Organisation Internationale de
Lutte Biologique et Intégrée Contre les
Animaux et les Plantes Nuisibles (OILB)
www.iobc-global.org

International Organization for
Biological and Integrated Control of
Noxious Animals and Plants (IOBC)
www.iobc-global.org

IWGO

NEWSLETTER

VOLUME XXVI **SEMI-ANNUALLY**
NUMBER 2 **DECEMBER 2005**

<u>TABLE OF CONTENTS</u>: **PAGE**

<u>Editor & Publisher</u>
Dr. Ulrich KUHLMANN
CABI Bioscience Switzerland Centre
Rue des Grillons 1
CH – 2800 Delémont
SWITZERLAND
E - mail: u.kuhlmann@cabi.org
Home – page: WWW.IWGO.ORG

IWGO –NEWSLETTER XXVI / 2

EDITORIAL

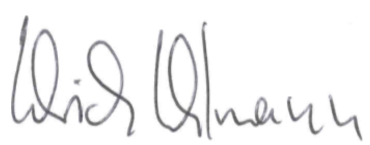
Dear Colleagues, Dear IWGO –Members

Time is running ……but here is the second IWGO Newsletter 2005 (Number 2 Volume XXVI, December 2005)! As mentioned already in the last issue, the IWGO Newsletter will from now onwards only available as a PDF file, which saves the IWGO Convenor quite some money, which he would not have available for postal fees anyway! In the future you will be able to download the Newsletter from our webpage www.iwgo.org, where you could find also other older issues of the IWGO Newsletter as a PDF file. In addition, the IWGO Newsletter will be sent to a large number of active IWGO members as an e-mail attachment for your convenience.

After having published the list of participants and the abstracts of the talks presented during the most recent IWGO *Diabrotica* Subgroup Meeting in Bratislava, Slovak Republic, 14-17 Feb 2005, you will find the abstracts of the poster presentation in this issue. In addition, please find news related to IWGO matters and some more contributions from our IWGO members Prof. C. Richard Edwards, Prof. Jozsef Kiss and Dr. Sylvia Fernandez. These IWGO Newsletter contributions are very much appreciated and I am looking forward to receive more contributions in the near future.

Finally, I would like to make sure that you please reserve the 5 to 8 November 2006 in your agenda as our next “big” 22nd IWGO Conference will be held in Vienna, Austria. This conference is the continuation of a series of international meetings on *Ostrinia* and other maize pests that began in 1968. The intent of these IWGO conferences is to create a meeting for practitioners, a forum for information exchange, an event to build cohesion among the research community and to foster discussions of issues affecting the control of maize insect pests, particularly pertaining to the use of integrated control measures in the maize crop agro-system. Focus areas of our most recent “big” 21st IWGO Conference in Venice, Italy (27 Oct to 3 Nov 2001), included many aspects of the ecology and management of *Diabrotica*, *Ostrinia*, *Agriotes*, *Sesamia*, aphids, etc. The 22nd IWGO Conference in Vienna will be organized following this concept and will deal with all maize insect pests, not only *Diabrotica!!*. The scientific committee consists of Prof. C. Richard Edwards, Purdue University, W. Lafayette, Indiana (U.S.A.); Dr. Wang Zhen-Ying, Plant Protection Institute of CAAS, Beijing (P.R. China) and myself. The local organizer is Harald Berger (Vienna, Austria). In January 2006, session subjects and session organizers will be nominated by the scientific committee and afterwards speaker selection will be the responsibility of session organizers in collaboration with the scientific committee. Attendees who are not speakers have the opportunity to submit their research in the form of a poster presentation. All talks and posters will present original data from specific projects pertaining to maize pests. Efforts should be made to be specific and to avoid presenting overviews, summaries or material that is already widely known. The goal of the meeting is to stimulate ideas and discussion by presenting new information. Information about the 22nd IWGO Conference will be available on our webpage www.iwgo.org with the beginning of February 2006 and will be made available through the next IWGO Newsletter.

With kind regards,



IWGO –NEWSLETTER XXVI / 2

News Related to IWGO Matters

- **DVD Film: "The Western Corn Rootworm" Receives Award**
  The organizing staff of 2005 AGROFILM informed Stummfilm GmbH in Stuttgart, Germany, in the end of September 2005 that the DVD film ***"The Western Corn Rootworm"*** *was awarded the* ***Prize of the Academy of Agriculture Sciences.*** *Congratulations!* U.K.
- **Western Corn Rootworm in "Science"**
  Nick Miller, Arnaud Estoup, Stefan Toepfer, Denis Bourguet, Laurent Lapchin, Sylvie Derridj, Kyung Seok Kim, Philippe Renaud, Lorenzo Furlan and Thomas Guillemaud were able to publish their results entitled ***"Multiple Transatlantic Introductions of the Western Corn Rootworm"*** *in* ***Science****. Congratulations! The finding that there have been at least three independent transatlantic introductions of WCR suggests that incursions from North America are chronic. If you have questions about the paper, feel free to contact Thomas Guillemaud (guillem@antibes.inra.fr) or Nick Miller (miller@antibes.inra.fr).* U.K.
- **Former IWGO President Prof. Huai C. Chiang Passed Away (1915-2005)**
  Prof. Chiang made extensive and major contributions to the development of numerous international scientific, technical assistance, and policy programs and working groups. In 1969, Prof. Chiang organized the foundation of IWGO and served as ***President of IWGO until 1982****. For details of Prof. Chiang's life and accomplishments please refer to the article written by Chiang in 1993: "I am happy to be an entomologist", Chinese Journal of Entomology 13: 275-292. It is greatly appreciated what he has done for IWGO.* U.K.
- ***Diabrotica*** **Proposal by European Commission Approved**
  A project proposal focusing on ***a balanced management strategy for Diabrotica in Europe*** *has been approved by the European Commission. ARVALIS in France and the University of Göttingen in Germany will coordinate jointly this specific support action. Congratulation! Nonetheless, it should be noted that at first a contract with the EU Commission needs to be established before the actual work (or travel) can start in 2006.* U.K.
- **DVD on *Diabrotica* Produced by Peter Cate, Austria**
  Peter Cate was responsible for producing a new DVD on Diabrotica, which is focusing on the importance, distribution, biology and control of this invasive alien pest in Europe (35 min). This DVD is available in German and English and cost Euro 32, please order at AGES, Institut für Pflanzengesundheit, Spargelfeldstrasse 191, 1220 Vienna, Austria or e-mail to pflanzengesundheit@ages.at U.K.
- **Approvals have been received for MON88017**
  A second-generation product combining its rootworm and Roundup ReadyR Corn 2 trait technologies in a single event; and MON88017 stacked with YieldGardR Corn Borer. These regulatory clearances represent a major step toward the future commercialization of these technologies. MON88017 is a vector stack of Monsanto's rootworm and Roundup Ready Corn 2 trait offerings, which provides breeding efficiencies that aid Monsanto and growers in bringing out traited hybrids. Monsanto is seeking further regulatory approvals for MON88017 from countries that import corn from the U.S. R.E.

IWGO –NEWSLETTER XXVI / 2

Enclosed is a document prepared by Rich Edwards and collaborators that describes the procedure/protocol for taking maize yields in research plots to determine yield differences in treatments/ entries. It includes formulas for converting these data to yields in kg/ha. Several IWGO members of you have asked Rich Edwards about how they take maize yields in research plots in Indiana and the Midwestern USA. This document describes this procedure. This procedure/protocol is the one that will be used in a collaborative study in the Brescia Province, Italy. U.K.

ARTICLE:

Procedure/Protocol for Hand Harvesting Maize to Estimate Yields in Research Studies/Tests

by C. Richard Edwards[1], Larry W. Bledsoe[1], and Mauro Agosti[2]
[1]Department of Entomology, Purdue University, W. Lafayette, Indiana 47907, USA
[2]Consorzio di Difesa delle Colture Intensive di Brescia, 25020 Poncarale (BS), ITALY

Equipment/items needed: Metric measurements given below should be at least what are referenced in the text, but can be altered to accommodate the actual size of available items/sizes/capacities in the metric country. However, the length of the row to be harvested should be as stated below because the conversion factors are based on this dimension.

1) Rope, chain, or measuring tape that is 5.31 meters long.
2) Large, sturdy bags that are about 60 cm by 100 cm to carry the maize ears out
3) Tags to mark bags (information should include test/field, plot/treatment replication number, date, etc. - can be attached to bag or dropped inside the bag, but normally it is dropped inside the bag).
4) Handheld-size grain moisture tester, such as a Dickey-John Portable Moisture Tester or equivalent (see examples under "Grain Moisture Testers" at www.gemplers.com).
5) Grain moisture conversion scale/table (Table 1) to use in converting the weight of each maize sample based on its % moisture to the international standard of maize at 15.5% H_2O (must check the moisture level for each maize plot/treatment).
6) Approximately 4-liter plastic bucket or coffee can to shell and hold maize kernels in for grain moisture testing - however, can also use plastic bucket described in 8) below.
7) Approximately 10 to 15 kg capacity hanging weigh scale with hook on the top to hold the scale up and a hook on the bottom to attach large plastic bucket, as described in 8) below, to weigh maize samples - weigh scale can be something like the Chatillon Net/Gross Scale or the Fish and Game Scale (see examples under "Weighing Scales" at www.gemplers.com and www.forestry-suppliers.com).
8) Two sturdy 20-liter plastic buckets with wire handles for attaching to the bottom hook on weigh scale - place maize ears in these to weigh.
9) Several 80-liter or larger plastic buckets for placing maize in after processing.

Procedure/Protocol[1]:
Determine the number of plots/treatments that yields will be taken in (based on number of replications in the study for each treatment, but if less than 4 replications for a treatment then take 2 yield samples per treatment-replication to reduce variability).

When the maize has reached maturity (black layer at the tip of the kernel), one can begin harvesting. Harvest all ears in 5.31 meters of row for each plot/treatment (converted from linear feet in 1/1000th of an acre at a set row spacing). This represents 3.7231081/10,000th of a hectare for 70 cm row width or 3.9821058/10,000th for 75 cm row width.

Carry a rope, chain, or measuring tape that is 5.31 meters long into the pre-selected row of each plot/treatment that is to be hand-harvested. Walk a predetermined number of steps/paces into the field and stop at the final step. This is the beginning of where the harvest will take place. Place one end of the measuring device on the ground and secure it (can use a stick, rod, rock or other item). Now stretch this device down the row and pull gently to fully extend it. At the last plant, begin harvesting the ears within the measured row and place them in the tagged bag. Work your way back toward the beginning of the measured row.

Separate each ear from its husks (Fig. 1) by pulling back the husks and running your hand down the exposed kernels of the ear to the bottom of the ear. Break the ear off and place the huskless-ear in the bag. Do this for each ear in the 5.31 meters of row.

Do not forget to place a tag on or in the bag indicating the field/farmer number (if you have multiple fields), plot/treatment, replication number, etc. Once all the ears are harvested in a plot/treatment, bring the bag out of the field. Repeat this procedure for each plot/treatment in the study/test.

Gather all the bags containing the maize ears in the place where the ear weighing and moisture testing will be performed.

Weigh the maize (maize kernels still on the cobs) for each plot/treatment before determining the moisture level of the maize for that plot/treatment. Place all the ears from a bag (plot/treatment) in the approximate 20-liter large plastic bucket (illustrated by the white bucket in Fig. 2). Now attach the handle of the bucket to the hook on the weigh scale and hold the weigh scale and bucket with maize off the ground (Fig. 3). Read the dial to determine the weight of all the ear maize for that plot/treatment. Record this value on a sheet of paper. Be sure to calibrate (tare) the weigh scale taking into consideration the weight of the large plastic bucket. Most scales will allow you to place the bucket on the scale and readjust the scale back to “0” so that the number you get when you weigh the ear maize will be the actual sample weight (Fig. 4).

[1] The harvesting and weighing procedures/protocols to determine kg/ha of maize for the plots/treatments of a study/test as described under “Procedure/Protocol” are based on “ear” maize (maize where the kernels are still on the cob).

After the ear maize for a plot/treatment has been weighed (Fig. 5) and the weight for that plot/treatment recorded, determine the moisture level of some of the maize shelled from the cob. Remove 5 randomly selected ears (just reach in the plastic bucket without looking and randomly select and remove 5 ears). Break each ear in half and hand-remove some of the kernels (Fig. 6), beginning at the point where the ear broke, from each half into the 4-liter bucket or coffee can. Add some kernels from each of the 5 ears and mix the kernels together before testing the moisture level. Fill the moisture tester with these kernels up to the full point and follow the directions for determining the % moisture of each sample (Fig. 7). Record the % moisture level for each plot/treatment on your record sheet. If the study/test is in a farmer's field, you may need to return the maize ears to the farmer after you have finished weighing and determining the % moisture of the maize from all the plots/treatments.

Use the maize % moisture conversion scale/table (Table 1) to obtain the appropriate "divisor" to use to convert the weight by % moisture of each plot/treatment of the maize to the international standard of 15.5% H_2O. These data can now be analyzed to determine differences among the plots/treatments and to determine the estimated yield in kg/ha for each treatment in the test/study (see Formula 1, for Ear Maize).

Formula 1[2]:

Converting Ear Maize to International Standard Shelled Maize at 15.5% H_2O -

___ kg (weight of maize with kernels still on the ear from 5.31 meters of row at its tested % moisture level) ÷ by the divisor for the tested moisture level so as to adjust back to the international standard 15.5% moisture maize and to adjust the weight to shelled maize (Table 1) = ___ kg of maize adjusted to 15.5% moisture ÷ by the conversion factor for the row width (0.0003723 for 70 cm row width or 0.0003982 for 75 cm row width) = ___ kg/ha of 15.5% "shelled" maize

1) Example - 70 cm row width:

5.5 kg of Ear Maize in 5.31 meters of row, 20% grain moisture, 1.3207 divisor for 20% moisture Ear Maize, 0.0003723 conversion factor for 70 cm row width

5.5 kg ÷ 1.3207 = 4.1645 kg ÷ 0.0003723 = 11,185.87 kg/ha of 15.5% moisture shelled maize

2) Example - 75 cm row width:

5.5 kg of Ear Maize in 5.31 meters of row, 20% grain moisture, 1.3207 divisor for 20% moisture Ear Maize, 0.0003982 conversion factor for 75 cm row width

5.5 kg ÷ 1.3207 = 4.1645 kg ÷ 0.0003982 = 10,458.31 kg/ha of 15.5% moisture shelled maize

---

[2] The "divisor" to use in "Formula 1" is in Table 1 under the heading "Ear Maize - Divisor" for the tested % moisture. If the procedure/protocol as described is changed and the ears are shelled (kernels removed from the cobs) before weighing and % moisture testing, then the "divisor" to use from Table 1 is under the heading "Shelled Maize - Divisor" and the formula to use to calculate the yield in kg/ha is "Formula 2".

Formula 2:

Shelled Maize -

___ kg (weight of maize kernels "removed" from the cobs from 5.31 meters of row at its tested % moisture level) ÷ by the divisor for the tested moisture so as to adjust back to the international standard of 15.5% moisture maize (Table 1) = ___ kg of maize adjusted to 15.5% moisture ÷ by the conversion factor for the row width (0.0003723 for 70 cm row width or 0.0003982 for 75 cm row width = ___ kg/ha of 15.5% moisture "shelled" maize

1) Example - 70 cm row width:

5.5 kg of Shelled Maize in 5.31 meters of row, 20% grain moisture, 1.0563 divisor for 20% moisture Shelled Maize, 0.0003723 conversion factor for 70 cm row width

5.5 kg ÷ 1.0563 = 5.2069 kg ÷ 0.0003723 = 13,985.76 kg/ha of 15.5% moisture shelled maize

2) Example - 75 cm row width:

5.5 kg of Shelled Maize in 5.31 meters of row, 20% grain moisture, 1.0563 divisor for 20% moisture Shelled Maize, 0.0003982 conversion factor for 75 cm row width

5.5 kg ÷ 1.0563 = 5.2069 kg ÷ 0.0003982 = 13,076.09 kg/ha of 15.5% moisture shelled maize

Fig. 1. Harvesting maize ears in 5.31 meters of row.

Fig. 2. Maize from 1 plot/treatment ready to be placed in the 20-liter white plastic bucket with a wire handle for weighing. The larger 80-liter plastic buckets are for placing all maize in after weighing and testing for moisture.

IWGO –NEWSLETTER XXVI / 2

Fig. 3. Weighing the plot/treatment sample of maize and recording the weight.

Fig. 4. Empty plastic bucket hanging from weigh scale adjusted back to “0”.

Fig. 5. Ear maize sample for a plot/treatment has been weighed - weigh scale partially visible behind person in picture.

Fig. 6. Removing maize kernels from an ear so that they can be tested to determine the % moisture level for the plot/treatment.

Fig. 7. Placing maize kernels in the moisture tester to obtain % moisture level reading.

Table 1. Divisors for “ear” and “shelled” maize at various % moisture levels to use in making maize weight corrections to the international standard of 15.5% moisture.

% Moisture	Ear Maize - Divisor	Shelled Maize - Divisor
10.0	1.1338	0.9389
11.0	1.1473	0.9495
12.0	1.1618	0.9602
12.5	1.1696	0.9657
13.0	1.1777	0.9713
13.5	1.1861	0.9770
14.0	1.1945	0.9825
14.5	1.2034	0.9884
15.0	1.2123	0.9941
15.5	1.2214	1.0000
16.0	1.2311	1.0060
16.5	1.2413	1.0120
17.0	1.2516	1.0181
17.5	1.2623	1.0242
18.0	1.2734	1.0305
18.5	1.2848	1.0368
19.0	1.2964	1.0432
19.5	1.3084	1.0497
20.0	1.3207	1.0563
20.5	1.3321	1.0629
21.0	1.3457	1.0696
21.5	1.3584	1.0764
22.5	1.3845	1.0903
23.0	1.3973	1.0974
23.5	1.4109	1.1046
24.0	1.4243	1.1118
24.5	1.4375	1.1192
25.0	1.4509	1.1267
25.5	1.4648	1.1342
26.0	1.4789	1.1419
26.5	1.4911	1.1497
27.0	1.5034	1.1575
27.5	1.5161	1.1655
28.0	1.5289	1.1736
28.5	1.5414	1.1818
29.0	1.5543	1.1901
29.5	1.5671	1.1986
30.0	1.5804	1.2071
31.0	1.6061	1.2246
32.0	1.6327	1.2426
33.0	1.6580	1.2612
34.0	1.6836	1.2803
35.0	1.7091	1.3000
36.0	1.7352	1.3203
37.0	1.7614	1.3413
38.0	1.7880	1.3629
39.0	1.8148	1.3852
40.0	1.8421	1.4083

ARTICLE:

Bt Corn Registrations in U.S.A., as of October 2005

by C. Richard Edwards

Department of Entomology, Purdue University, W. Lafayette, Indiana 47907, USA

Updates on Herculex RW and Herculex XTRA are the changes from the previous chart (October 2005 approvals for use by USEPA). These are now fully approved for planting in the USA for corn rootworm (RW) and corn rootworm/selected Lepidoptera species (XTRA) control.

Company	Insect[1]	Transformation/ Event	Crystalline Protein	Trade Name
Monsanto	**ECB, SWCB**	**Mon 810**	Cry1A(b) [2,4]	**YIELDGARD** Corn Borer (YGCB)
Syngenta	ECB, SWCB	Bt11	Cry1A(b) [2,4]	YieldGard Corn Borer (YGCB)
Dow AgroSciences & Pioneer Hi-Bred	ECB, SWCB, BCW, FAW	TC 1507	Cry1F[2,4]	Herculex I (HX1)
Monsanto	CRW	Mon 863	Cry3Bb1[3,4]	YieldGard Rootworm (YGRW)
Dow AgroSciences & Pioneer Hi-Bred	CRW	DAS-59122-7	Cry34Ab1[3,4] /Cry35Ab1[3,4]	Herculex RW
Syngenta	CRW	MIR604	mCry3A[3,4]	Agrisure RW (Experimental Use Permit)
Monsanto	CRW, ECB, SWCB	Mon 863 + Mon 810	Cry3Bb1[3,4] + Cry1A(b) [2,4]	YieldGard Plus (YGPlus)
Dow AgroSciences & Pioneer Hi-Bred	CRW, ECB, SWCB, BCW, FAW	DAS-59122-7 + TC 1507	Cry34Ab1[3,4] /Cry35Ab1[3,4] + Cry1F[2,4]	Herculex XTRA

[1] ECB = *Ostrinia nubilalis*; SWCB = *Diatraea grandiosella*; BCW = *Agrotis ipsilon*; FAW = *Spodoptera frugiperda*; CRW = *Diabrotica* spp.

[2] Protoxin - processed in insect into toxic protein.

[3] Toxin - produced in the plant as toxin.

[4] Cry1A(b) = Bt subspecies *kurstaki*; Cry1F = Bt subspecies *aizawai*; Cry3Bb1 = Bt subspecies *kumamotoensis*; Cry34Ab1 = Bt subspecies *wuhanensis* (serovar designation, but cannot be categorized since it is a non-motile form- no flagellae) and Cry35Ab1 = Bt subspecies *wuhanensis* (serovar designation, but cannot be categorized since it is a non-motile form- no flagellae); mCry3A = Bt subspecies *tenebrionis*.

(Source: C. Richard Edwards, Purdue University, W. Lafayette, Indiana, USA)

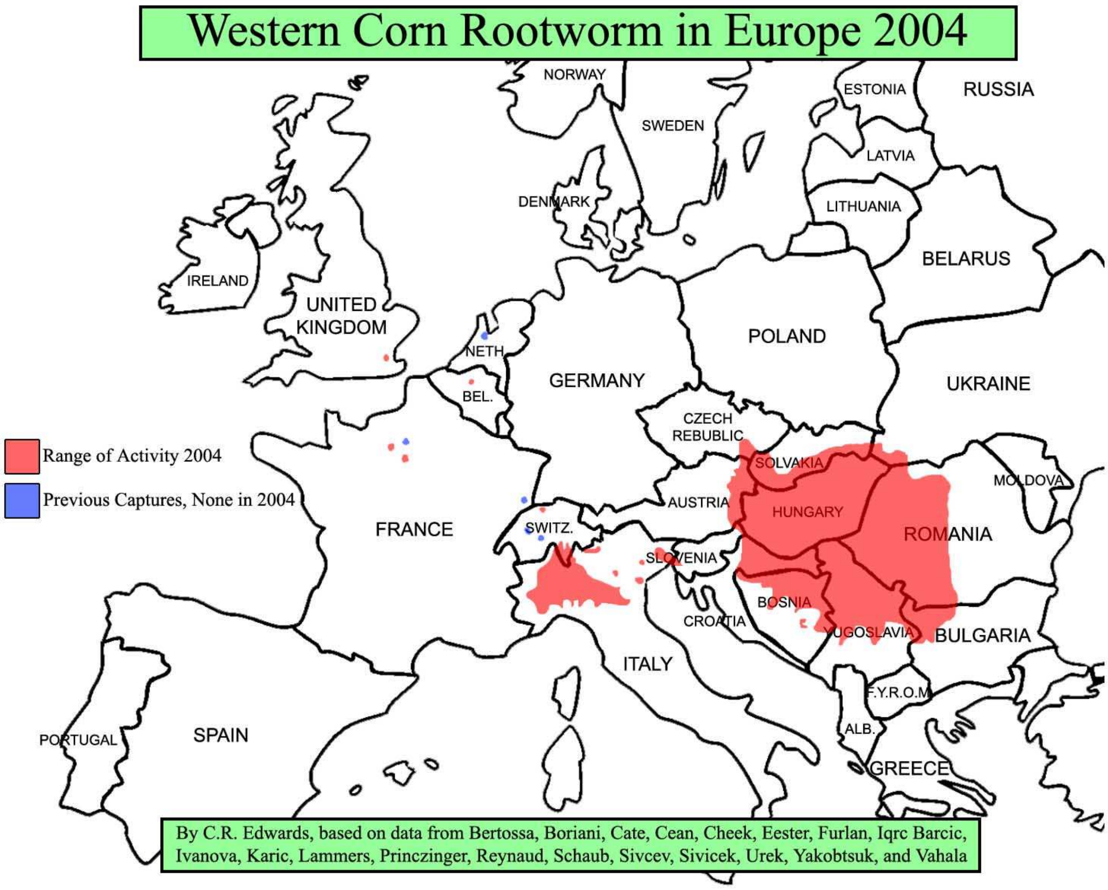
IWGO –NEWSLETTER XXVI / 2

ARTICLE:

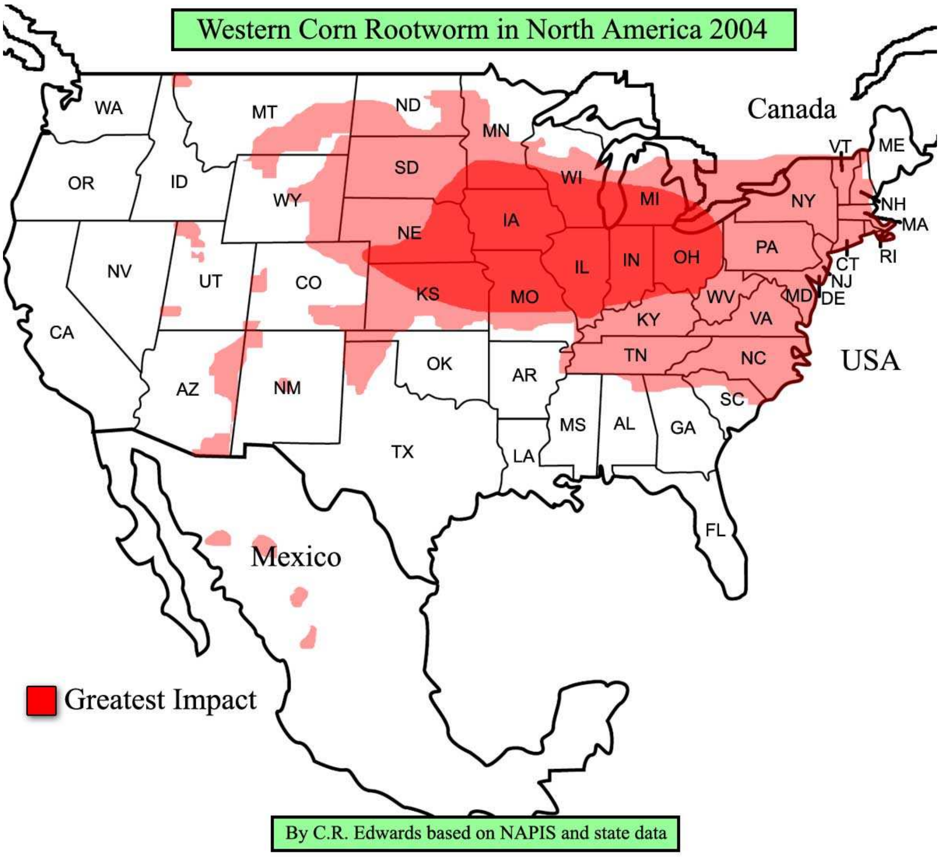
New WCR 2004 General Spread Maps for Europe and North America

by C. Richard Edwards[1] and Jozsef Kiss[2]
[1]*Department of Entomology, Purdue University, W. Lafayette, Indiana 47907, USA*
[2]*Department of Plant Protection, Szent Istavan University, Gödöllö, Hungary*

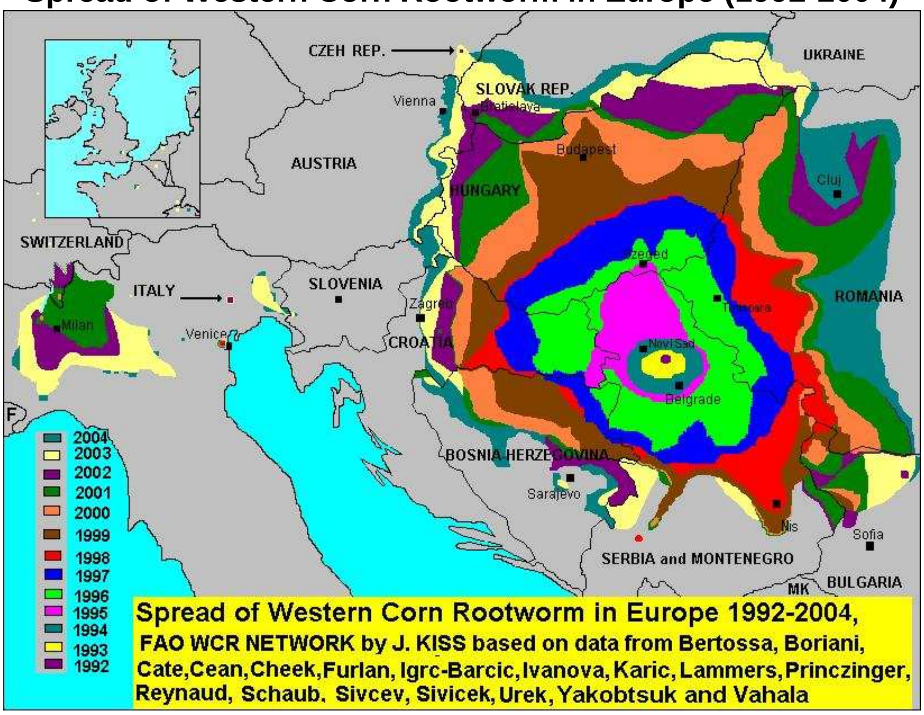
Printable and downloadable maps showing the spread of WCR in Europe and North America as of 2004 can be found at http://www.entm.purdue.edu/wcr. These are general spread maps within tolerance of the precision level for maps such as these. We appreciate all those listed on the maps for their input. In two cases, we did not hear back from country representatives so the FAO spread map for 2004 was used to pinpoint WCR boundaries in those countries. For the foreseeable future, IWGO plans to continue to produce these maps on a yearly basis with the help of those who are monitoring the movement of WCR within infested countries. We appreciate your assistance. We think these maps compliment the FAO map. Each serves a good purpose. You are on our mailing list to receive future updates, but you can also visit the www site listed above for this and future maps.



IWGO –NEWSLETTER XXVI / 2



Spread of Western Corn Rootworm in Europe (1992-2004)



IWGO –NEWSLETTER XXVI / 2

ARTICLE

GM-NTO Papers in Environmental Entomology

by Silvia Fernandez
Scientific Affaires Europe – Africa, MONSANTO Europe, Brussels, Belgium

Most of our IWGO members might know this but just in case... on of the last issues of Environmental Entomology (October 23005, Volume 34, No. 5) has an entire section on GM crops and NTOs. All these articles are free of charge and can be accessed through the journal's webpage:

<http://titania.esa.catchword.org/vl=31820255/cl=23/nw=1/rpsv/cw/vhosts/esa/0046225x/latest.htm>

TRANSGENIC PLANTS AND INSECTS

1178 Field Studies Assessing Arthropod Nontarget Effects in Bt Transgenic Crops: Introduction <http://titania.esa.catchword.org/vl=31820255/cl=23/nw=1/rpsv/cw/esa/0046225x/v34n5/s25/p1178> *Steven E. Naranjo; Graham Head; Galen P. Dively* Environmental Entomology, Vol. 34, No. 5, October 2005 pp.1178-1180

1181 Assessing the Effects of Pest Management on Nontarget Arthropods: The Influence of Plot Size and Isolation <http://titania.esa.catchword.org/vl=31820255/cl=23/nw=1/rpsv/cw/esa/0046225x/v34n5/s26/p1181> *J. R. Prasifka; R. L. Hellmich; G. P. Dively; L. C. Lewis* Environmental Entomology, Vol. 34, No. 5, October 2005 pp.1181-1192

1193 Long-Term Assessment of the Effects of Transgenic Bt Cotton on the Abundance of Nontarget Arthropod Natural Enemies <http://titania.esa.catchword.org/vl=31820255/cl=23/nw=1/rpsv/cw/esa/0046225x/v34n5/s27/p1193> *Steven E. Naranjo* Environmental Entomology, Vol. 34, No. 5, October 2005 pp.1193-1210

1211 Long-Term Assessment of the Effects of Transgenic Bt Cotton on the Function of the Natural Enemy Community <http://titania.esa.catchword.org/vl=31820255/cl=23/nw=1/rpsv/cw/esa/0046225x/v34n5/s28/p1211> *Steven E. Naranjo* Environmental Entomology, Vol. 34, No. 5, October 2005 pp.1211-1223

1224 A Comparison of Arthropod Communities in Transgenic Bt and Conventional Cotton in Australia <http://titania.esa.catchword.org/vl=31820255/cl=23/nw=1/rpsv/cw/esa/0046225x/v34n5/s29/p1224> *M. E. A. Whitehouse; L. J. Wilson; G. P. Fitt* Environmental Entomology, Vol. 34, No. 5, October 2005 pp.1224-1241

1242 Canopy- and Ground-Dwelling Predatory Arthropods in Commercial Bt and non-Bt Cotton Fields: Patterns and Mechanisms <http://titania.esa.catchword.org/vl=31820255/cl=23/nw=1/rpsv/cw/esa/0046225x/v34n5/s30/p1242> *Jorge B. Torres; John R. Ruberson* Environmental Entomology, Vol. 34, No. 5, October 2005 pp.1242-1256

1257 A Multiyear, Large-Scale Comparison of Arthropod Populations on Commercially Managed Bt and Non-Bt Cotton Fields <http://titania.esa.catchword.org/vl=31820255/cl=23/nw=1/rpsv/cw/esa/0046225x/v34n5/s31/p1257> *G. Head; W. Moar; M. Eubanks; B. Freeman; J. Ruberson; A. Hagerty; S. Turnipseed* Environmental Entomology, Vol. 34, No. 5, October 2005 pp.1257-1266

1267 Impact of Transgenic VIP3A × Cry1Ab Lepidopteran-resistant Field Corn on the Nontarget Arthropod Community <http://titania.esa.catchword.org/vl=31820255/cl=23/nw=1/rpsv/cw/esa/0046225x/v34n5/s32/p1267> *Galen P. Dively* Environmental Entomology, Vol. 34, No. 5, October 2005 pp.1267-1291

1292 Effect of Bacillus thuringiensis Transgenic Corn for Lepidopteran Control on Nontarget Arthropods <http://titania.esa.catchword.org/vl=31820255/cl=23/nw=1/rpsv/cw/esa/0046225x/v34n5/s3

3/p1292> *Timothy Daly; G. David Buntin* Environmental Entomology, Vol. 34, No. 5, October 2005 pp.1292-1301

1302 Impact of Transgenic Bacillus thuringiensis Corn and Crop Phenology on Five Nontarget Arthropods <http://titania.esa.catchword.org/vl=31820255/cl=23/nw=1/rpsv/cw/esa/0046225x/v34n5/s34/p1302> *Clinton D. Pilcher; Marlin E. Rice; John J. Obrycki* Environmental Entomology, Vol. 34, No. 5, October 2005 pp.1302-1316

1317 Utility of Ground Beetle Species in Field Tests of Potential Nontarget Effects of Bt Crops <http://titania.esa.catchword.org/vl=31820255/cl=23/nw=1/rpsv/cw/esa/0046225x/v34n5/s35/p1317> *Miriam D. Lopez; Jarrad R. Prasifka; Denny J. Bruck; Leslie C. Lewis* Environmental Entomology, Vol. 34, No. 5, October 2005 pp.1317-1324

1325 Field Evaluation of the Impact of Corn Rootworm (Coleoptera: Chrysomelidae)-Protected Bt Corn on Ground-Dwelling Invertebrates <http://titania.esa.catchword.org/vl=31820255/cl=23/nw=1/rpsv/cw/esa/0046225x/v34n5/s36/p1325> *Muhammad A. Bhatti; Jian Duan; Graham Head; Changjian Jiang; Michael J. McKee; Thomas E. Nickson; Carol L. Pilcher; Clinton D. Pilcher* Environmental Entomology, Vol. 34, No. 5, October 2005 pp.1325-1335

1336 Field Evaluation of the Impact of Corn Rootworm (Coleoptera: Chrysomelidae)-Protected Bt Corn on Foliage-Dwelling Arthropods <http://titania.esa.catchword.org/vl=31820255/cl=23/nw=1/rpsv/cw/esa/0046225x/v34n5/s37/p1336> *Muhammad A. Bhatti; Jian Duan; Graham P. Head; Changjian Jiang; Michael J. McKee; Thomas E. Nickson; Carol L. Pilcher; Clinton D. Pilcher* Environmental Entomology, Vol. 34, No. 5, October 2005 pp.1336-1345

1346 Biodiversity and Community Structure of Epedaphic and Euedaphic Springtails (Collembola) in Transgenic Rootworm Bt Corn <http://titania.esa.catchword.org/vl=31820255/cl=23/nw=1/rpsv/cw/esa/0046225x/v34n5/s38/p1346> *Royce J. Bitzer; Marlin E. Rice; Clinton D. Pilcher; Carol L. Pilcher; Wai-ki frankie Lam* Environmental Entomology, Vol. 34, No. 5, October 2005 pp.1346-1376

Abstracts of the Poster Presentations 11th IWGO *Diabrotica* Subgroup Meeting, Bratislava, Slovak Republic, February 14-17, 2005

WILL WCR ADULTS GET OVER THE CARPATHIAN PASSES? A CASE STUDY FOR VERECKE PASS IN UKRAINE

Bela PAI[1], Adalbert J. SZIKURA[2], Vaszil I. YAKOBTSUK[1] and Jozsef KISS[3]

[1]*Transcarpathian Plant Quarantine Inspection, Onokovtsi, Uzhgorodskyy region, Uzhgorod, Ukraine;*
[2]*Transcarpathian Territorial Dept. of Plant Quarantine, Uzhgorod, Ukraine;*
[3]*Department of Plant Protection, Szent Istvan University, Pater K. ut 1, 2100 Godollo, Hungary, Jozsef.Kiss@mkk.szie.hu*

The Western Corn Rootworm (WCR, *Diabrotica virgifera virgifera* LECONTE) was first detected in Ukraine in the border triangle of Hungary/Ukraine/Romania (Movchan, Melnyk and Konstantynova, 2001; Omelyuta and Filatova, 2001; Sadlyak, *et al.*, 2001). Maize acreages in Ukraine (1.800 000 ha, FAOSTAT data, 2004.) offers large area for WCR population to build up once spread. Based on experiences from other areas in Europe, WCR adults often spread along traffic roads, highways, train lines in valleys. Spread of adults over passes is also a possible scenario.

The first detection point and also the spread area of WCR in Ukraine is still inside the Carpathian basin up to now. We decided to observe one possible spread line through Carpathian mountains.

Observation sites: In 2003 WCR spread approached the Verecke pass at Nelipino location. In 2004 observations were made along the Chop-Kyiv highway, its highest point is 770 m height above sea-level. Csalomon sex pheromone traps (PALs) were established from the 2003 detection point in each 5 kilometers up to and over Verecke pass (total of 12 locations) on the road side in Latorca river valley.

The observation started in early July and was terminated in early October 2004. Traps were checked for WCR presence in an interval of 10 days and changed after 30 days.

Maize fields or maize plots (gardens of farmer families) were recorded along the road side up to the pass. Presence of maize fields/plots offer feeding and egg laying sites for WCR females.

In 2004, there was no evidence for WCR adult spread towards or over the Verecke pass. Rotation of maize fields and even small maize plots in family gardens along the possible spread line will be an important measure to prevent/reduce WCR establishment there.

INSECTICIDE SEED COATING OF MAIZE TO CONTROL LARVAE OF WCR

Albert ESTER and Klaas VAN ROZEN

Applied Plant Research (PPO-AGV), Edelhertweg 1, 8219 PH Lelystad, The Netherlands, Albert.ester@wur.nl; Klaas.vanrozen@wur.nl

Western corn rootworm (WCR), *Diabrotica virgifera virgifera* LE CONTE, (Coleoptera: Chrysomelidae) is a slowly progressing pest into the Western Europe countries. In 2003 the first beetles appeared in The Netherlands. A potential treat, as 35,000 ha grain maize and 200,000 ha silage maize are grown in mainly the east and southern part of the country. Initial research started in 2004, focused on low-chemical input as a seed treatment of maize against the larvae of WCR on laboratorial scale in quarantine circumstances.

WCR larvae in second life stage were collected in Hungary. In a preliminarily laboratorial trial second as well as third instar larvae were tested for seven seed coated treatments. The experiments ended at pupae stage, to decline risks of escaping individuals due to heavy quarantine regulation. Using three to eighteen larvae per plot, where larvae were applied in a range of zero to eight days after planting, no visual damage was noticed to the roots in treated and untreated plots as well. Average maximum plant length at the date of assessment was 31 cm. Small numbers of larvae were recovered. Lack of recovered larvae may be due to large temperature differences, resulting in temperature related mortality and quickly decaying dead larvae. Nevertheless, six out of seven treatments resulted in significantly ($p < 0.001$) smaller numbers of living larvae then the untreated plots. All treatments showed less dead larvae or larvae which had entered the pupae life stage in relation to the untreated plots, though none of these results were significant.

Average numbers of living and dead larvae, pupae, total recovered numbers and percentage of recovered numbers in relation to the initial (source) applied numbers, 2004.

Object	Living larvae		Dead larvae	Pupae	Total		Source [%]
A (untreated)	1.67	BC	0.67	1.00	3.33	D	35.7
B	0.17	A	0.17	0.33	0.67	AB	7.1
C	0.00	A	0.33	0.50	0.83	AB	8.9
D	0.00	A	0.17	0.83	1.00	AB	10.7
E	0.17	A	0.50	0.67	1.33	ABC	14.3
F	0.67	AB	0.33	0.17	1.17	ABC	12.5
G	0.17	A	0.00	0.00	0.17	A	1.8
H	0.17	A	0.33	0.17	0.67	AB	7.1
F-probability	< 0.001		0.663	0.432	0.006		-
Lsd (α= 0.05)	1.01		0.69	1.05	1.60		-

DETECTABILITY OF COLEOPTERAN-SPECIFIC CRY3BB1 PROTEIN IN SOIL AND ITS EFFECT ON NONTARGET BELOW-GROUND ARTHROPODS

Aqeel AHMAD, Gerald WILDE and Kun Yan ZHU

Department of Entomology, Kansas State University, U.S.A., aahmad@oznet.ksu.edu , gwilde@oznet.ksu.edu ; kzhu@oznet.ksu.edu

Corn engineered to produce the Cry3Bb1 protein from *Bacillus thuringiensis* (*Bt*) Berliner has provided unprecedented control for corn rootworm (*Diabrotica* spp.). However, the *Bt* protein may be released in soil by root exudates or decaying plant residues that may affect soil organisms. Field studies were conducted to determine the abundance of below-ground nontarget arthropods in fields planted with *Bt* or non-*Bt* corn for the first year or planted over three consecutive years. Results of these studies showed that there were no significant differences in numbers of below-ground arthropods in soil planted with *Bt* and non-*Bt* corn at any of the studied locations. Enzyme-linked immunosorbent assay (ELISA) showed no detectable Cry3Bb1 protein in any of the soil samples collected in a field planted with a *Bt* corn hybrid and its non-*Bt* isogenic hybrid for the first year or planted over three consecutive years near Manhattan, Kansas. However, a small amount of Cry3Bb1 protein (3.38 – 6.89 $ng.g^{-1}$ dry soil) was detected in the soil samples collected from an area near plants in a *Bt* corn field that was planted for the first year near Scandia, Kansas. These findings indicate that the Cry3Bb1 protein released from root exudates or decaying plant residues does not persist and is rapidly broken down in the soil. The rapid degradation of Cry3Bb1 in soil results in none or trace amounts of protein being detected by ELISA.

ATRACTIVENESS OF SWEET MAIZE HYBRIDS FOR WCR (*DIABROTICA VIRGIFERA VIRGIFERA* LECONTE) BEETLES IN THE LATE SOWING IN 2004

Franja BACA[1], Jan V. PLANCAK[2], Jan J. TANCIK[3] and Ludovit CAGAN[3], Miklos TOTH[4]

[1] *Maize Research Institute, Zemun Polje, Belgrade-Zemun, Serbia&Montenergo, fbaca@mrizp.co.yu*
[2] *ACB Factory for frozen Vegetables, Ruski Krstur, Serbia&Montenergo,*
[3] *Slovak Agricultural University, Nitra, Slovak Republic,*
[4] *Plant Protection Institute Hungarian Academy of Sciences, Budapest, Hungary*

Sowing of sweet maize in dry land farming starts from the beginning of April and with a successive sowing last until the end of May - beginning of June. Later sowing of maize in June and July, as a stubble crop have to be under irrigation, Sweet maize sown in April and early May is usually harvested prior to mass migration of WCR beetles in search for food. Maize of later sowing dates or a stubble crop sowing rich in pollen and fresh silk is very attractive to migrating beetles. Considering that this production is performed under regular irrigation, besides greater plant attractiveness, soil is softer and more suitable for egg laying.

The aim of this study was to confirm effects of a sweet maize hybrid and a sowing date on crop attractiveness to WCR beetles and to estimate efficiency of three types of traps in the examination of the population and risk levels for the repeating maize sowing in the following year.

The plant test material consisted of three commercial sweet maize hybrids sown on two sowing dates. The following hybrids were sown as follows: CLX (May 18, 21, and 27), then Empire (June 1), CLX (June 8) and Royalty (June 11). Each hybrid was sown on the area of 20 ha. The trial was carried out under irrigation conditions on the plot of over 100 ha in NW of Vojvodina, the location of Ruski Krstur. The following traps were used to monitor the WCR beetles and to check attractiveness of the stated hybrids and their combinations with sowing dates: Pheromone Csalomon (PhT), yellow sticky Pherocon AM (YsT) and cylindrical traps with cucurbitacine as nutritive attractant (CuT). The traps were set on maize plants on the 1.5-m stakes on August 19. Reading of WCR beetles started on August 21, each subsequent every second day and ended on August 27. The results are presented in table bellow.

Number of WCR Beetles Trapped in Sweet Maize according to Type of Traps in R. Krstur in 2004

Traps	Sexes	21. 08.	23. 08.	25. 08.	27. 08.	Sum
PhT	♂	660	185	197	112	1154
YsT	♂♀	15	1	1	0	17
CuT	♂♀	1	2	2	0	5
Total		676	188	200	112	1176

A total of 1176 WCR beetles were trapped during the eight days of monitoring. Out of this number, 1154 WCR beetles were trapped on pheromone Csalomon (PhT) in the following ratio: hybrid CLX sown in May 18: 398, CLX sown in May 27:444 and CLX sown in June 8: 307. A total of 17 WCR beetles were trapped on yellow Pherocon AM traps (YsT) in the following ratio: hybrid CLX sown in May 21: 5, hybrid Empir: 5 and hybrid Royalty: 7 WCR beetles. Only 5 WCR beetles were trapped on cucurbitacine traps (CuT) in the ratio: hybrid Royalty 3, hybrids CLX sown in May 21: 1 and CLX sown in May 27: 1 WCR beetles.

The greatest number of beetles was registered in the first two days of monitoring: PhT: 660, YsT: 15 or 110 and 2,5 beetles/trap/day. In the second and successive monitoring of PhT traps, there were 30.6, 32.8 and 18.6 beetles/trap/day. The corresponding numbers on the YsT traps amounted to 0.16, 0.16, and 0.0 beetles/trap/day.

It was proved once more different plant attractiveness among sweet maize hybrids, sowing dates and trap types. Pheromone Csalomon traps were the most powerful.

BIOLOGY OF WCR IN MIDDLE- SLOVAKIA

Prof. Ľudovít CAGÁŇ[1] and Mgr. Csaba VARGA[2]

[1]*Department of Plant Protection of Slovak Agricultural University in Nitra, Slovak Republic*
[2]*Department of Botanic and Zoology of University of Constantine the Philosopher in Nitra, Slovak Republic*

In our poster presentation we want to show what kind of research activities we were realize in the middle part of Slovak Republic in the year 2004. We were checked population density of WCR adult and other pests (*Ostrinia nubilalis, Agriotes* species) with traps on 30 checkpoints in region of town Fiľakovo. We were setup some experiments with crop rotation, day activity of adult WCR beetles and with alternative food plants for WCR. In that work we participated with research persons: prof. Ludovit Cagan from Slovak Agricultural University in Nitra, prof. Jozsef Kiss from Szent Istvan University in Godollo and Ing. Tibor Lukacs from Nova Basta.

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

IWGO –NEWSLETTER XXVI / 2

CEREALS AND WEEDS AS POTENTIAL HOST PLANTS FOR LARVAE OF *DIABROTICA VIRGIFERA VIRGIFERA*

Sven BREITENBACH[1], Kai GLOYNA[2], Udo HEIMBACH[1] and Thomas THIEME[2]

[1]BBA - Institut für Pflanzenschutz in Ackerbau und Grünland, Messeweg 11-12, D-38104 Braunschweig Germany, s.breitenbach@bba.de;
[2]BTL Bio-Test Labor Sagerheide, Birkenallee 19, D-18184 Sagerheide Germany, tt@btl.hro.uunet.de

Since the late 60s it is known that the larvae of the Western Corn Rootworm (*Diabrotica virgifera virgifera* LECONTE) do not only feed on maize. In most parts of Europe a crop rotation with cereals and grassy fodder crops is common, which may result in an increase in the percentage of larvae of *Diabrotica* that survive on such hosts. For eradication, which is the policy in the EU, rotation is an important means of controlling *Diabrotica*. For this and integrated control in regions where *Diabrotica* is already established the availability of all suitable host plants needs to considered. For this reason we determined the suitability of different cereals and monocotyledonous weeds as hosts for the larvae of *Diabrotica virgifera virgifera*.

Larval development (% of larvae surviving 3–4 weeks) of *Diabrotica virgifera virgifera* on maize and ten other possible host plants

Tested plant species	No. Ex.	No. Larvae inserted	No. Larvae surviving	% Larvae surviving	% surviving compared to maize (=100%)
Summer Wheat	1	25	1	4	14.3
Summer Wheat	3	25	0	0	0
Winter Wheat	2	25	1	4	12.5
Summer Barley	3	25	2	8	25
Triticale	3	25	0	0	0
Echinochloa crus-galli	5	30	0	0	0
Elytrigia repens	1	25	1	4	14.3
Elytrigia repens	6	45	9	20	-
Poa annua	5	30	0	0	0
Setaria glauca	4	25	5	20	50
Setaria verticillata	4	25	1	4	10
Setaria verticillata	5	30	0	0	0
Setaria viridris	4	25	5	20	50
Sorghum sudanense	6	45	0	0	-
Maize	1	25	7	28	100
Maize	2	25	8	32	100
Maize	3	25	8	32	100
Maize	4	25	10	40	100
Maize	5	30	10	33	100

These trials revealed that besides cereals four (out of eight) species of grasses tested were suitable host plants for larvae of *Diabrotica virgifera virgifera* reared under laboratory conditions (s. Table). The genus *Setaria* was especially suitable and is a common weed in many crops. Also cereals like barley and wheat could be possible host plants and should be tested more thoroughly. In most cases larvae that fed on species of grass or cereals were lighter in weight than those fed on maize. Only the larvae that fed on *Setaria* were nearly the same weight as those fed on maize. Most of the beetles that emerged were male, independent of the larval food plant. In future trials host plants at different phenological stages and other species of plants will be assessed. These laboratory result need to be confirmed by field trials, and the coincidence in the field of possible host plants and *Diabrotica* larvae need to be established. Preliminary field experiments carried out in Romania in 2004 indicate that *Setaria glauca* is also a suitable host plant for larvae of *D. virgifera virgifera* in the field.

Parts of the study were financially supported by the Bundesministerium für Verbraucherschutz, Ernährung und Landwirtschaft

BIOLOGY OF WESTERN CORN ROOTWORM IN CENTRAL SLOVAKIA

Csaba VARGA[1] and Ľudovít CAGÁŇ[2]

[1]Department of Botanic and Zoology of University of Constantine the Philosopher in Nitra, Slovak Republic; vrgcsb@hotmail.com;
[2]Department of Plant Protection of Slovak Agricultural University in Nitra, Slovak Republic

Population density of the Western corn rootworm, *Diabrotica virgifera virgifera* adult and other pests (European corn borer, *Ostrinia nubilalis, Agriotes spp.*) was checked with traps on 30 checkpoints in region of town Fiľakovo.

Based on collected data it was determined that Western corn rootworm was presented on all checked maize areas in Central Slovakia. When population density of WCR adults was compared from year 2003 and 2004 on same areas, it was obvious, that the growth on each maize field was very significant. It was confirmed that Western corn rootworm adult do not present on barley-, winter wheat, potato, pumpkin and sunflower fields sowed after maize. The growth of WCR population density on fields with maize after maize in 2nd, 3rd and 6th year was significant. Western corn rootworm adults showed the highest activity at 10.00 and 18.00 p.m. High population density of European corn borer was detected in year 2004 on two maize fields in Central Slovakia near the Fiľakovo and Veľké Dravce.

High population density of *Agriotes* spp. was found on maize fields near Nová Bašta and Holiša in *Agriotes* pheromone traps.

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

PARTICIPATION BETWEEN FARMERS AND RESEARCH PERSONS ON IPM FOR WCR IN CENTRAL SLOVAKIA

Csaba VARGA[1] and Ľudovít Cagáň[2]

[1]*Department of Botanic and Zoology of University of Constantine the Philosopher in Nitra, Slovak Republic;* vrgcsb@hotmail.com;
[2]*Department of Plant Protection of Slovak Agricultural University in Nitra, Slovak Republic*

Three Farmer Field School's groups in that region of Fiľakovo (Central Slovakia) were organized in participation with FAO in 2004. Together 21 farmers from the region were included in the activity. The experiments were planned together with the participation of scientists. Agro-economical system were analyzed, collected data were discussed with national research persons and risk assessment was made for maize areas.

Result of those activities and studies in Farmer Field School (FFS) was that farmers became more active in calculation of risks for field managing using traps and participate with other farmers in group. Farmers are slowly changing traditional methods of pest management and start to take care about beneficiary organisms that are potential natural enemies of western corn rootworm. Farmers in FFS groups decided to choose crop rotation system on fields with highest population density of WCR.

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

FFS EXPERIENCE IN ROMANIA AS AN IMPORTANT PART OF WCR (*Diabrotica virgifera*) IN IPM PROGRAMMES

Ioan ROSCA[1] and Tomel PETRACHE[2] and FFS Facilitators

[1]*University of Agricultural Sciences and Veterinary Medicine – Bucharest, Bdl. Marasti no. 59, 71322 Bucharest, Romania,* rosca@cons.incerc.ro
[2]*Research and Development Agricultural Station - Lovrin, Str. Principala no. 200, 1957 – Lovrin, Romania,* ptomel@yahoo.com

Romania grew annual about 3 millions hectares with maize that means maize is a very important crop for Romanian farmers. The infested area by *Diabrotica virgifera*, represent the western half part from our country.

The FAO Project: GTFS/RER/017/ITA, a program regarding Integrated Pest Management for WCR in Centre and Eastern Europe has as a target improve the knowledge's of farmers, about *Diabrotica virgifera*, in particularly case (identification, biology, ecology, attack, relationship between pest and environmental, control) and agroecosistem analyzes and new tendencies of technologies in maize crop, in generally case.

In 2004 we developed 10 FFS in 5 counties from Romania, 9 of them from infested area (3 FFS in 2nd cycle, 7 FFS in 1st cycle). In each FFS, the farmers developed small experiments, as reaction of different hybrids at WCR attack, bio-ecological studies, monitoring, different host plant etc.

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

COLOR VARIABILITY OF *DIABROTICA VIRGIFERA VIRGIFERA* ADULTS FROM A POPULATION IN WESTERN PART OF ROMANIA

IOANA GROZEA, IOAN PALAGESIU, ALIN CARABET AND RAMONA CHIRITA

Department of Plants Protection, Banat's University of Agricultural Sciences and Veterinary Medicine, Calea Aradului, 119, Timisoara, 300645, Timis, Romania, ioana_entomol@yahoo.com

Western corn rootworm, *Diabrotica virgifera virgifera (*LE CONTE*),* (Coleoptera: Chrysomelidae) is an important pest for maize fields from western part of Romania. Eight years ago, this pest has entered in our country and he has installed in Timis and Arad counties.

In monitoring activities, the most of specialists use the color as a criterion to establish which adults are males or females. Anyway, this is not a very precise method, because of the great variability of color, frequently observed in many populations. So, we tried to discern the main color groups from a population and potentially errors that can appear regarding sex ratio when this criterion is used to identify the two sexes.

Researches that were made in a maize field from Didactic Station of BUAS Timisoara, Timis District (29 July 2004) emphasized many phenotypic (color) groups.

Adults were selected according to the shape of the last abdominal segment. From the total number of studied adults (614 ad.), only 256 (252-matures, 4-immatures) adults were males and 358 were females (352-matures, 6-immatures). It was observed a lower variability of males' color (4 color groups) than in females (6 color groups). The most of adults shown normal characteristics described in specialty literature (group 1; Gr.1), but there is a significantly number of them with another color particularities.

Color groups. *Males*. Gr.2- black elytra with diffuse longitudinal yellow-green stripes; similarity with females; Gr.3- black elytra and reddish-brown in posterior part; Gr. 4- black elytra with diffuse longitudinal reddish-brown stripes; similarity with females. *Females*. Gr.2- yellow-green elytra with diffuse black stripes; similarity with some males; Gr.3- dark elytra with yellow-green color in posterior and lateral side, similarity with males; Gr.4- reddish-brown elytra and visible black longitudinal stripes; Gr.5- yellow-brown elytra with diffuse black stripes; similarity with males; Gr.6- dark elytra with reddish-brown posterior and lateral side, similarity with males.

Percent of individuals from different color groups in studied population

Adults	Color groups [%]					
	Gr.1	Gr. 2	Gr. 3	Gr. 4	Gr. 5	Gr. 6
MALES	66.66	20.63	7.93	4.76.	-	-
Females	31.25	28.97	19.88	7.38	6.25	6.25

IWGO –NEWSLETTER XXVI / 2

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

Dirk BABENDREIER[1], Siegfrid KELLER[1], Ulrich KUHLMANN[2], Jörg ROMEIS[1], Stefan TÖPFER[2], Ted TURLINGS[3] and Franz BIGLER[1]

[1]*Agroscope FAL Reckenholz, Swiss Federal Research Station for Agroecology and Agriculture, Reckenholzstr. 191, CH-8046 Zürich, Switzerland, dirk.babendreier@fal.admin.ch; siegfrid.keller@fal.admin.ch; joerg.romeis@fal.admin.ch; franz.bigler@fal.admin.ch;*
[2]*CABI Bioscience Switzerland Centre, Rue des Grillons, CH-2800 Delémont Switzerland, u.kuhlmann@cabi.org; s.toepfer@cabi.org;*
[3]*University of Neuchatel, Rue Emile-Argand 11, CH-2007 Neuchatel, Switzerland; ted.turlings@unine.ch*

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.

IMPACT OF NATIVE STRAINS OF ENTOMOPATHOGENIC FUNGI TO MAIZE INSECT PESTS

Ľudovít CAGÁŇ, Ján TANCIK and Marek BARTA

Department of Plant Protection, Slovak Agricultural University in Nitra

Together 12 *Beauveria bassiana* that were isolated in the former research of the Department of Plant Protection, Slovak Agricultural University from the *Ostrinia nubilalis* larvae and stored at low temperatures. For the next research they were again reactivated (long time passage of strain develops its lower aggressivity) by infection of the *O. nubilalis* larvae and reisolation. Effectivity of native isolates of *B. bassiana* in the control of the European corn borer, *O. nubilalis* in field conditions achieved 10-61 %.

During July 2004 the spores of the *Beauveria bassiana* have been applied to maize plants to influence the attack of *O. nubilalis*, *H. armigera* and *Diabrotica virgifera virgifera* (Western corn rootworm –WCR) to maize plants at two localities.

Only *O. nubilalis* was important pest in 2004. The effectiveness of *B. bassiana* was the highest in the second week of July 2004. It was 45.9 – 60.1 %.

The adults of the WCR were used in laboratory trials where influence of *B. bassiana* strains developed at Slovak Agricultural University were evaluated. The number of dead animals achieved 0 – 33%. The most effective strains will be tested in the next year in field conditions. In field cages the mortality of WCR adults caused by *B. bassiana* was very low.

OBSERVATIONS ON *DIABROTICA VIRGIFERA VIRGIFERA* LECONTE BIOLOGY IN NORTHERN ITALY AND AGRONOMIC MANAGEMENT MEASURES

Costanza JUCKER[1], Ivo RIGAMONTI[2] and Mario COLOMBO[2]

[1] *Biolomb, Fondazione Minoprio, Viale Raimondi 54, I-22070 Vertemate con Minoprio (CO), biolomb@fondazioneminoprio.it,*
[2] *Istituto di Entomologia agraria, Università degli Studi di Milano, Via Celoria 2, I-20133 Milano* Italy, ivo.rigamonti@unimi.it, mario.colombo@unimi.it

In Italy Western corn rootworm (WCR) was first recorded in Veneto in 1998 and now it infests almost 400.000 ha in the Po Valley. The highest population density is in Lombardy, where damages have been observed since 2002. Cause of the great importance of maize for Lombard agriculture, a research Project with the grant of Regione Lombardia, on western corn rootworm in our region started in 2003-4.

To obtain biology information pre-immaginal stages have been monitored collecting soil samples from June 2004. Adult flight was monitored using six typologies of traps: yellow sticky traps (Pherocon AM and Csalomon YST), pheromone / kairomone traps (Csalomon PAL and PALs) and experimental pheromone traps (Novapher Dvv-n and Dvv-l). Larvae were found from the end of June until the end of July. The first collected specimens were larvae II or III so the hatching should have begun at least in the first half of June. Pupae were present from the end of June. Adult flight started at the end of June and ended at the beginning of October. PAL and PALs showed the greater catches but their flight curves showed high fluctuations, probably due to structural problems. Novapher traps had little fewer catches and less intense fluctuation. This makes Novapher Dvv-l very interesting, cause it has a long lasting pheromone dispenser and its management is very simple. Pherocon AM had caught up to 20 times more than the Csalomon YST, exceeding the damage threshold. The Csalomon YST catches were always below the threshold.

In order to determine the cultivations to insert in the rotation we studied the WCR response to five crops (barley, rye, wheat, soybean, alfalfa) and summer maize, sown at the beginning of August. We monitored the adults presence by means of large emergence cages with yellow sticky traps. No adult was caught on the five crops. Some adults instead were collected in summer maize. This could indicate that a little part of the eggs can hatch very late in the season and that a delayed sowing couldn't be effective in eradicating WCR. Moreover summer corn is very attractive to ovipositing females, cause of the fresh vegetation and silks. For these reasons summer corn have to be excluded from crop rotation options.

The effect of four tillage depths (15, 25, 35 and 45 cm) on the survival of WCR larvae was studied too. Samples of roots and soil were collected in June and July to determine larval infestation. The greatest number of larvae was recorded at 45 and 35 cm tillage depth. This seems to indicate that an increase in the tillage depth has no detrimental effect on WCR larval population, but further investigation are needed to confirm this preliminary data.

RESULTS OF IMPLEMENTATION FARMER FIELD SCHOOLS (FFS) IN BOSNIA AND HERZEGOVINA 2004

Nedzad KARIC[1], Husnija FESTIC[1], Meho MAJDANCIC[2], Vojislav TRKULJA[3] and Samid KURTALIC[4]

[1]*Faculty of Agriculture Sarajevo, Zmaja od Bosne 8, 71000 Sarajevo, Bosnia and Herzegovina, hfestic@bih.net.ba ; nkaric@bih.net.ba ;*
[2]*Secondary School of Agriculture Kalesija, 75260 Kalesija, Bosnia and Herzegovina, mehom@inet.ba*
[3]*Institute of Agriculture Banja Luka, Knjaza Milosa 17, 78000 Banja Luka, Bosnia and Herezegovina, vtrkulja@blic.net ;*
[4]*Secondary School of Agriculture Brcko, 49000 Brcko, Bosnia and Herzegovina, samid.k@bih.net.ba*

New educational model introduction in B&H started 2002 trough pilot activities on three locations. Based on results and experiences from previous year in 2003 four FFS groups with 56 farmers are established on location with more intensive corn production. There was one facilitator who facilitated and controlled farmers work for each FFS. Next year there were new 6 FFS groups. So there were summary 10 FFS group: 4 of them where groups of second circle and 6 new groups with new 87 farmers during 2004. Also there was one facilitator and one co-facilitator in every new group (to prevent facilitators domination above group). Work in every group is organised with intention to stimulate and encourage farmers' independent work.

Results got during 2004 showed that this type of education is very good and acceptable for farmers. 56 farmers (groups established 2003) finished second education circle with success. There are summary 143 farmers who participate in this Program and each of them has interest for further work.

FFS Program will be continued 2005. First of all intention is to arise training/education quality so there will not be a lot new farmers groups/ FFS. One of main goal will be establishing of long-term study's and more active farmers participation in WCR problem solving.

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

EDUCATIONAL CAMPAIGN ON WESTERN CORN ROOTWORM

Henk VAN DER MAAREL

Syngenta CP / Region EAME, Stepveldelden 8, 4704RM Roosendaal, The Netherlands

In economic terms, one of the most damaging maize pests is the Western Corn Rootworm *Diabrotica virgifera virgifera*. In the corn-belt of the USA, it has been causing severe yield losses for decades. Now it is also spreading in Europe, and economic damages have been reported.

Driven by the FAO and EU eradication programmes, the awareness of the Corn Rootworm has increased significantly in many European countries. However, many stakeholders in the maize food/feed chain in Europe will still have to go through a steep learning curve regarding the Western Corn Rootworm, its impact and, in particular, various pest management options.

In order to combat this pest effectively, it is critical for agricultural advisors and farmers to improve their knowledge of the Western Corn Rootworm and the control options.

Effective pest management advisors and farmers need:

– to be aware of the problem,
– to understand the pest and the related risks
– to know what measures to take to fight this pest.

Syngenta Crop Protection has taken the initiative and developed an educational package with a DVD and a CD-ROM, which will be distributed to agricultural advisors for self-education or for extension activities . In addition, a poster for distribution to farmers was also developed.

DVD / The Western Corn Rootworm
In a combination of fascinating macro sequences and 3D animations, this educational film impressively illustrates the life-cycle of this pest and the damage larvae and adult beetles may cause. The DVD will become available in many European languages.This film addresses decision makers, officials and agricultural advisors and, last but not least, farmers.

CD-Rom / Biology, Pest Management and Solutions for Control of the Western Corn Rootworm
The results of an extensive literature study, the outcome of many years of field development work regarding the control of the Western Corn Rootworm with Syngenta solutions, such as Cruiser®, Force® and Karate Zeon®, and a broad collection of illustrative materials have been compiled in an easy accessible CD-ROM.
This CD-ROM addresses researchers, agricultural advisors and farmers.

Poster / The Western Corn Rootworm
The adaptation of the life-cycle of the Western Corn Rootworm to the maize crop is impressive. The host – pest relationship of the Western Corn Rootworm with the maize crop is shown in a simple and visual way. Pictures of life stages and damage symptoms are included. A general Integrated Pest Management advice is given.
The poster addresses agricultural advisors and farmers.

® *Cruiser, Force and Karate Zeon are registered trademarks of Syngenta Crop Protection*

MONITORING OF *DIABROTICA VIRGIFERA VIRGIFERA* Le Conte IN ROMANIA IN 2004

Mirela CEAN

Central Laboratory for Phytosanitary Quarantine, 11 Afumati str., Bucharest,Romania 077190,
e-mail address: mirela.cean@lccf.ro

The corn is growing annual approximately on 3 million ha in Romania and about 35% is cultivated in the infested district. For this reason the pest western corn rootworm (*Diabrotica virgifera virgifera* LE CONTE) present a danger for Romanian corn production and its monitoring was carried out since the first occurrence (1996) until now.

The monitoring of WCR in 2004 was carried out by the Ministry of Agriculture, Forestry and Rural Development, by PHARE and FAO support, through the Central Laboratory for Phytosanitary Quarantine, the County Phytosanitary Units and Border Inspections Points. The observations were done from the mid of June to mid-September and were carried out in 27 counties (16 infested counties and 11 non-infested counties. It have been used pheromone traps (Romanian and Hungarian) and yellow sticky traps (Pherocon® AM) which were placed in 229 sites, 135 sites were located in the infested counties (to establish the density of population) and 94 within non infested counties (to detect new infested areas) .The monitoring of larval damages have been performed in continuous maize, using Iowa scale.

Diabrotica virgifera virgifera was caught in 18 out of 27 counties. It was captured for the first time in Harghita and Valcea counties, so the pest is spreading to the centre of the country.

Comparing the population density from last year in 2004 population decreased: total number of captures was 43533 (63.6 beetles/installed traps) while in 2003 total number of captures was 71206 (560.6 beetles/installed trap). In the monitoring sites located on the airports Bucharest, Constanta and Suceava, WCR was not found on any trap.

The highest density of the pest was record in Timis county with 1555.5 beetles/installed trap and the lowest density in Harghita county with 0.2 beetles/installed trap. This year were registered areas with larval damage (lodge plants) on 20 ha in Arad county, only on small farmers. Also, it was noted a strong adult fly in Arad, Alba and Gorj counties.

EXPERIENCES WITH FARMER FIELD SCHOOL ACTIVITIES IN ROMANIA AS AN IMPORTANT PART OF WCR (*Diabrotica v. virgifera*) IPM PROGRAM

Ioan ROSCA[1] and Tomel PETRACHE[2]

[1]*University of Agricultural Sciences and Veterinary Medicine – Bucharest, Bdl. Marasti no. 59, 71322 Bucharest, Romania, rosca@cons.incerc.ro*
[2]*Research and Development Agricultural Station - Lovrin, Str. Principala no. 200, 1957 – Lovrin, Romania, ptomel@yahoo.com*

Romania grew annually about 3 millions hectares of maize that means maize is a very important crop for Romanian farmers. The western half part from our country is infested by *Diabrotica v. virgifera*. The FAO GTFS/RER/017/ITA project (Integrated Pest Management for WCR in Centre and Eastern Europe) targeted to develop IPM of corn through improvement of knowledge of farmers on *Diabrotica v. virgifera*, (identification, biology, ecology, attack, relationship between pest and environmental, control) on corn agroecosistem. In 2004, we developed 10 FFS in 5 counties in Romania, 9 of them from infested area (3 FFS in 2nd cycle, 7 FFS in 1st cycle). In each FFS, farmers developed small field studies (experiments), as response of different hybrids to WCR larval damage, bio-ecological studies, monitoring, different host plant etc.

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

RESULTS OF MONITORING WESTERN CORN ROOTWORM, *Diabrotica virgifera virgifera* IN SLOVAKIA IN 2005

Peter SIVIČEK

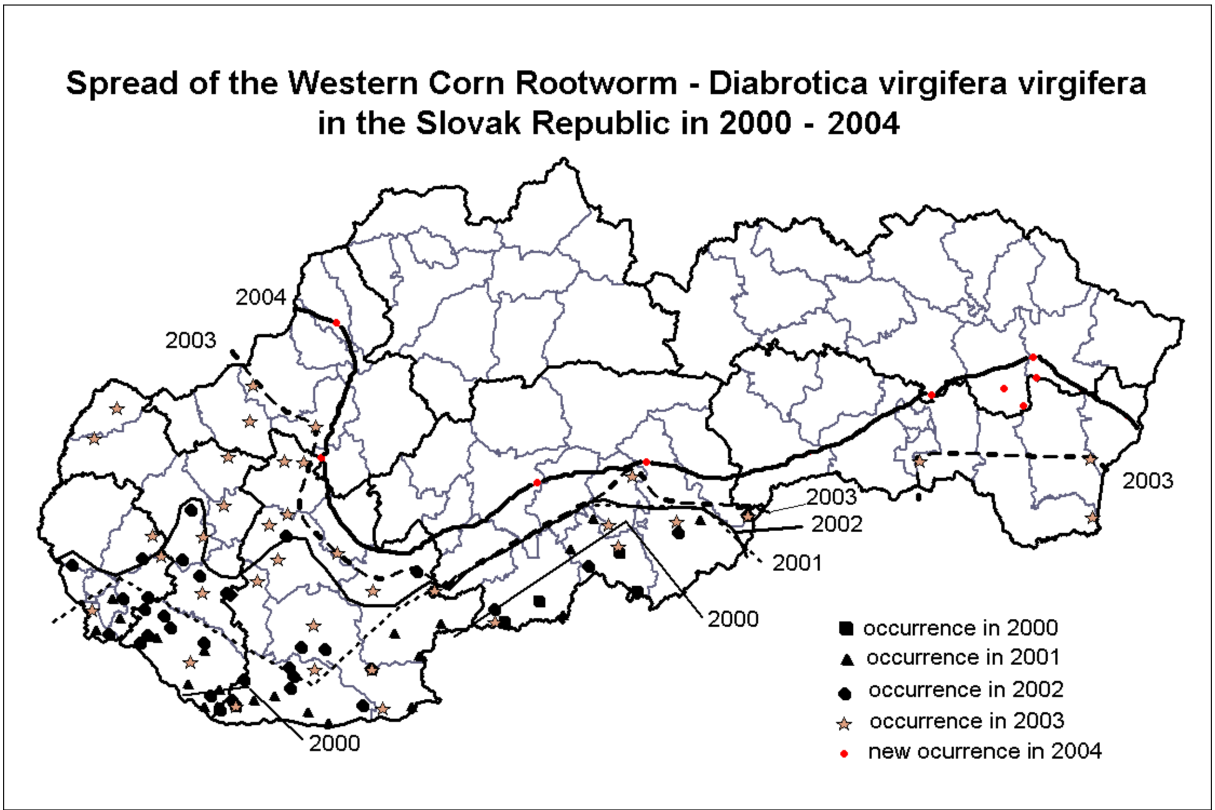
Central Control and Testing Institute of Agriculture, Hanulova 9/A, 844 29 Bratislava 42; p.sivicek@uksup.sk

The first occurrence of the WCR in Slovakia has found in 2000. In 2005 the survey was oriented mainly into east part of Slovakia and to north border of WCR occurrence *Diabrotica virgifera* subsp. *virgifera* LeConte. The yellow traps for monitoring population density in infested areas had been provided by FAO projects GTFS/RER/017/ITA. Phytosanitary inspectors of the Central Control and Testing Institute of Agriculture had carried out the survey.

We used pheromone traps Csalomon and yellow traps Pherocon AM for survey. The monitoring points have been set as in infested as in endangered corn belts. The pheromone and yellow traps had been set together in infested areas. The pheromone traps only had been set in endangered corn belts. The monitoring adults of WCR started in second half June.

In 2004 the WCR was caught 9 743 pcs WCR adults on pheromone Csolomon PAL traps and 1 404 pcs on yellow Pherocone AM traps. More than 35 adults per one yellow Pherocone trap have been caught only in two localities in south Slovakia. It was in Čiližská Radvaň (district D. Streda) and in Somotor (ditrict Trebišov). In spite of this fact no economic damages were found. On the map you can see infested territory.

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



PARTICIPATION BETWEEN FARMERS AND RESEARCH PERSONS ON IPM FOR WCR

Prof. Ľudovít CAGÁŇ[1] and Mgr. Csaba VARGA[2]

[1]Department of Plant Protection of Slovak Agricultural University in Nitra, Slovak Republic
[2]Department of Botanic and Zoology of University of Constantine the Philosopher in Nitra, Slovak Republic

We organized in participation with FAO three Farmer Field School's groups in that region in 2004. We were in a daily contact with farmers in that region. We were planned and setup experiments together, made agro-economical system analysis, discussed our data with national research persons and made risk assessment for our corn areas. In that work we participated with research persons: prof. Ludovit Cagan from Slovak Agricultural University and Ing. Tibor Lukacs from Nova Basta.

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

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

Joachim MOESER and Stefan VIDAL

Institute for Plant Pathology and Plant Protection, Georg-August-University Goettingen, Grisebachstr. 6, 37077 Goettingen, Germany. email: jmoeser@gwdg.de

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 possible failure 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.

MONITORING AND MEASURES AGAINST SPREADING WCR IN THE CZECH REPUBLIC

Jiri ZARUBA

State Phytosanitary Administration, Division of Harmful Organisms, Drnovska 507, Praha 6 – Ruzyne, 161 06, Czech Republic, e-mail:jiri.zaruba@srs.cz

Official monitoring of *Diabrotica virgifera* LE CONTE (herein after only “WCR”) was carried out by the State Phytosanitary Administration (herein after only „SPA“) in year 2004. The SPA placed pheromone traps (type Csalomon PAL only) on 104 localities (one trap on each locality) in the Czech Republic where maize was grown. The monitoring was carried out in period from the 1st July till the 1st October 2004. Altogether 141 males of WCR were captured in period from the 21st July to the 1st October 2004. The SPA concluded, based on the repeated findings of the pest on many places for 2 years that WCR has been established in the region of southern Moravia. This establishment is the result of the active spreading of WCR in Europe by the natural way - from the Slovak Republic (probably), not a result of an outbreak in new area.

The SPA issued the Decision no 39/05/41 from 6th January 2005 with definition of an area infested of WCR (area of continuous spreading of WCR) and the precautionary measures which are in force in the whole area of continuous spreading of WCR (including infested districts) in the Czech Republic for 2005. These are the following:

a) in the maize fields establish a crop rotation that takes place whereby during any period of two consecutive years maize is grown only once, or
b) an appropriate treatment on maize fields is carried out against WCR in the year of growing.

When the results of the survey confirm the presence of WCR outside the area of continuous spreading of WCR in 2005, the SPA will define the focus and safety zones according to Article 3 of the Commission Decision 2003/766/EC and will take all the control measures specified in Article 4 of the Commission Decision.

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

Mario BERTOSSA[1] & Lukas SCHAUB[2]

[1]*Agroscope RAC Changins,CH- 6594 Cadenazzo, Switzerland, mario.bertossa@rac.admin.ch;*
[2]*Agroscope RAC Changins, CH-1260 Nyon, Switzerland, lukas.schaub@rac.admin.ch*

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.

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

Judit KOMÁROMI[1], Péter RÓZSAVÖLGYI[2], Jozsef KISS[1] and Stefan TOEPFER[1]

[1] Szent István University, Department of Plant Protection, H-2100 Gödöllő, Hungary
[2] Farmer Facilitator of Kétegyháza Farmer Field School, Hungary
Komaromi.Judit@mkk.szie.hu, rozsavolgyi_p@freemail.hu, stoepfer@gmx.net, Jozsef.Kiss@mkk.szie.hu

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