production.
After first season it is obviously that farmers accepted the knowledge about corn development stages. Farmers from all 3 groups improved their knowledge about pest, its biology and ecology. They become familiar with methods of monitoring WCR population level for the purpose of monitoring (Rugvica region) and also for the purpose of predicting damages in next year (Tovarnik and Topolje). They become familiar with the methods of damage evaluation. Farmers collected beneficial fauna from Barber's pots and they realize the importance of beneficial insects in soil. They realize how some measures taken could reduce number of beneficial insects. Farmer's also collected beneficial insects and pests on the plants and they realized their importance in corn ecosystem.
Problems and questions from all conducted activities encountered are: a) number of the group members; b) how to move special topics in the field; c) motivation of the farmers; d) how to get feedback from the farmers; e) how to find future facilitator, how to train them and how to improve facilitation skills; f) sustainability of the project; Model of FFS has been working in 2003 quite well.
Farmers attended meetings regularly; they were active in the fieldwork, asked questions and make conclusions after field observations. Small investigations what farmers done in previous season resulted in expected results and farmers could conclude about WCR biology, ecology importance of previous crop on population density and damages.
Only one season is not enough for one group of farmers to accept everything what should be accepted in WCR biology ecology and control. There is a need to continue work with same groups of farmers. Most farmers are willing to continue work and they already have shoved interest in some topics.

11th International IWGO – Workshop

9th FAO/TCP Meeting
10th EPPO ad hoc Panel
Bratislava, Slovak Republic ; February 14-17, 2005

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IWGO –NEWSLETTER XXVI / 1

Abstracts of the papers presented at the XIth IWGO – *Diabrotica* Subgroup Meeting in Bratislava, Slovak Republic; February 14 – 17, 2005

IWGO AND ITS SUBGROUP: 37 YEARS OF IWGO AND 10 YEARS OF *Diabrotica* – SUBGROUP

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The International Working Group on *Ostrinia* (IWGO) is certainly one of the oldest Working Groups within Global IOBC. The group was started during an International Congress in Moscow in 1968, but the roots reach back to the USA regional project on *Ostrinia* already begun in 1951. IWGO was established through this USA regional project. The founders of the group were D. HADZISTEVIC (Yugoslavia), who had the original idea of founding a group for international cooperation, Prof. H.C. CHIANG (USA), who brought the ideas of the USA regional project into the group, I.D. SHAPIRO (Russia of the USSR), T. PERJU (Romania), C. KANIA (Poland) and B. DOLINKA (Hungary). Entomologists and breeder from Spain, Austria, Canada and CSSR joined the group later in the year. Prof. ZHOU Darong, John TSITSIPIS, Bud GUTHRIE, Les LEWIS, and Pierre ANGLADE are and were further members of the group.

The original idea of IWGO was to exchange inbred lines within the group and test these lines for resistance against the most important maize pest throughout the world, the European corn borer (ECB), *Ostrinia nubilalis* HUBNER. The results of this breeding program were made available to all member countries. Up to now, three synthetics resistant breeding lines to ECB have been developed and released (IWGO 1, 2, and 3, both late and early). As the membership of the group increased, interests in other areas of ECB research expanded. The appearance of *Diabrotica virgifera virgifera* LeConte in Europe (Serbia) in 1992 became a further matter of discussion within the group. This appearance was so important that even a subgroup within IWGO was founded in 1995.

The group has held 20 annual (since 1980 biannual) meetings in one of the member states. Several publications have been released and some are still partly available. Since 1981 "IWGO - NEWSLETTER" has been published. This has been a way to link the members and to establish a permanent record of the activities of the working group, distribute information about the members, and to publish the abstracts of papers presented at the congresses. After several meetings proceedings of the papers presented were issued.

Prof. H.C. CHIANG was the first president of the group and held this position until 1982. The group elected P. ANGLADE (Bordeaux, France) as the new president in 1982 and he served until 1993. Since 1994, I am the president of this international group. As the group and the topics discussed and researched grew, the necessity of the nomination of vice presidents (Sub- or Co - Convenors) came up. Prof. Dr. Les LEWIS (Iowa State University; USA) became Vice President and Prof. Dr. Rich EDWARDS Convenor of the *Diabrotica* subgroup, which was established in 1995. Ulrich KUHLMANN from Switzerland has also become Vice – President and will lead the group in the future.

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DEVELOPMENT OF BIOLOGICAL PRODUCTS FOR SUSTAINABLE CONTROL OF THE WESTERN CORN ROOTWORM

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The invasive maize insect pest, the Western Corn Rootworm (WCR), *Diabrotica virgifera virgifera*, is rapidly dispersing over Europe, and thus ecologically sound and economically competitive control strategies are urgently needed. In this new project, we aim to develop biological control products consisting of entomopathogenic nematodes and fungi and to integrate biological methods into sustainable control strategies of WCR. Critical factors that will be investigated for several nematode species include establishment potential and virulence as well as application techniques. In order to optimize efficacy of nematodes, we will investigate and hopefully use the attraction of nematodes by maize varieties.

A collection of fungi species and strains including those isolated from WCR will be tested in order to select the strain with highest virulence and probability of controlling the soil dwelling larvae of WCR and the leaf feeding adult. As another management option, transgenic Bt-maize (MON 863) will be evaluated with special emphasis on non-target effects. Since the overall aim is to develop biological products, the compatibility of Bt-maize with above mentioned biological control agents will be studied. A comparative risk assessment which includes pesticides will be performed in order to detect possible detrimental effects on the environment.

RESULTS OF THE 2004 MONITORING PROGRAM FOR WCR IN AUSTRIA

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In 2004 the WCR monitoring program (*Diabrotica virgifera virgifera* LEC.) was intensified, with a total of 667 traps in the whole country with special attention to the eastern provinces. Csalomon® PAL traps were used for monitoring purposes in all cases. Monitoring began at the end of June to the beginning of July and was discontinued at the end of September to the beginning of October. Traps and pheromones were renewed every 4 weeks.
Of the 667 traps installed in Austria, beetles were recorded in 326 traps. The total number of beetles captured was 11156, whereby 9341 were caught in Burgenland province, 1642 in Niederösterreich, 140 in Steiermark and 33 in Wien. In 2004 the influx of WCR along the entire eastern border of the country continued undiminished. Distribution now ranges up to approx. 75 km into Austrian territory, whereby new infections were primarily recorded in the northern and southern areas. In the North the range of the pest increased by approx. 40 kilometres inland. In the South the increase in range was about 20 kilometres. No beetles were recorded in other parts of the country.

In addition to these traps AGES installed an additional 147 traps of different types for research purposes. In all of these traps 77575 beetles were caught. Further 7269 beetles were caught in traps of a commercial agrochemical firm on experimental fields. All of these traps were located in the district of Neusiedl/See (Burgenland), where the highest population density in Austria occurs. No damages were recorded.

The first beetle was captured on July 12th, the last on October 14h. The population increased regularly until it peaked in the first week of August. After that it declined regularly to end of August and then dropped sharply. A warm period at the beginning of October is reflected in a small increase in beetle numbers.

SPREADING OF WCR IN SLOVENIA IN 2004

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Maize is one of the major crops in Slovenia covering approximately 40 % of all arable fields. Since Western Corn Rootworm, *Diabrotica virgifera virgifera* LECONTE is one of the major maize pests and since Slovenia has suitable climatic and trophic conditions for its establishment, the offical monitoring of the spreading of WCR in Slovenia started in 1997. WCR was not discovered in Slovenia until 2003 when first specimens were caught not only in north eastern but also in western Slovenia. From the total number of 62 inspected localities at that period the pest was registered in 14 of them (22.6 %); 19 specimens were caught altogether.

In 2004 the WCR monitoring was intensified. 200 checkpoints were set up towards the end of June (29 June) in maize growing areas: 139 in the north-eastern Slovenia (Pomurje, Podravje), 15 in the south-eastern Slovenia (Posavje), 10 in Savinjska dolina, 10 in the central Slovenia (near the Ljubljana airport) and 26 in the region of Primorska (near the Slovenian-Italian border). PAL pheromone traps and yellow sticky traps were used. The presence of WCR was recorded on 55 locations (27.5 %). The total of 386 specimens were caught. The majority of specimens were found in the north-eastern Slovenia very close to Slovenian-Hungarian, Slovenian-Croatian as well to Slovenian-Austrian border. Only one specimen was recorded near the border with Italy (Šempas). The greatest number of WCR specimens was caught on the following locations: Pince, Dolina near Lendava and Lakoš. From the area analysis of WCR occurrence in 2004 it is evident that spreading of WCR in the north-eastern Slovenia reached an approximate distance of 15 km towards east in comparison with the WCR occurrence in 2003.

In 2004, the first WCR specimens were caught at the beginning of the third decade of July in the area of Prekmurje near the village Pince (2) and in Ljutomer (1), Podravje, (22 July). Larger peaks of *D.v.v.* occurence were recorded on 5 and on 11 August in Lakoš-1 (16 and 14, respectively) and in Dolina near Lendava (15 and 10, respectively); on 20 August in Lakoš-2 (21) and on 27 July and 1 September in Pince (18 and 19, respectively). The last specimens were caught on 21 September in Gornji Petrovci (1) near Murska Sobota (1), on 22 September near the village Genterovci (3) and on 23 September in Lakoš-1 and Lakoš-2 near Lendava (1 and 2, respectively).

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EVALUATION OF CONTROL STRATEGIES THROUGH MONITORING IN SWITZERLAND

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In 2004 more than 200 traps were placed in Switzerland to monitor western corn rootworm (WCR) distribution and to evaluate control measures. South of the Alps (SoA, "Tessin") WCR is established since 2000 and North of the Alps (NoA) WCR has been captures for the first time in 2003. SoA, crop rotation is mandatory everywhere and NoA rotation is mandatory in the 10km vicinity of trap catches. No insecticides were applied. The eradication measures NoA were successful because no WCR males were caught in 2004 in areas where there were catches in 2003. In 2004, only one male was caught in a new, industrial area. SoA, trap catches were 2004 in average a quarter the size of those of 2003. In an isolated mountain valley, crop rotation reduced trap catches from 87 to 1 catch per trap.
The weekly trap catch data of 2001 to 2003 SoA were used to describe the flight phenology of WCR. A model of the beginning of flight based on soil temperatures above 10.5°C predicted the first emergence of the adults at 620 day-degrees (threshold 10.5°C, start January 1 st). Observations from experimental fields submitted to monoculture indicated that the first adults emerged at 600 ± 40 day-degrees. In rotated fields, adults were captured 200 day-degrees later. This difference indicates that it took WCR about 15 days from emergence to colonization of other maize fields.

EFFECT OF SUPPRESSION STRATEGIES AGAINST *Diabrotica virgifera virgifera* IN SWITZERLAND

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During 2004 the whole territory of Ticino, a canton South of the Alps, was under a corn crop rotation decree. The only exception was a 0.6-hectare wide cornfield in the most southern part of the region, which was continuously cultivated with corn for the last three years. As in 2003 several parameters were observed. Egg density was determined by soil analysis, emerging adults were caught with self constructed emerging cages and adult population was quantified by three different trap models (Csalomon ® PAL, PALS and yellow sticky traps). On the plant, root damage and different ear characteristics such as weight and thousand grain weight were examined and compared with first year corn. The number of captured insects in the PAL traps in the unrotated field was compared with catch numbers in rotated corn located in the region within a radius of 10km.
Third year corn allowed the population of Diabrotica to increase continuously while in the rotated fields a significant decrease compared to 2003 was observed. Third year corn roots were clearly damaged which resulted in lodged plants. Roots were rated with the new Iowa scale from 1 to 3 and showed an average of 1.7. Flight activity in third year corn began June 30th and ended late September. In rotated corn adults appeared two weeks later and showed an eight times lower peak on the flight curve and didn't build up an economic population.
These results confirm the effectiveness of a rotation strategy also near a highly infested area. Under the present conditions economic damage was visible after only three years of continuous corn.

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PREVENTING THE SPREAD OF *DIABROTICA VIRGIFERA VIRGIFERA* THE UK EXPERIENCE

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Diabrotica virgifera virgifera (Dvv), the western corn rootworm was first confirmed as present in England in 2003. This was the first year that an official survey had been undertaken, with c. 70 pheromone (PAL) traps initially placed in maize fields at over 30 locations considered at greatest risk due to i) their proximity to international civil and military airports; and ii) their location in southern England, where warm summer temperatures occur. On 29th August the pest was first found on traps in forage maize crops at a site 5 km west of London Heathrow airport. It was subsequently confirmed at three further sites in the vicinity, and a further site near London Gatwick airport. Trapping was immediately increased to a total of c. 350 traps at 80 locations and a total of 92 adult Dvv were caught in 2003. The majority (86/92) of beetles were trapped at just one of the sites, suggesting that the pest may have already been present for one or more years.

In 2004, a more extensive national survey was undertaken to determine the potential distribution of the pest in maize-growing areas throughout the UK, in accordance with Article 2 of Commission Decision 2003/766/EC. In addition, an extensive trapping programme was also carried out in the demarcated focus and safety zones following the findings in 2003 (as outlined in Articles 3 and 4). Over 1700 pheromone (PAL) traps were utilised. All traps from the national survey proved negative, with no findings of the pest in new areas of the UK. However, the pest was found to be still present in the known outbreak area, with a total of 87 adults confirmed on traps. Traps were checked regularly and the first adults were found on 25th August 2004. Although an emergency approval for use of lambda-cyhalothrin had been obtained for contingency use, the height of the mature maize crop precluded ground-based insecticide applications. Aerial applications cannot be authorised at the outbreak sites due to the semi-urban location.

Harvesting was co-ordinated locally to delay harvesting in the fields of capture and thus minimize potential dispersal of adult stages. Operators were required to process fresh maize in situ to prevent the movement of live beetles from the field. Pest phenology models are also under development to assist in predicting life-stage development, as an aid to implementation of control measures.

Findings of the pest in 2004 indicate that the emergency measures taken in the UK have prevented further spread of the pest, in accordance with the aim of the Commission Directive 2003/766/EC. Whilst crop rotation remains the primary recommendation for long-term management of this pest, due to local constraints on farms in the outbreak areas, alternative options are under investigation to ensure that the economic impact of the emergency measures does not exceed the direct economic impact of the pest itself.

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THE *Diabrotica virgifera virgifera* ERADICATION – CONTAINMENT ATTEMPT IN VENETO IS STILL SUCCESSFUL IN 2004

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The attempt to eradicate or at least to contain the population of *Diabrotica virgifera virgifera* (WCR) first detected in 1998 near the Venice airport was implemented using basically the measures deployed in previous years although some modifications were introduced to reduce the negative impact on farmers.
Materials and Methods: the eradication program was based on:♦ **Initial focus area (6000 ha of cultivated land, 714 ha of maize**): - monitoring the WCR population: 629 sex pheromone traps (most of them PAL) were placed out; most of them from the 26th of June to the 20th of July. - Imposing restrictions on the planting of maize in fields: it was prohibited to plant maize after maize; in alternative to rotation farmers were allowed to spray twice with insecticides the monoculture fields (totally 94.1 ha were treated twice by using chlorpyrifos or pyrethrins between the 22nd of July to the 13th of August) - Applying insecticide treatments to maize fields where and all around a WCR beetle has been caught (10.8 ha of maize fields were sprayed on the 7th of August) - Prohibiting the movement of fresh maize or soil in which corn was grown the previous year outside of the focus area. - Not allowing maize to be harvested before September 15th. ♦ **Safe area (about 29.000 ha of cultivated land):** - monitoring of WCR population: totally 243 sex pheromone traps were deployed (most of them from the 2nd to the12th of July) in all the monoculture maize fields of the part of safe area (named safe-endangered area) close to the border of focus area (about 2-3 km around); 52 PAL traps were placed out according to a 2 km X 2 km grid in monoculture maize fields localized in the rest of the safe area. Trap inspections were done twice per week or weekly. In order to reduce the negative impact on farmers of the measures the following strategies were also deployed:

a) based on development models concurrently tested in Lombardy:
the period in which no more WCR eggs were present in the soil was individuated and a bulletin informed farmers that from that time on maize sowing was allowed also in fields
planted with maize in the previous year;
the period of gravid females appearance was detected and this information was used to optimise insecticide treatments in the fields where rotation had not been done.

b) concurrently the evaluation of the effectiveness of different traps for males and females and of different treatments to control WCR populations was done in Lombardy.

Results

Field checks in focus area: all the fields in the focus area that had been planted to maize in 2003 were checked to determine what crop was planted in 2004. About 86 ha of monoculture maize fields were found.

WCR captures: ♦ **Initial focus area**: 1 beetle was captured on the 24th of July in a field planted with soybean in 2003 and maize in 2002.♦ **Safe area**: no beetles were captured.

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FINDING OF A NEW DIABROTICA POPULATION IN FRANCE AND RESULTS OF THE OFFICIAL CONTROL AFTER 2 YEARS OF IMPLEMENTATION

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1/ Official survey.

A trapping network including 471 sites (Figure 1) was set up in 2004 in high-risk sectors (airports, military bases, motorways) or by random samplings in corn areas from mid-june to mid-september. Two traps located in *Ile-de-France* region showed captures from July 27, 2004 near the town of Pierrelaye. Others sites did not show any other captures in the different french regions.

2/ Eradication programme.

Three plans of control (Figure 2) were active from June 2004 to October 2004. This scheme included 2 phases : an evaluation of the focus by trapping reenforcement and implementation of multiannual phytosanitary measures, including for the focus zone (5 km radius) :

- crop rotation (corn one year in three consecutive
- years)
- soil treatments and seed treatments
- adults treatments
- date of harvest delayed
- no soil displacement
- destruction of estival graminaceous and volunteer maize plants and for the safety zone (10 km radius) :
- corn one year in two consecutive years
- larval treatment (soil or seed treatments)
- soil treatments or seed treatments
- adults treatments

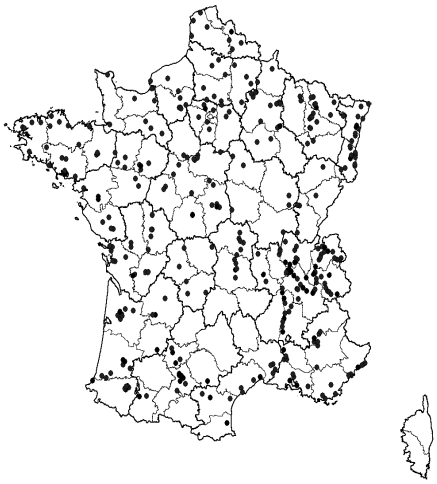

Figure 1 : localisation of trap sites of the official survey

On the Roissy zone, no capture was recorded. The control plan was completely effective. On the Orly zone, two captures only - very late in the season and whose origin remains enigmatic – were registred. Total control of the Blotzheim (Alsace) focus with no beetles detected in 2004.

3/ The focus of Pierrelaye.

The new focus was immediately subject to eradication measures by the *Direction Générale de l'Alimentation* (DGAL), carried out by the DRIAF/SRPV of *Ile–de-France* in collaboration with FREDON.

At the end of the trapping period, the total of beetles trapped was 180. The core of the focus is now well circumscribed. It will be the subject of a special attention in 2005.

4/ Conclusion.
Results of the second year of implementation of an eradication strategy are very encouraging with a strong reduction of captures.
The measures taken prove to be very effective to maintain populations at an extremely low level.

The number of captures was reduced by 90% between 2002 and 2003 and 93% between 2003 and 2004 in the 2 demarcated zones under official control near Paris.

However, the origin of the 2 beetles trapped in the safety zone of Orly raises question. The assumption of a new introduction by air or terrestrial means is not to be exclude.
The eradication effort will be maintained in 2005. Specific measurements will be implemented on all demarcated areas in agreement with Commission Decision of 24 October 2003 on emergency measures to prevent the spread within the Community of *Diabrotica virgifera* LeConte.

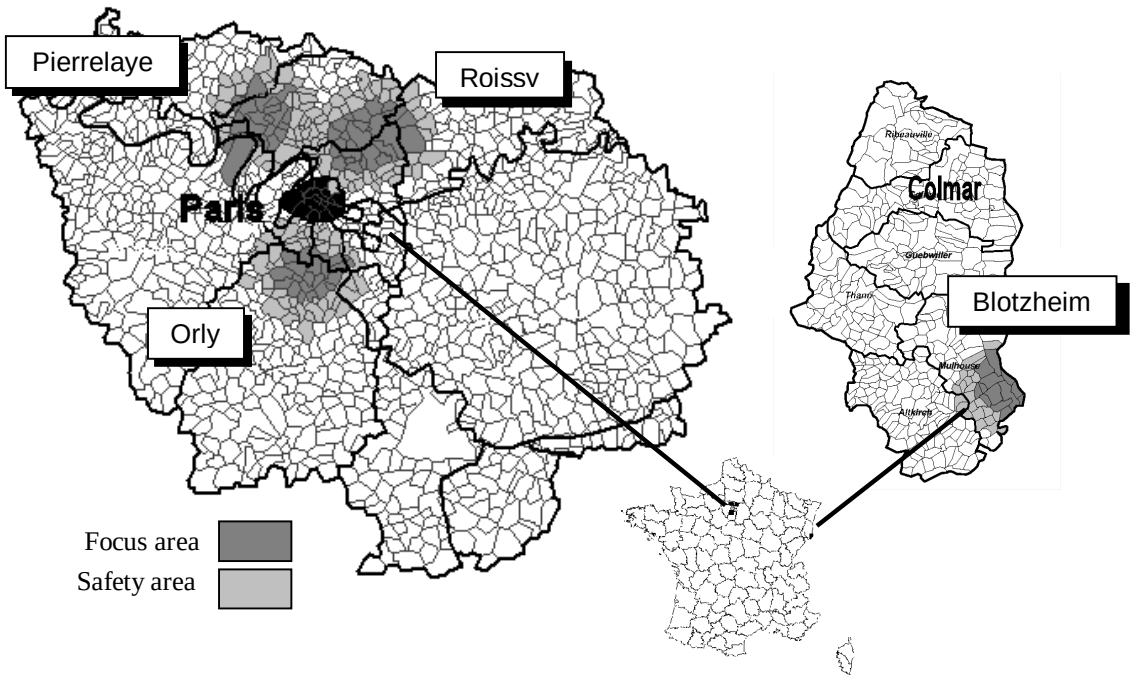

Figure 2 : localisation of demarcated zones under official control

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EXPERIENCES WITH THE MEASURES AGAINST *Diabrotica virgifera virgifera* LECONTE IN BADEN-WÜRTTEMBERG AFTER DETECTION NEAR THE EUROAIRPORT BASEL-MULHOUSE IN THE YEAR 2003.

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The Land Baden-Württemberg, placed in the southwest of Germany, has a total area of about 145.000 ha maize cultivation. About half of this is grain maize (incl. CCM) and half is silage maize. Most of grain maize is grown in the Rhine valley. The maize production there dominantly takes place in monoculture. Therefore already in 1997 a WCR-monitoring programme started in the governmental district of Freiburg and from 1999 the monitoring with PAL traps included all of Baden-Württemberg.

In the year 2003 the first occurrence of *Diabrotica virgifera virgifera* in the Rhine Valley was registered in Alsace (France) near the Basel-Mulhouse airport about 5 km from the German border at F-Blotzheim. As a consequence France established a safety zone of 5 km, which also included 150 ha of maize in Germany in the administrative district of Freiburg. In 2003 an insecticide treatment was prescribed with “Karate Zeon” (Lambda-Cyhalothrin) by a contractor with a stilt tractor on about 130 ha.

In the year 2004 281 PAL traps were set up from the 1st July until the beginning of October in the important maize growing areas and at high-risk locations for introduction such as airfields, airports, truck stops, railway reloading stations, customs, barracks, inland ports, central markets.
The monitoring was carried out on the basis of a guideline on the “execution of official measures against *Diabrotica virgifera virgifera* LECONTE”, which has been elaborated by the Federal Biological Research Centre together with the Federal Länder.

In the security zone within the area of Weil am Rhein 12 pheromone PAL-traps were set up in maize fields (a total of 91 traps in the whole Regierungspräsidium Freiburg). The monitoring started on the 15th June and the last observation was done on the 1st October 2004. The pheromone dispenser and the sticky tables were changed twice during the whole observation time.

Result of the monitoring: No beetles of the Western Corn Rootworm were captured in 2004 in the security zone and the other trap locations in Baden-Württemberg (281traps).

According to the Decision 2003/766/EC the individual farmers in the safety zone can decide, whether they will implement crop rotation or carry out an appropriate treatment of their maize fields in the zone. In accordance with the German guideline the entire seed stock of maize in the safety zone was treated uniformly against the larvae of *Diabrotica virgifera virgifera* with the seed coating “Poncho Pro” (Clothianidin). Furthermore the administrative district of Freiburg ensured, that all the maize fields situated within the security zone (130 ha) were treated against the WCR in August 2004 with the insecticide “Fastac SC” (Alpha-Cypermethrin). The treatment of the maize fields situated within the security zone was carried out with a stilt-tractor by a contractor within a period of 3 days from 18th until 20th August 2004.

In addition to this a preventive soil treatment with the insecticide granulate “Force 1,5 G” (Tefluthrin) against *Diabrotica*, and other pests (*Agrotis spp*, A*griotes spp. Oscinella frit)* was executed on an area of about 2.500 ha maize within a buffer zone established in the production region of seed maize, situated north to the safety zone.

If an outbreak of *Diabrotica* occurs in the Rhine valley, there will be some difficulties and problems: Insecticide sprayings can probably not be done by helicopter and there are only a

few stilt tractors. There are very high costs of the treatments and the measure “crop rotation” is an enormous economic problem for the farmers, who have no alternative to corn and to seed corn production.

PROCEDURES FOR OFFICIAL CONTROL OF *Diabrotica virgifera*

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The EPPO Panel on phytosanitary procedures has drafted a standard, in EPPO series PM 9 National regulatory control systems, on *Diabrotica virgifera*: procedure for official control. EPPO countries with areas at risk are advised to prepare a contingency plan for surveillance, eradication and containment of the pest. Detailed appendices present methods for monitoring *D. virgifera*, procedures for eradication, and measures for containment. This standard will probably be approved in 2005. It is consistent with the EU Commission decision on emergency measures to prevent the spread of the pest in the EU, and provides fuller descriptions of the methods to be used to implement the measures.

ACTION AND RESEARCH PLAN AGAINST THE INVASIVE MAIZE PEST *Diabrotica virgifera virgifera* IN EUROPE

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In the past few years the Western Corn Rootworm (WCR - *Diabrotica virgifera virgifera*) invaded central Europe more rapidly than expected in the past. The rapid spread of WCR together with the establishment of continuous populations will evidently result in severe problems to European high intensity maize production areas throughout Europe.
Several research activities in the EU member states aimed at finding integrated strategies for reducing WCR populations below threshold levels. There is an urgent need for harmonising and concentrating these activities both on a scientific and administrative level to establish a community-scale action and research plan.
Thus the goal of the Specific Support Action DIABR-ACT (Framework Programme 6, Policy-oriented research – Scientific support to policies, call 4) is to establish a harmonised and sustainable control strategy for continuously established and discontinuously emerging WCR populations. On the same time DIABR-ACT aims at minimizing the impact of these measures on biodiversity and the environment. Control strategies to be established should also be adapted to the situation of each country involved and should take into account the situation of the farmers and the economic chains build upon the maize crop, including biological and integrated control, plant resistance traits, the adaptation of biotechnological approaches and cultural techniques. Furthermore, DIABR-ACT will evaluate short and long term costs/benefits of containment and eradication strategies at the micro or macroeconomic level (farms, regions, countries, Europe).
Details of DIABR-ACT and possibilities for interested groups to join this SSA will be outlined in the presentation.

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2004 PERFORMANCE OF YIELDGARD® ROOTWORM MAIZE

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Maize (Zea mays L.) yields are negatively impacted by a number of insect pests. One of the most destructive in the US corn belt is the corn rootworm (Diabrotica spp.). The western corn rootworm (D. virgifera virgifera LeConte) and the northern corn rootworm (D. barberi Smith & Lawrence) are the most economically important rootworm species. Corn rootworm larvae damage maize by feeding on the roots which reduces the ability of the plant to absorb water and nutrients from soil and causes harvesting difficulties due to plant lodging. Corn rootworm is the most significant insect pest problem for maize growers in the US from the standpoint of chemical insecticide usage. An estimated 5.7 to 7.7 million hectares of maize in the US are treated annually with organophosphate, carbamate, pyrethroid, and phenyl pyrazole insecticides to control this pest.
Monsanto initially sold genetically enhanced maize in 2003 under the name of YieldGard® Rootworm. This innovative corn technology consisted of the MON 863 transformation event which contained the Cry3Bb1 protein. In 2004, MON 863 was combined with MON 810 under the name YieldGard Plus to offer control of both corn rootworm and European corn borer (*Ostrinia nubilalis* HÜBNER). Over these past two seasons, 20,000 growers have commercially utilized this technology on roughly 1.0 million hectares.

Overall, 87% of farmers surveyed in 2004 were satisfied with the performance of YieldGard Rootworm and YieldGard Plus technologies according to an independent grower survey. An extensive commercial test was also conducted on YieldGard Plus with 2,000 growers. Thirty-one percent indicated moderate to heavy root damage in their adjacent refuge or comparison field, whereas, 99% of growers reported little to no root damage with their YieldGard Plus maize hybrid. As with any new technology, a small number of performance inquiries were expected as growers began to use a new technology like YieldGard Rootworm over a wide range of growing conditions, however, isolated reports of greater than expected damage were reported on less than 0.2% of YieldGard Rootworm acres. Growers are currently indicating that YieldGard Rootworm and YieldGard Plus hectares will more than double in the 2005 season.

Cry34ab1/Cry35ab1: PERFORMANCE CHARACTERISTICS OF A GENETIC SOLUTION FOR CORN ROOTWORM PROTECTION

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Corn rootworm (*Diabrotica spp.*) is a pest with growing economic importance in maize production systems in the United States and especially Europe. This growing pest problem can be offset by the development and commercialization of novel rootworm management

tactics. Pioneer Hi-Bred and Dow AgroSciences are collaborating to develop and commercialize a genetic solution for corn growers needing protection from larval corn rootworm injury.

This solution uses maize-plant expression of Cry34Ab1 and Cry35Ab1 insecticidal proteins and is described by the transformation event number DAS-59122-7. Expression of these proteins in roots protects against larval western corn rootworm injury and preserves the genetic yield potential of maize. Root protection can result from lethal susceptibility after ingestion and mortality resulting from a combination of chronic effects. Wide-area efficacy testing in the US during 2004 described how DAS-59122-7 reduced average injury from 1.9, on the 0-3 Node Injury Scale, down to an average of 0.2. This level of efficacy protects yield by reducing physiological plant stress and reducing loss from plant lodging during harvest.
Safety assessments conducted on DAS-59122-7 showed no adverse effects on nontarget insects, and no adverse effects of high doses of protein to mammals, birds and fish have been identified. Regulatory submissions were made to the US Environmental Protection Agency, Department of Agriculture and Food and Drug Administration. Approval for cultivation in the US is anticipated during 2005 and Pioneer is pursuing approvals for this product in other relevant markets including Europe.

ROOTWORM TRANSGENIC FAILURE? - PROBABLY NOT!

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In a few research plots and farmers' fields in Indiana and Illinois in 2004, Monsanto's YieldGard Rootworm (YGRW) corn did not perform as expected where rootworm larval pressure was extremely high. Instances where this occurred were primarily in northwestern Indiana and east central Illinois where the variant western corn rootworm, *Diabrotica virgifera virgifera* LECONTE (Coleoptera: Chrysomelidae), is present. In research plots in Indiana where untreated check rows showed an average root damage rating of 5.9 (Hills and Peters 1-6 root rating scale), or nearly 3 nodes destroyed, the YGRW corn had an average root damage rating of 3.1, or less than 1 node destroyed. This compares to root damage ratings of 2.2-3.7 for commercial rootworm soil insecticides within the same plots. In Illinois, K. Steffey and M. Gray, University of Illinois, Crop Science Department, reported that in research plots near Urbana, Illinois, the average root damage rating for the untreated check was 5.8 with the YGRW corn averaging 3.15. As in Indiana, the level of root damage exhibited in the YGRW corn was higher than anticipated.
Although we should be concerned about this lack of "expected" control, we must remember that the transformation event (MON 863) that forms this transgenic is a non-high-dose event unlike those events (MON 810, Bt11, and TC 1507) that form the basis for managing insects such as the European corn borer, *Ostrinia nubilalis* Hübner. With these, we have grown to expect almost 100% control. So for YGRW, some rootworm survivorship is expected and will occur. If the corn rootworm larval population is high enough within a field, there could be enough larval survival to cause economic root damage. As is noted by the United States Environmental Protection Agency document "Event MON863 *Bt* Cry3Bb1 Corn Biopesticide Registration Action Document," YGRW was judged to have "comparable or greater efficacy than the current chemical alternatives." For this particular event, we can expect to occasionally see what we saw in Indiana and Illinois in 2004. So failure? Probably not!

YieldGard RW root rating performance in comparison with selected soil insecticides, 2004

Location	Best Rating[1]	YieldGard RW	Force[3]	Untreated
Lafayette, IN	1.50 (YGRW)	1.50	1.65	2.55
Wanatah, IN	2.20 (Fortress)[2]	3.10	2.55	5.90
Columbia City, IN	1.60 (YGRW)	1.60	1.95	3.60
DeKalb, IL	2.35 (YGRW)	2.35	2.65	5.00
Monmouth, IL	1.80 (YGRW)	1.80	3.35	5.75
Urbana, IL	2.45 (Force)[2]	3.15	2.45	5.80

[1] The "Best Rating" is the least amount of rootworm damage for any treatment in the plot.
[2] Fortress 2.5G (chlorethoxyphos), Force 3G (tefluthrin).
[3] One of the most widely used and efficacious products; used for comparison.

CLOTHIANIDIN (PONCHO®, PONCHO PRO®) – SEED TREATMENT SOLUTIONS FOR SUCCESSFUL *Diabrotica virgifera virgifera* MANAGEMENT

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Clothianidin represents the latest available CNI/neonicotinoid chemistry which is now used as insecticide seed treatment on crops such as cereals, maize, oil seed rape/canola, sugar beets etc. The active is highly root systemic and enters the transpiration stream through the roots of germinating seedlings and developing plants. Pests become poisoned mainly through ingestion of protected plant tissue causing an early anti-feeding reaction. The benefits of clothianidin seed treatment are improved control of insect pests over current CNI chemistry, along with reduced human exposure, no cross-resistance to other insecticide chemistries, and convenience to the grower. Seed treatment has clear safety and handling advantages as the products are contained "on-the-seed" and "in-the-bag".
The first Clothianidin registration on corn/maize was granted by EPA (USA) in May 2003 for the control of various insect pests including *Diabrotica spp*. at 1,25 mg active ingredient per kernel of maize seeds. In the meantime additional countries - Austria, Brazil, Canada, Germany, Hungary, Mexico, New Zealand – have approved Clothianidin seed treatment on maize.

Research supports suggestions that *Diabrotica virgifera virgifera* originally went into the U.S. from Mexico and/or Central America. Now it can be found across the US corn belt being the pest of major economic importance in maize.

In Europe *Diabrotica virgifera virgifera* was first detected near Belgrade airport in 1992 and has since spread within Europe. Latest outbreaks were reported in Austria and France in 2002 and in Belgium, the Netherlands and in the U.K. in 2003.

Trials conducted with clothianidin seed treatment in maize in Europe in 2003 and 2004 have confirmed the excellent *Diabrotica virgifera virgifera* management potential of Poncho Pro® at 1,25 mg ai./k. under European conditions as well. Crop damage caused by root feeding larvae was significantly reduced enabling treated crops to realize their yield potential. Poncho® at 0,5 mg a.i./k can be recommended for low pressure

conditions. Representative results from Croatia, Hungary, Italy and Romania are presented.

In addition to its excellent activity against *Diabrotica virgifera virgifera* Clothianidin offers outstanding control of very important European maize pests including wireworms *(Agriotes sp.*), cutworm *(Agrotis spp.)*, frit fly (*Oscinella frit*), plant hoppers *(Macrosteles spp*., *Zyginidia spp.*) at 0.5 mg a.i./k.

PEST MANAGEMENT OF THE WESTERN CORN ROOT WORM (Diabrotica virgifera virgifera) WITH SYNGENTA SOLUTIONS

S.**NOWAKOWSKI**, R. **PECZE**, H. van den **MAAREL**

NO ABSTRACT

INTRODUCTION OF THE "KLP" ("HAT") TRAP, A NOVEL NON-STICKY TRAP DESIGN HIGHLY EFFICIENT IN CAPTURING WESTERN CORN ROOTWORM: COMPARISON OF PERFORMANCE WITH FORMER STICKY TRAP TYPES

Miklos **TOTH**, I. **SZARUKÁN**, G. **VÖRÖS**, L. **FURLAN**, Z. **IMREI**, J. **VUTS**

NO ABSTRACT

COMPARATIVE STUDY OF EFFECTIVENESS OF ELEMENTS USED IN IPM SYSTEM AGAINST *Diabrotica virgifera virgifera*

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Since the appearance of Western corn rootworm (*Diabrotica virgifera virgifera* LECONTE) in Hungary, numerous technology had been developed and tested which resulted in more or less success. In this study we have compared the effectiveness of crop rotation, seed dressing, soil and field treatments.

Crop rotation is called to be the most effective part of IPM against WCR. It is suitable in regions where corn takes small part of the total sowing area. Even in these regions the possibility of the extended diapause of eggs and the change in the feeding preference of a larvae must be considered.

The two widely used methods against pests in corn are the seed dressing and the application of soil treatment. The effectiveness of these methods against WCR are influenced under the fact that the time of the mass egg hatch rarely coincide with the duration of insecticides. Early sowing or prolonged hatching can cause quite low effect to these products.
Experiences in Hungary and in he USA are shown that the most useful method against WCR is field treatment. Tank mix combination of INVITE® EC (a.s. cucurbitacin) and DIABRO® (a.s. microencapsulated chlorpyrifos) was applied twice, one at the beginning of the flowering period, repeated two weeks later successfully reduced damage to the silk and decreased the

egg laying population of the pest. The average yield loss the adults themselves can cause is about 10-30 % on the flowering corn plant. They feed, mate and deposits their eggs into the soil. Protection against male and female adults can resulted not only in the annual decreasing of loss but have a remarkable impact on the following years.
Considering the increasing Diabrotica infected area in Europe, every element of the IPM method is advised to use to have successful protection.

Effectiveness of elements used in IPM system against *Diabrotica virgifera virgifera*

Treatment	Effectiveness	Survival
seed dressing	51 %	49 %
soil treatment	61 %	39 %
cucurbitacin+chlorpyrifos 1x	72 %	28 %
cucurbitacin+chlorpyrifos 2x	92 %	8 %

IMPORTANCE AND MANAGEMENT OPTIONS ON WCR (*Diabrotica v. virgifera*) IN ROMANIA

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As for the other countries, the establishment of *Diabrotica virgifera virgifera* in an area, which covers approximately 60 % of the total corn production acreage in Europe, should change the corn production practice and will have a serious impact on maize yield and corn pests management. The speed of WCR spread is high, in eight years the pest is present in half of the country. Total area with economic damage by larvae is estimated at 10% from corn cultivated area. It has to be kept in mind that there are no regular evaluations of damage status on the field during June, July. Till now the possibilities of informing farmers about the risk of presence and importance of pest are limited and what is more important there are, in generally no funds to offer to the farmers with corn monoculture an alternative crop subsidized by state. The cost of controlling the pest is high and till now there are no registered pesticides for larvae or adults.

Like a general tendency the corn monoculture is decreasing in the last years. The pest is and will be a problem for small farmers (owners of 1-5 hectares) or in that particular situation where due to a particular situation for farmers is very difficult to rotate crops. The spreading of WCR was supported by the tradition of small farmers to have a corn culture, which is possible to sold on the market or to be used for animal feeding.
The rough explanation for the question why the pest produced losses only on small area is that WCR attack is not surveyed on large scale basis, state institutions are more interested in monitoring the pest and generally there are no funds for this kind of activity, rural farmers community have no economic possibilities to replace corn with another crop and there are no subsidies for this. In our opinion the most important fact are the monoculture, many or not so many small corn fields, cultivation of different hybrids, time of sowing and appearance of larvae, structure of hybrids in zone, their period of vegetation especially silking period connected with having for a long period of time food source for WCR adults. Till now the

possibilities of informing farmers about the risk of presence and importance of pest are limited and what is more important there are, in generally no funds to offer to the farmers with corn monoculture an alternative crop subsidized by state. The cost of controlling the pest is high and till now there are no registered pesticides for larvae or adults. Till the present it wasn't done a large and scientific Risk Assessment Analysis in Romania.

Activities were carried out under the FAO GTFS/RER/017/ITA project

DO WCR ADULTS FLY TO AIRPORT LIGHT SOURCES

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The attractant of light on airports could be a possible reason for introduction of Western corn rootworm (WCR) by airplanes in non-infested areas in Western Europe. Therefore the following different light sources, which are common on airports in Europe, are tested also in combinations with two types of yellow sticky traps: Mercury Vapor light, Natrium High Pressure light, Metal Halogen light and the last one in combination with Multigard trap and Pherocon AM no bait trap. All light sources were of 400 W bulb or strip lights.

The five light traps were established on a grassy farm about 200 meters from a continuous maize field. No other continous maize fields were in the neighborhood of the test place. Along the edge of a poplar plantation five light sources were established about 40 m from each other. All light sources were fixed to a wood pole at 4, 7 m above ground. The trap consists of a bulb (light source), a cover metal plate above the bulb, a funnel under the bulb ending in a sampling container to collect insects. An insect killing chemical is generally added into the container.

WCR density on the nearby continuous maize field was measured by Pherocon AM traps from 11 July to 02 September 2004 while light trapping was conducted from 14 July to 02 September 2004. All traps in maize stand and under the light sources were checked in each 3 days.

The WCR density on the nearby third year maize field was pretty high. The peak density was 27,6 adults/trap/day over 3 days. This density exceeds the economic threshold in USA corn belt for next year economic larval damage (5 adults/trap/day over a period of 7 days, thus 35 adults/trap/week). Our light traps and yellow sticky traps under light source did capture very few WCR adults. In 3 light traps, there were captures between 20-22 and 23-25 July a total of 23 and 3 females only. In yellow sticky traps under light sources the captures were also very low. A total of 11 adults were sampled by two traps in 7 occasions.

WCR adults did not orient themselves to 400 W different light sources from a distance of 200 meters or above. First results indicate that light sources on airports are not very attractive for the WCR beetles.

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POPULATION GENETIC STUDIES OF *DIABROTICA VIRGIFERA VIRGIFERA* IN THE USA AND EUROPE

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An attractive method of controlling *Diabrotica virgifera virgifera* is crop rotation. However, in east-central Illinois, rotating maize with soybean has become increasingly ineffective. It is generally thought that this is due to adaptation of *D. virgifera virgifera* to crop rotation. A study of selectively neutral genetic variation was made to test the hypothesis of reproductive isolation between rotation resistant and susceptible beetles. Samples collected from east-central Illinois were compared to samples from locations where crop rotation is still effective. Further comparisons were made between samples collected from maize and soybean within east-central Illinois. This study did not show evidence of neutral genetic differentiation between rotation resistant and susceptible samples, or between samples from maize and soybean within the area of rotation failure. This result can be interpreted as an absence of reproductive isolation between rotation resistant and susceptible individuals.

An ongoing study is concerned with the *D. virgifera virgifera* populations currently invading Europe. It aims to elucidate details of the demography and history of the invasion process.

RECRUITMENT OF ENTOMOPATHOGENIC NEMATODES BY INSECT-DAMAGED MAIZE ROOTS

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Plants under attack by arthropod herbivores often employ a strategy of indirect defence, emitting volatile compounds from their leaves to attract natural enemies of the herbivores. Herbivore-damaged plant roots may employ a similar strategy by attracting entomophatogenic nematodes. Here we report on the first identification of a belowground indirect defence signal, (*E*)-β-caryophyllene. This sesquiterpene was found to be released by maize roots following attack by larvae of the beetle *Diabrotica virgifera virgifera*, an important pest of maize that is currently invading Europe. (*E*)-β-Caryophyllene strongly attracted the nematode *Heterorhabditis megidis* in a belowground olfactometer. Curiously, *Diabrotica* attack does not induce the release of (*E*)-β-caryophyllene in most North American maize lines, whereas European lines and the wild maize ancestor, teosinte, readily emit the signal in response to an attack. This difference was consistent with dramatic differences in the attractiveness of representative lines observed in the laboratory. Subsequent field experiments showed a 5-fold higher nematode infection rate on a maize variety that produces the signal as compared to a variety that does not, whereas spiking the soil near the latter variety with authentic (*E*)-β-caryophyllene resulted in a more than 2-fold reduction in emergence of adult *Diabrotica*. The ability to emit (*E*)-β-caryophyllene is likely to have been lost during breeding of North American maize lines. Development of new varieties that release the attractant in adequate

amounts should help to enhance the efficacy of nematodes as biological control agents against root pest like *Diabrotica*.

HOW TO MARK ADULT WESTERN CORN ROOTWORMS FOR FIELD DISPERSAL STUDIES?

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The Western Corn Rootworm, *Diabrotica virgifera virgifera* LECONTE (Coleoptera: Chrysomelidae), is rapidly invading European maize production areas. For field studies on its movements, a long-lasting, cheap and easy mass - marking technique with different colours was missing. Therefore, the suitability of fourteen fluorescent powders for mass - marking the adults was studied in laboratory and in field cages in Hungary. The visual discrimination of each colour on the beetles was investigated under UV light, as well as their marking retention time and influences of those colours on beetle survival under laboratory conditions, i.e. 40 replicates per colour and control and tests lasting for 30 days. The most promising powders were also investigated for marking retention time on 50 beetles in each of four field cages per colour over 30 days. The flight take – off response of marked beetles was studied in 70 replicates per colour and control under laboratory conditions.
The two best recognisable orange colours (i.e. of Radiant Color BE and of Fiesta Colours Swada UK) were proposed for field experiments in first priority, followed by an orange and a yellow (both Magruder Color USA), another yellow (Fiesta Colour) and a pink (Radiant Color), as all did not affect beetle survival and flight take - off response and were recognisable under UV light for at least 10 days in the field. For mass - releases with differently marked beetles, only the use of a single orange colour and a single yellow colour or the use of a single pink and a single yellow colour can be proposed since even few spots can clearly be discriminated between each other.

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INTERACTIONS BETWEEN PLANT COLONIZING SOIL MICRO ORGANISMS AND THE INVASIVE MAIZE PEST *Diabrotica virgifera virgifera*

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Interactions with other organisms play a major role in biological invasions. These are often regarded as responsible for the success of an invasive species as well as for a possiblefailure in establishment. Invasive plants, which leave their pathogens behind often fare better in the area they invade. Therefore an increased competitive ability facilitates the invasion process. A similar pattern could also be observed for invasive mammals, which escape their parasites during the invasion.

The western corn rootworm *Diabrotica virgifera virgifera* LECONTE (Coleoptera, Chrysomelidae) is not regarded as a serious pest in its area of origin Mexico and Central America compared to the maize production areas in the USA or Europe. Considering the different agricultural production systems, one major difference is the constant application of herbicides and fungicides in the high input production systems in the USA and Europe. This constant use of agrochemicals reduced the abundance and diversity of plant colonizing fungi in the soil over time. The colonisation of plants by fungi is known to heavily affect the performance of herbivorous insects feeding on them. Mycorrhiza, other endophytic fungi or pathogens alter dramatically the host plant quality and may even directly influence herbivore performance. We hypothesise that a reduction of multitrophic interactions could be important factor responsible for the success of *D. v. virgifera* in the USA and in Europe.

The presented study evaluates the impact of three different functional groups of fungi (symbionts, endophytes and pathogens) on the host plant maize and on the performance of *D. v. virgifera* larvae. Larval growth, the amount of feeding and a set of biochemical parameters were measured. A food conversion efficiency index was calculated to relate these measures to host plant quality.

Results of the interactions between fungi tested and *D. v. virgifera* larvae via the host plant maize indicate a strong impact of the fungi on the herbivore. Growth as well as feeding was significantly different between treatments as well as compared to the controls. Survival of larvae was influenced as well by the plant-colonizing fungi. These findings will be discussed in relation to changes in some biochemical parameters.

IMPACT OF CROPS AND THEIR PHENOLOGY ON WCR EGG LAYING

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The efficiency of crop rotations as WCR control is linked to maize preference for egg laying and root larval feeding the following year. The rotation of maize with soybean in Illinois which does not work any more and the diversity of landscape in Europe which can play a role in the insect crop preference for egg laying, orientated our research towards a better understanding of egg laying and particularly of plant stimuli.

In laboratory with WCR adults collected in maize stands in Hungarian we already showed the egg laying stimulant effect of maize leaf surface washings. Vegetative phenological stage (V8) was much less egg laying stimulant than the reproductive ones (R3, R4). Primary metabolites: soluble carbohydrates, sugar alcohols and free amino acids discriminated the maize phenologies in the same way as insect preference for egg laying. We hypothesised they could be used as parameters for prediction of egg laying stimulation of different crops.

Experiments of rotations with maize in Hungary in 2001 and 2002 permitted to compare the efficiencies of several crops like soybean, sunflower, cereals to continuous maize. Presence of adults in the crops throughout the season in 2001 evaluated by catches with Pherocon AM traps and in emergence in cages in 2002 in maize cultivated after all the crops were registered. The ratio between these two parameters “egg laying ratio” gives us an egg laying “coefficient” of the different crops in 2001. In parallel these crop plants and hybrids were

cultivated in 2002 in Versailles to collect water leaf surface washings and to analyse primary metabolites.

On the whole growing season adult presence in crops in 2001 and emergence of WCR in 2002 in maize are correlated (r^2=0.91). Proportions and quantities of the primary metabolites present on leaf surfaces discriminate the crops and phenologies in the same way as WCR for egg laying in the field trials (PCA analyse = Principal Component Analyse). In the increasing order of egg laying preference, crops were ranged as sunflower (69-70), winter wheat (22-23), soybean 76, soybean 80, maize VT, maize R3 and maize R4.Thus our first results in laboratory are verified in field trials. PCA analyses show the impact of metabolite blends on the egg laying. Proportions of alanine to free amino acids (r^2= 0.91) and myo-inositol to sugar alcohols (r^2=0.86) were correlated with the "egg laying ratio". Whereas the effect of blends and particular metabolites within the blend, we observed also a correlation between the "egg laying ratio" and quantities of proline (r^2=0.95).

As Hollister et al 1999 for WCR pollen phagostimulation, we identify free amino acids more than carbohydrates as dominant cues for egg laying and the alanine activity within a metabolite blend. Does the insect lay eggs where it is the most stimulated for feeding? Would WCR adult select host for egg laying according to cues linked to plant nitrogen metabolism to which larvae are adapted (Moeser and Vidal 2004)? Is alanineactivity which is known as an agonist of cucs from the *Cucurbitaceae* a result of a long term WCR host plant co-evolution?

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FIRST RESULTS OF APPLICATION OF *Beauveria bassiana* (BALSAMO) VUILLEMIN FOR WCR LARVAE CONTROL IN SERBIA AND MONTENEGRO AND SLOVAK REPUBLIC IN 2004

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Taking into consideration the fact that main damages on maize are caused by larvae of *Diabrotica virgifera virgifera* LECONTE and that they live in the soil which represent a complex system composed of organic and inorganic components, biological control is necessary especially in the larval stage. In the frame of the bilateral project testing the efficacy of the entomopathogenic fungus *Baeuveria bassiana* in Western Corn Rootworm (WCR) larvae control, the trials were performed using the inoculum of *B. Bassiana* (originated from the caterpillar of *Ostrinia nubilalis* HBN.) in Zemun Polje (ZP), Serbia and Montenegro (USM) and the location in Želiezovce, Slovak Republic (SR).
In USM, a small scale trial was conducted in ZP. The trials encompassed four hybrids (three for grain production and one sweet maize), in six treatments, four dosages of inoculum (T1 with one, T2 with two, T3 with three inoculated grain of oats placed in each hill), one untreated check T4 and control with insecticide T5 and seed treatment with inoculum of *B .bassiana T6*. The second trial conducted in SR was a large scale trial with one maize hybrid for grain production in three treatments. The trials were set up in the fields where maize was a previous crop. Sowing was done by hand, i.e. a sowing machine in USM and SR, respectively. The following data were registered: number of plants per square unit, plant lodging, and grain yield with 14% of moisture. The results from ZP were analysed for the hybrid ZP 434, which is according to longevity of vegetation the closest to the hybrid used in SR.

The results were obtained in one year, but in two different agro-ecological conditions. Taking into consideration the results from both sites, they are analogue and could be stated promising. Before discussion of the results it is necessary to point out that they were obtained under a higher amount of precipitation in ZP in comparison to the long term average. Similar conditions were in SR. According to the results of number of plants obtained in ZP there were significant differences among the treatments as well as among the replications. The reasons are probably other biotic factors, which were not matter of our investigations.
Absence of plant lodging in one year of maize continuous cropping indicate the presumption that it was a low level of larval population, what was the case in two-year and in long-term maize continuous cropping where plant lodging was sporadic.
Grain yield over the treatments in ZP, average for all three grain hybrids ranged from 10.607 t ha^{-1} (T1), to 11.974 t ha^{-1} (T3). The following table presents and discusses results obtained in ZP; treatments T4, T5 and T6, which are the equal to the treatments used in Želiezovce.

Plant stand and yield response to the application of *B. bassiana* inoculum in 2004

Criterion	Number of plants [ha^{-1}]				Grain yield [t ha^{-1}] (14% moisture)			
Treatments	ZP	Zel.	Aver	Index	ZP	Zel.	Aver	Index
Check	50.505	54.333	52.419	100.0	10.463	9.558	10.010	100.0
Insecticide	45.545	59.333	52.439	100.0	11.675	10.582	11.128	111.2
B. BASSIANA	47.799	58.333	53.066	101.2	11.497	10.810	11.154	111.4

The results on number of plants in the untreated check indicate that damages caused by soil pests were not significant. In ZP, the highest number of plants was recorded in the untreated check, followed by *B. bassiana* and the smallest in the treatment with the insecticide. In SR, the smallest number of plants was registered in the untreated check. Grain yield in treated treatments was higher by 11.12% and 11.14% than the check, respectively. If plant lodging had occurred in the check treatment the differences would have been more promising. Investigations will be continued in 2005 using the inoculum of *B. bassiana* originated from *Diabrotica*.

WHEATHER CONDITIONS INFLUENCE AT WESTERN CORN ROOTWORM SPREADING IN BOSNIA AND HERZEGOVINA

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Western Corn Rootworm is registered in B&H for first time 1997 and until the end of 2004 it is spread almost on a half of B&H territory. We estimate that 90-95% fields under corn are infested by WCR. WCR spreading has been different during different years. This pest is noted first time on north-east part of B&H. It had faster spreading in north B&H (flat ground) then in other parts (hills and mountains, smaller areas under corn) of B&H. In the beginning WCR spreading depended of weather condition as well as of corn cultivation practice- monoculture. Monoculture is main factor for increasing of population density in B&H and less important factor for WCR spreading in future. Weather condition had great influence on WCR spreading in the beginning but pest almost adapted here and weather condition have less and less influence every next year. For example: drought period 2000 cut WCR population almost for a half but 2003 drought period had less influence on WCR population. WCR spreading during

2001 and 2004, when weather conditions were almost the same, were different. We noted higher spreading during 2004 and spreading was especially high in areas with smaller corn production. It also indicates good pest adaptation on local weather conditions and also different feeding plants.

Opinions about different weather conditions influence on WCR spreading and population density are different now then 2000. Our monitoring showed WCR good adaptation on B&H climate and weather condition so they have no too big influence on further pest spreading and population density. It also showed that geographical position of B&H and all natural barricades (hills, mountains, isolated locations) have no to much influence on WCR spreading.

Activities were carried out under the FAO GTFS/RER/017/ITA Project.

THE PRESENCE OF *Diabrotica virgifera virgifera* LECONTE IN ITALY IN 2004: DISTRIBUTION AND POPULATION LEVELS

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In 2004 the monitoring of *Diabrotica virgifera virgifera* (WCR) was done continuing the implementation of a common protocol. In areas where WCR had not been detected yet pheromone traps (mainly PAL) were placed out almost exclusively in monoculture fields selected in sites at increasing distances from already infested areas or in potential introduction areas. In infested areas Pherocon AM yellow sticky traps were also placed out preferably in monoculture maize fields where planting continuous maize was permitted. 3611 pheromone traps were placed in Italy, more than 4500 sticky traps were deployed in Lombardia.

Presence. Restricted focus areas where a containment-eradication program based on prohibition of maize monoculture and/or treatments against the adults was implemented: in *Veneto* only 1 specimen was captured in the focus area; in *Pordenone* (Friuli) 11 beetles were captured in the initial focus area and 67 in monocolture fields of the close safe area; 2 beetles were captured some kms far from the focus area so that a new focus area (2500 ha) was individuated. Largely infested areas: *Lombardia*: all the cultivated land may be considered infested. In the area where an economic population was detected in 2002 continuous corn planting was permitted only after 15th June. In all the municipalities around it, monoculture was permitted in half of the fields which had been planted with maize in 2003. No prohibitions were implemented in the rest of the region. Along the boundary with Veneto a network of pheromone traps was deployed and treatments against the adults were applied. Despite this, the first three focus areas were detected in the western part of Veneto. *Piemonte*: no specific

containment strategies were implemented. Infested cultivated area increased by 2700 ha. Other regions: in *Emilia Romagna* monoculture was permitted only in half of the fields of each farm and treatments against the adults were made compulsory where maize was planted after maize. The presence of WCR is still restricted to the areas of Parma and Piacenza provinces close to the border with Lombardia. In *Trentino* WCR is still restricted to Chiese valley, while in the north eastern Italy, the pest proved to be present in a much larger area of the provinces of *Udine* and *Gorizia* than expected from records of 2003 (35.000 ha). No beetles were captured in the other regions

Population levels: actually, no economic populations were observed. Few fields showing sporadic lodging symptoms were found in north western Lombardy and in eastern Piemonte (0,5 ha).
Negligible peaks of male captures were recorded in *Veneto, Emilia Romagna, Trentino*. In *Friuli* the maximum population peak decreased from *75* to 20 males/ PAL trap/day (Udine Province). In *Lombardia* even in first infested areas maximum population levels decreased from 200 WCR males/ PAL trap/day to less than 30. Findings over 5 beetles/sticky trap/day were rarely recorded. In *Piemonte:* conspicuous populations were detected only in the Eastern part; on Pal the maximum peak population was over 40 males/trap/day while yellow sticky traps captured significant numbers of beetles but they were below 5 beetles/sticky trap/day.

CURRENT STATUS OF WESTERN CORN ROOTWORM IN HUNGARY IN 2004

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In the past few years Western Corn Rootworm (WCR) (*Diabrotica virgifera virgifera* LeConte), originating from North-America has spectacularly quickly spread in various countries of the European Union. This species has become a major pest of maize also in Central Europe.
Similarly to the previous years, nation-wide survey had been carried out for monitoring the new spread, the adult population, and larval damage of WCR by the entomologists, forecasting specialists and plant protection inspectors of the plant protection and soil conservation county services.

Scout trapping for further spreading of WCR. Based on the monitoring data of 2003, trapping with pheromone traps continued in 2004 at 8 locations of 4 counties where the beetle has not been recorded.

Permanent trapping for following development of WCR population. In addition to the previous observations, we estimated the populations of WCR in 21 infested fields of 19 counties with Csalomon® pheromone traps and Pherocon® AM yellow sticky traps. The traps were operated from 13 June to harvesting, with checking of the catches at 10-day intervals and changing the traps every 30 days.

In the frame of a cooperation between Austria, Hungary and Slovakia, 12 traps were set in counties Győr-Moson-Sopron and Vas.
Assessment of larval damage. From 1997, in every June, thus also in 2004, we assessed larval damage especially in continuous maize. We determined the severity of the injuries – in 46556 hectares of the 14 counties with the longest history of WCR infestation, on about 5% of all the maize fields – using Hills-Peters's scale on root damage.
In 2004, the first larvae were observed on 2 June in the southern counties of Hungary, but in 2003 the first larva was found earlier, on 27 May. Calculating the effective degree-days, we expected hatching of larvae from last decade of May. In 2004 flight of the beetles started on 27 June. In 2003 it was also earlier, on 16 June. Seasonal flight of the pest was intensive in August, but in 2003 the peak of flight was in late June – the first part of July. The average beetle catches of both types of traps was less than in 2003.

During the representative survey for root damage in 2004, root injuries were recorded in 6750 hectares. It was less than in 2003. Throughout the country the area affected by larvae was estimated to 75150 hectares, out of which plant lodging was observed in about 10350 hectares.

In the previous years more and more growers applied the crop rotation. In continuous maize they carried out treatments on several thousands of hectares by soil treatment together with sowing, or by in-crop aerial application of insecticides to control the beetles.

HOW TO WORK WITH STAKEHOLDERS FOR DEVELOPING AND IMPLEMENTING IPM IN MAIZE?

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The FAO GTFS project aims to develop IPM in maize production with involvement of local stakeholders. Most important stakeholders are: (1) the farmers, i.e. small farmers, family farmers, agricultural enterprises, (2) village communities, (3) local agricultural education systems, such as agricultural secondary schools, (4) farmer associations and (5) IPM experts in extension services and University staff researchers.
First, village communities and farmers were approached for pilot training activities in farmer field schools (FFS) in 2002, 2003. The aim of this activity was to increase farmer knowledge on IPM in their local agro-ecosystem and to train them to work with new, so called participatory methods, where farmers had responsibility in their activities. Second, agricultural secondary schools and farmer associations were involved in such training activities in 2003. During the training over the entire maize growing season, many questions on IPM had been raised by the participating stakeholders, and many could not be answered in group discussions. Thus, experts, .e.g. from universities or extensions services were invited to provide their knowledge, usually by giving formal and/or participatory presentations. However, still several questions remained open or provided answers of experts were difficult to be adapted to local conditions. Therefore in 2004, participatory research was developed by farmers in the farmer field schools, with scientific support of researchers and local secondary schools.
An example: Participatory research in the village Kétegyháza in Hungary: Participating stakeholders and researchers aimed to investigate at local conditions. RWhat is the impact of different soil tillage systems on soil structure, soil biotic activity, weeds and yield in commercial maize? What is the role of ecological compensation areas (field margins) in the

maize ecosystem? Is there any natural enemy which could influence population levels of Western Corn Rootworm (*Diabrotica v. virgifera* LeConte)?

Data collection and evaluation was carried out jointly by farmers, researchers and other stakeholders during the maize growing season. Some of the results were new for researchers as well as for farmers. However some new results and information were not easily adaptable to daily farming practices.
Based on first experiences, the success of participatory research depends on whether the aims of the joint research are clear and important for each participating stakeholder.
Supported by the FAO GTFS/RER017/ITA project

INVOLVING AGRICULTURAL SECONDARY SCHOOLS IN IPM DEVELOPMENT

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IPM, as a concept or method, has existed in B&H for more years. Its introduction and usage is slow and began few years ago.
In fact all IPM activities started as part of FAO Project GTFS/RER/017/ITA „Integrated Pest Management of Western Corn Rootworm in Central and Eastern Europe“ in the beginning of 2003. Main activities are concentrated on WCR problem solving trough IPM. These activities started 2002 and go on during 2003 and 2004. We included pupils (only these pupils who have had interest) from secondary schools in these activities during 2004. There were 47 pupils from three secondary schools. Our main goal was to educate these pupils about IPM and WCR and also give them knowledge that they should transfer to members of their families and neighbours. This method of education showed good results and we succeeded to educate more farmers then trough FFS during previous years.

Also we initiated some changes in schools programs. Schools staffs and teachers saw all IPM advantages in plant protection of pests, weeds and different diseases. Pupils got trough our activities chance for practical work on field, for work with farmers what arise their chance for further education.

At the end pupils concluded (and convinced themselves) that IPM is not a static and unchangeable method given once for all times. They could change and improve IPM on base of their own experiences. And also trough IPM they could protect nature, natural pests of enemies and competitors as much as possible. We are going to continue program of secondary schools including in IPM development in B&H. We are going to include 2-3 new schools and improve our work with pupils during next corn season.
Activities were carried out under the FAO GTFS/RER/017/ITA Project.

RISK ASSESSMENT FOR WESTERN CORN ROOTWORM IN INFESTED AREAS IN 2004

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Under the framework of the FAO GTFS/RER/017/ITA project WCR risk assessment activities were conducted at four levels (country, regional, village and field level ones) in seven participating countries in 2004. The purpose of the activities was to:
- develop field based methodology and indicators to asses WCR population level and potential risk to crop in current season and in the following year;
- make appropriate decisions in specific locations for further IPM development with farmers and
- contribute to WCR risk assessment at larger scale.

Country and regional levels were focusing to collect data on corn production area, ratio of continuous corn in different regions in all countries. WCR population density data were collected at permanent monitoring sites and were compared with previous year data in order to assess population changes. Based on this, the spread area, economic adult population area and the larval economic damage area were estimated.

Economic adult population activity was registered on approximately 530.000 ha of corn fields in all seven infested countries. Economic larval damages were observed on approximately 51.800 ha of continuous corn. Regions with higher and lower risk were determined in some countries.

Village and field level risk assessment activities were conducted through activities with farmers in 52 FFS groups in all seven countries. Field and village level risk assessment was based on two sampling methods: Pherocon AM trapping and visual counting on 182 farmers fields. As economic threshold level the daily catch of 6 beetles/Pherocon AM trap/day or 1 beetle per plant (visual checking) were considered. For village level risk assessment, farmer's data about corn production area and continuous corn area were collected also. On FFS meetings, farmers draw village map and marked the fields with high WCR adult population. They determined the fields and the areas which were at risk in the case if continuous corn will be planted. Farmers improved their ability to conduct their own risk assessment on their fields and showed high interest in this kind of activities. Risk assessment will be conducted in 2005 at region, village and field level. 2004 year WCR population density data will be correlated to 2005 year larval activity on continuous corn fields.

Activities were carried out under the FAO GTFS/RER/017/ITA project.

IPM PRACTICES IN MAIZE: THE SPANISH CASE

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Maize is the main summer cereal in Spain. It covers 500,000 ha, being the third country in Europe after France and Italy, and it is devoted mainly to grain production for livestock feeding.

The Mediterranean corn borer *Sesamia nonagrioides* LEFÈBVRE (Lepidoptera: Noctuidae) and the European corn borer *Ostrinia nubilalis* HÜBNER (Lepidoptera: Crambidae) are the most damaging maize pests in Spain. However, other secondary pests can cause occasionally economic damages: aphids (Homoptera: Aphididae), mainly *Rhopalosiphum padi* L., *Metopolophium dirhodum* WALKER and *Sitobion avenae* F.; the leafhopper *Zyginidia scutellaris* HERRICH-SCHÄFER (Homoptera: Cicadellidae); the cutworm *Agrotis segetum* DENIS & SCHIFFEMÜLLER (Lepidoptera: Noctuidae); the wireworm *Agriotes lineatus* L. (Coleoptera: Elateridae) and the two-spotted spider mite *Tetranychus urticae* KOCH (Prostigmata: Tatranychidae). The western corn rootworm *Diabrotica virgifera virgifera* LECONTE (Coleoptera: Chrysomelidae) has not been reported.

Pest control strategies must evaluate the risk of economic damage for the k-pests, target them and minimize the effects on maize biocenosis. Many aspects of the IPM for corn borers have been studied, as well as the control strategies against the secondary pests.
The highest risk of damage by corn borers occurs from July in advance. Chemical, biological, behaviour interference, cultural and resistance methods are theoretically useful against corn borers, but some of them have technical and economic problems to be applied in Spanish crop conditions. Chemical control is rather low effective, especially for *S. nonagrioides*, and may cause outbreaks of secondary pests as aphids or mites. The usefulness of biological control against *O. nubilalis* has been proved using T*richogramma brassicae* (BEZDENKO) (Hymenoptera: Thrichogrammatidae) but it is too expensive. As eggs or larvae of *S. nonagrioides* cannot be effectively controlled by parasitoids, other control methods have been evaluated. Mating disruption of *S. nonagrioides* using sprayable formulations of pheromone is more efficient than insecticides and it is compatible with biological control. Sowing date also affect the impact of *S. nonagrioides* and delaying it may avoid the first generation attack, which is more damaging in maize monoculture, and reduce aphid incidence. Recently, several commercial varieties of genetically modified maize that incorporate the insecticidal capacity of *Bacillus thuringiensis* Berliner toxins (Bt maize) have been proved to be effective against corn borers. The effects of this emerging technology on non-target arthropods have been investigated and no negative effects on aphids, leafhoppers, soil pests and on the main predatory groups have been found, suggesting that Bt maize is compatible with the naturally occurring predators and that it can be incorporated in IPM programmes.

Damage risks of soil pests and sucking insects occur mainly during the first half of the maize crop cycle. The most widely and usual control method against them is the seed treatment with imidacloprid. This method is effective for aphids and leafhoppers and may also control cutworms and wireworms. However, cultural practices (ploughing and crop rotation) are, probably, the most effective control method for soil pests. It has also been found that the imidacloprid may increase the incidence of *O. nubilalis* as a result of the reduction of heteropteran predators.

AN IPM APPROACH AGAINST THE WIREWORMS IN MAIZE FIELDS: CURRENT POSSIBILITIES IN EUROPE

Lorenzo **FURLAN**

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Wireworms are larvae belonging mainly to the family Elateridae. From a practical point of view, in most cases the larvae belong to the genus *Agriotes*. They are polyphagous and harmful to many important crops in all European regions. Maize is one of the sensitive crops to wireworm attacks. Currently the main knowledge needed to implement an IPM strategy in maize fields has been made available: a) taxonomic criteria for species determination; b) biology and ecology of some key species; c) methods to predict population density; d) economic thresholds; e) effectiveness of different control strategies.

b) The Agriotes species can be divided into two main groups:
1) species with adults which do not overwinter, live a few days and lay eggs a few days after swarming: *Agriotes ustulatus* Schäller, *Agriotes litigiosus* Rossi*, Synaptus filiformis* F.; the larvae belonging to these species mainly attack the seeds and the first internode;
2) species with adults which overwinter and live for months laying eggs months after adult hardening and for a long period: *Agriotes sordidus* Illiger, *Agriotes brevis* Candeze, *Agriotes lineatus* L., *Agriotes sputator* L., *Agriotes obscurus* L., *Agriotes rufipalpis* Brullè, *Agriotes proximus* Schwarz.; the larvae belonging to these species attack also the stem just above or on the crown node and may damage maize plants also late in the season.
As to the ecology crop rotation and availability of food resources throughout the season, the organic matter content of the soil are the main factors influencing the larval population density. The presence of meadows and double crops in the rotation causes an increase of the populations of the species belonging to the group 2.
c) A a newly developed ground sex pheromone trap (YATLORf), suitable for monitoring, at the same time, all the *Agriotes* species and WCR populations has been developed. It may be possible to get reliable information about the presence of soil pest population by using only one simple and inexpensive tool.
d) Thresholds expressed as number of beetles captured by sex pheromone traps are under study. First promising data will be presented. Thresholds expressed as number of larvae per sq and as number of larvae caught by bait traps have already been found for *Agriotes brevis*, *A. sordidus, A. ustulatus* in Italy. The *Agriotes* species showed a different response to the bait traps (e.g.: the threshold for *A.ustulatus* is 3-4 times higher than *A. brevis)*. The thresholds have also to be referred to the crop sowing period.
e) where economic wireworm populations have been found and there is no possibility of moving the sensitive crop to other non-infested fields, different protection options may be considered. The chemical approach has been largely implemented all over the world causing also severe side effects. Unfortunately, biological, effective, practical and low cost strategies suitable for protecting sensitive crops from wireworms attacks in these fields have been lacking so far. Currently biocidal plants and meals and *Metharizium* spores are promising.

Finally an overall rational IPM strategy based on the knowledge reported above will be presented.

DEVELOPMENT AND FEASIBILITY OF IPM FOR WCR IN EUROPE

Jozsef **KISS**[1], Jasminka **IGR-BARCIC**[2], Ivan **SIVCEV**[3], Ludovit **CAGAN**[4], Nedžad **KARIC**[5], Ioan **ROSCA**[6] and Ivanka **IVANOVA**[7]

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Significant bulk of new knowledge on WCR (*Diabrotica virgifera virgifera* LeConte) has been created by scientific communities in the past twelve years in Europe, who have been recently working in close collaboration with farmer communities in the most affected countries. It is the right time to overview available knowledge, control options and to identify gaps and necessary future tasks for managing WCR populations. Ongoing FAO GTFS project (Development of IPM for WCR in Central and Eastern Europe) and other regional or national activities allow us to outline the development and feasibility of IPM for WCR under Integrated Plant Production or Integrated Farming.

Few knowledge is available in Europe on the possible application of biocontrol agents against WCR. This R&D topic surely will be an emerging one in coming years. Maize ecosystem is well researched and documented in many countries in Europe. Place of a new herbivore (WCR) in arthropod food web and the impact of natural regulating mechanisms and its elements (predators, parasitoids) on WCR population in local maize ecosystems requires special attention from researchers. Apparently, population build up of WCR in many areas in Europe will provide us the suitable background for finding new ways of better WCR population management. IPM is always implemented in a system over years and over larger areas instead of single fields or in single year. This system may be a farm (as functional unit) or cluster of fields in a local community. Percentage of arable land, of continuous maize within a system is a key source of subsequent year WCR population. Therefore, this factor should be considered in WCR risk assessment and decision making for control and management options. Integrated Farming guidelines are phrasing obligatory rotation of maize in many countries. However, entire rotation of maize fields is not an economically viable option for rural communities in several regions in Europe. In these areas, application of bio-pesticides, conduction of risk assessment for WCR should be tested and verified as manageable approach. Local/regional/national regulations should inspire farmers and support long term viable management of WCR. The presentation will demonstrate cases for some areas of IPM development.

Activities were carried out under the FAO GTFS/RER/017/ITA project

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IWGO MATTER

THE XIth *Diabrotica* SUBGROUP MEETING IN BRATISLAVA; FEBRUARY 14-17, 2005

The 11th Meeting of the IWGO Diabrotica Subgroup took place in Bratislava, Slovak Republic, February 14-17, 2005 (just 10 days before summit of Bush and Putin in the same city). The meeting was excellently organized by Josef Kotleba and his team (Peter Sivicek, Ian Kolnik). Most of us stayed at SUZA, the guest house of the Ministry of Foreign Affairs of the Slovak Republic, where also the meeting took place.

C. Richard Edwards (as Diabrotica -Subgroup Convenor) Harald Berger (as IWGO Convenor) and Ian Smith (as EPPO Director General) welcomed the more than 80 participants from approximately 20 countries. The 11 th Diabrotica Subgroup meeting was opened by the State Secretary for Agriculture of Slovakia Mr. Marián Radošovský.

During the meeting, approximately 40 scientific papers and 20 posters of high scientific value were presented. (see abstracts page xx ff)

On the last day of the meeting, the group was invited to a reception by the Slovak Minister for Agriculture Mr. **Zsolt SIMON**. At this reception, EPPO Director General **Ian SMITH** was honoured with the Gold Medal of the ministry of Agriculture for his work in Plant Protection. The presentation ceremony was followed by a musical performance by young artists performing on the violin and a boys' choir.

A decision of the place of the next meeting was not made, but the meeting will most likely take place in fall 2006.

IWGO –NEWSLETTER XXVI / 1

During the last IWGO meeting in Bratislava, Slovak Republic, on February 14-17, 2005, a new IWGO Convenor was elected.
After having sought the council of long serving IWGO members from each participating country, it was determined that **Dr.Ulrich KUHLMANN**, CABI, Delemont, Switzerland, would be an excellent candidate for this position.

All responding IWGO colleagues supported the nomination of Dr. Kuhlmann as the Convenor and his name was put forth at the meeting in Bratislava. No other nominations were made and those in attendance unanimously elected him as the new Convenor. (see

In his first speech as the new Convenor, Dr. Kuhlmann thanked **Harald BERGER** for providing leadership for the group for more than twelve years. He announced his plans for the near future concerning meetings, research activities and the position of IWGO between/among other IOBC working groups, as well as, the EU, EPPO and FAO.

Harald Berger expressed in his last talk his sincere thanks to all participants and IWGO members for their excellent work and the high scientific value of their presentations through the 12 years of his convenor ship. He mentioned especially, that leading the group gave him the opportunity to gain a large number of good, as well as, personal friends, to which he will stay in contact after his retirement. He was glad that IWGO had a new convenor with such an excellent reputation and outstanding international contacts, which will be a great benefit to the membership.

HKB

IN THE FUTURE YOU WILL FIND ALL IWGO – MATTER ON

http://www.iwgo.org

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IWGO –NEWSLETTER XXVI / 1

EUROPEAN COMMISSION POLICY SUPPORT ACTION: BALANCED MANAGEMENT STRATEGY FOR *DIABROTICA* IN EUROPE

In the past few years the Western Corn Rootworm, *Diabrotica virgifera virgifera*, has invaded Central Europe more rapidly than expected. This rapid spread of *D. v. virgifera*, together with the establishment of continuous populations, will obviously cause severe problems in high-intensity maize production areas throughout Europe. Several research activities in the EU member states have aimed to design integrated strategies for reducing *Diabrotica* populations below threshold levels. There is an urgent need to harmonise and concentrate these activities, both on a scientific and administrative level, in order to establish a community-scale action and research plan. Thus, the goal of this Policy Support Action of the European Commission named DIABR-ACT is to establish a harmonised and sustainable control strategy for continuously established and discontinuously emerging *Diabrotica* populations. At the same time, DIABR-ACT aims to minimise the impact of these measures on biodiversity and the environment. Control strategies should be adapted to the situation of each country involved and should take into account the situation of the farmers and the economic restraints upon the maize crop. Biological and integrated control, plant resistance traits, the adaptation of biotechnological approaches and cultural techniques are among the control strategies that should be included. Furthermore, DIABR-ACT will evaluate short and long term costs/benefits of containment and eradication strategies at the micro or macroeconomic level (farms, regions, countries, Europe). A project proposal has been submitted to the European Commission at the end of January 2005. In case funding will be approved, ARVALIS in France and the Georg-August University at Goettingen in Germany will coordinate jointly this specific support action.

UK

NEW BOOK: ECOLOGY AND MANAGEMENT OF WESTERN CORN ROOTWORM

Western Corn Rootworm, *Diabrotica virgifera virgifera LeConte*, has been a major economic pest of maize in the Americas for many years. However, since the early 1990's it has become an increasing threat to maize in Europe and is expected to spread to all maize growing areas of the continent. In December 2004, CABI Publishing published a new book entitled “Western Corn Rootworm: Ecology and Management”, edited by Prof. Stefan Vidal, Georg-August University, Goettingen, Germany, Dr. Ulli Kuhlmann, CABI Bioscience, Delémont, Switzerland and Prof. C. Richard Edwards, Purdue University, W Lafayette, Indiana, USA. This book provides a comprehensive review of current knowledge on the biology and ecology of this insect pest and how it might be managed in order to limit its damage as it spreads into new agroecological areas. Cultural,

biotechnical and biological control measures are addressed, as are ecological baseline data such as population dynamics, economic thresholds and aspects of its behaviour. The book also examines the potential of applying the same plant protection techniques in Europe as those currently used in North America. CABI Publishing are offering a 20% discount (Special Discount Price: £52.00 or US$96.00): to obtain your discount simply quote reference JBZ20 when placing your order by phone, fax, email or via our online bookshop: www.cabi-publishing.org/bookshop; CABI Publishing, CAB International, Wallingford, Oxfordshire, OX10 8DE, UK. Tel: +44 1491 832111; Fax: +44 1491 829292; E-mail: orders@cabi.org

UK

NEW WESTERN CORN ROOTWORM PROJECT FUNDED BY CTI IN SWITZERLAND

In December 2004, Swiss research teams (Agroscope FAL Reckenholz, CABI Bioscience Switzerland, and the University of Neuchatel) were informed that their joint proposal entitled “Development of biological products for sustainable control of the Western Corn Rootworm, *Diabrotica v. virgifera*, an invasive maize pest in Europe” was accepted for funding through the Innovation Promotion Agency (CTI) at the Federal Office for Professional Education and Techology in Switzerland. The invasive maize insect pest, *Diabrotica virgifera virgifera*, is rapidly dispersing over Europe and thus, ecologically sound and economically competitive control strategies are urgently needed. This Swiss collaborative research team aims to develop two biological control products, consisting of nematodes and fungi, and to integrate biological methods in order to provide sustainable control strategies of *D. v. virgifera*. To optimise efficacy of nematodes, attraction to maize varieties will be tested and compatibility with transgenic *Bt* maize and insecticides will be evaluated. The companies involved will be the first to market these novel products in the Swiss and European markets.

UK

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NEW and On Sale through May 31, 2005!

Edited by Ulrich Kuhlmann, Joachim Moeser and Stefan Vidal

In economic terms, one of the most important pests of maize is the Western Corn Rootworm *Diabrotica virgifera virgifera,* a native of Central America. In the cornbelt of the USA, it has caused severe yield losses for decades. Now it is also spreading in Europe.

In a combination of fascinating macro sequences and 3D animations, this educational film impressively illustrates the life-cycle of this pest. The overwintering eggs start to hatch into larvae in late spring at about the time that the maize crop is in the 4 – 6 leaf stage of development. The larvae feed for 3 – 4 weeks on maize roots, during which time they pass through three instar stages. At maturity, the third larval instars turn into pupae, which are inactive for a week or two. The pupae then turn into adult beetles, which emerge from the soil about the time the maize begins to flower. The adult beetles feed on maize foliage, pollen, and silks. They can be active for up to 12 weeks, during which time they feed, mate and deposit their eggs.

***Video Clips:** To view video clips, you will need the Windows Media™ Player, a plugin available from Microsoft Corp. If it is already installed on your computer, click on the link to view the clip. If you don't have the Windows Media™ Player, please visit Microsoft to download.

MULTILINGUAL DVD: Languages available on this DVD: English, Croatian, French, German, Hungarian, Italian, Romanian, Russian, Serbian, Slovak.

Scientific advisors:
Dr. Ulrich Kuhlmann, Head Agricultural Pest Research, CABI Bioscience Switzerland Centre
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Written and directed by: Dr. Rolf P. Stumm with contributions by: Henk van der Maarel, and Hans-Helmut Petersen

Produced by: STUMM-FILM Dr. Rolf Stumm Medien GmbH

2005; DVD; Running time: 14:30 min.; ISBN 0-89054-331-3; Item No 43313

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IWGO –NEWSLETTER XXVI / 1

IWGO HISTORY

In order to give new and future participants and for the old ones a nostalgic look back at IWGO, I offer an overview of the history of IWGO in this last hard-copy-version of the NEWSLETTER. This final mailed-issue provides for a good opportunity to record the history of IWGO, its aims and its results, as well venues of meetings, subgroups and convenors.

The International Working Group on *Ostrinia* and other Maize Pests (IWGO) is probably one of the oldest Working Groups within Global IOBC is certainly. The group was started during an International Congress in Moscow in 1968, but the roots reach back to the USA regional project on *Ostrinia* already begun in 1951. IWGO was established through this USA regional project. The founders of the group were **D. HADZISTEVIC (**Yugoslavia**)**, who had the original idea of founding a group for international cooperation, **H.C. CHIANG (**USA**)**, who brought the ideas of the USA regional project into the group, **I.D. SHAPIRO** (Russia of the USSR), **T. PERJU** (Romania), **C. KANIA** (Poland) and **B. DOLINKA** (Hungary). All were well known researchers or maize - breeders.

The original idea of IWGO was to exchange inbred lines within the group and test these lines for resistance against the most important maize pest throughout the world, the European corn borer (ECB), *Ostrinia nubilalis* Hubner. The results of this breeding programm were to be made available to all member countries. Up to now, three synthetics resistant breeding lines to ECB have been developed and released (IWGO 1, 2, and 3, both late and early). Most of the results of this testing program were published earlier by IWGO. As the membership of the group increased, interests in other areas of ECB research expanded. A pheromone project was established by France (INRA). The influence of other pests of maize became more and more important over time and colleagues from Asia wanted to include problems with *Ostrina furnacalis* and southern European members brought research work concerning *Sesamia nonagroides* into the group. The appearance of *Diabrotica virgifera virgifera* in Europe (Serbia) in 1992 became a further matter of discussion within the group. This appearance was so important that even a subgroup within IWGO was founded in 1996. Additionally, *Elateridae* (wireworms) were a topic of discussion by several member countries. Subsequently, corn borer biology and host response were also studied. More recently biological control has been emphasized. Therefore, within the last several years IWGO has become more and more a working group on all maize pest problems. No longer are members just considering the exchanging of inbred lines for testing for resistance to the European corn borer.

The group has held 20 annual (since 1980 biannual) meetings in one of the member states (Table 1). Several publications have been released and some are still partly available. Since 1981 "IWGO - NEWSLETTER" has been published. This has been a way to link the members and to establish a permanent record of the activities of the working group, distribute information about the members, and to publish the abstracts of papers presented at the congresses. After several meetings proceedings of the papers presented were issued .

Prof. **H.C. CHIANG** was the first president (convenor) of the group and held this position until 1982. The group elected **P. ANGLADE** (Bordeaux, France) as the new president in 1982 and he served until 1992. Since than, **Harald K. BERGER** (Vienna, Austria) has been the convenor of this international group. Since the IWGO *Diabrotica* subgroup Meeting in Bratislava (February 2005) **Ulrich KUHLMANN** is elected convenor of IWGO. meeting As the group and the topics discussed and researched grew, the necessity of the nomination of Sub- or Co-Convenors) came up: and Prof. Dr. **Rich EDWARDS** became Convenor of the *Diabrotica* subgroup, which was established in 1996. This subgroup organized – due to the importance of the pest – annualy meetings since 1995.

IWGO, which became a Global-IOBC Working Group in the meantime, is now a well established large international working group which now deals with all matters of maize pests and pest resistance. The group is open to all scientists with interest in working within an international group (with familiar and personal contact among the members).

IWGO MEETINGS 1968 - 2001

1968 Creating of IWGO in Moscow by **H.C. CHIANG** (USA) **D. HADZISTEVIC** (Yugoslavia) **B. DOLINKA**(Hungary), **N. SHAPIRO** (Soviet Union), **A. PERJU** (Romania) and **C. KANIA** (Poland).
W.Faber (Austria), **M.Hudon** (Canada), **P. Anglade** (France) and **A**. **Monteagudo** (Spain), **R. Masler** (Czecho-Slovakia), **D. Zhou** (China), **J. Tsitsipis** (Greece) joined the group later in the year

Prof. **Huai C. CHIANG (USA)** 1st elected president of IWGO

1969 Ist meeting in Vienna, Austria
1970 IInd meeting in Zemun, Yugoslavia (Serbia)
1971 IIIrd. meeting in Bordeaux, France
1972 IVth meeting in Martonvasar, Hungary
1973 Vth meeting in Zagreb, Yugoslavia (Croatia)
1974 VIth meeting in St. Paul; Minnesota; USA
1975 VIIth meeting in Leningrad (St. Petersburg); Soviet Union (Russia)
1976 VIIIth meeting in Madrid , Spain
1977 IXth meeting in Wrozlaw, Poland
1978 Xth meeting in Bergamo, Italy
1980 XIth meeting in Vienna, Austria
1982 XIIth meeting in Pistany, CSSR (Slovak Republic)
Retirement of Prof. CHIANG; Election of **Pierre ANGLADE (F)** as new IWGO President
1984 XIIIth meeting in Colmar, France
1986 XIVth meeting in Beijing, China
1989 XVth meeting in Varna, Bulgaria
1991 XVIth meeting in Martonvasar, Hungary
1993 XVIIth meeting in Volos, Greece
1992 Retirement of P. ANGLADE; election of **Harald K. BERGER (A)** as IWGO President
1995 XVIIIth meeting in Turda, Romania

1997 XIXth meeting in Braga, Portugal
1999 XXth meeting in Adana, Turkey
2001 XXIth meeting in Venice, Italy
2005 Retirement of H. BERGER; election of **Ulrich KUHLMANN (D/CH)** as IWGO President

IWGO – Diabrotica Subgroup Meetings 1995 - 2005

1995 Ist IWGO-Diabrotica Workshop in Graz, Austria (March)
Election of Prof. **Richard EDWARDS (USA)** as IWGO *Diabrotica* Subgroup Convenor
1995 IInd IWGO - Diabrotica Workshop in Gödöllö; Hungary (Nov.)
1996 IIIrd IWGO - Diabrotica Workshop in Zagreb, Croatia, (Oct.)
1997 IVth Diabrotica Workshop in Gödöllö, Hungary
1998 Vth Diabrotica Workshop in Rogaska Slatina, Slovenia
1999 VIth Diabrotica Workshop in Paris, France
2000 VIIth Diabrotica Workshop in Stuttgart, Germany
2001 VIIIth Diabrotica Workshop in Venice, Italy
2002 IXth Diabrotica Workshop in Belgrade, Serbia
2004 Xth Diabrotica Workshop in Engelberg, Switzerland
2005 XIth Diabrotica Workshop in Bratislava, Slovak Republic

IWGO - PRESIDENTS / Convenors

1969 – 1982	Prof. Huai C. CHIANG
1982 – 1992	Pierre ANGLADE
1992 - 2005	Harald K. BERGER
2005 -	Ulrich KUHLMANN

IWGO - *Diabrotica* Subgroup Convenor

1995 -	Prof. Richard C. EDWARDS

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PHOTO - GALLERY FROM THE XIth IWGO
Diabrotica SUBGROUP - MEETING IN BRATISLAVA

Openening speaches by Edwards,
Kuhlmann, Berger (from left to right)

The meeting was opened by the State Secretary of the Ministry of Agriculture
Marian RADOSOVSKY

IWGO –NEWSLETTER XXVI / 1

Discussion during the meeting
(Renata Bazok and Jozsef Kiss)

The audience hall, where the meeting took place

The Slovakian Minister for Agriculture Mr. Zsolt SIMON and EPPO Dir. Gen. Ian SMITH after the Gold-Medal ceremony in the Concert hall

Attentive audience listening the music

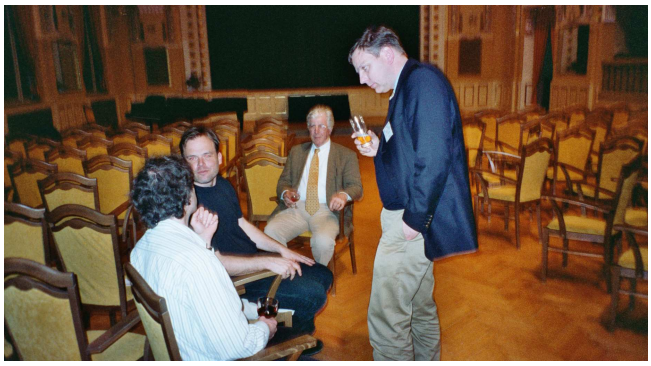
IWGO –NEWSLETTER XXVI / 1

Bratislava Boy's choir enjoyed the participants

Gen.Dir. Smith being awarded by the
Slovakian Agric. Minister Mr. Z. SIMON

GMO – what else ??
B. Tinland (Monsanto) & S. Lefko (Pioneer)

P. Baufeld (D) and J. Tsitsipis (GR) Diabrotica-Sub-Group participants from the very beginning



The new Convenor U. Kuhlmann chatting with Dr. Smith and colleagues