IRAC
Insecticide Resistance Action Committee
eConnection

Issue 20

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www.irac-online.org

About This Issue

Welcome to Issue 20 of the IRAC newsletter, eConnection. The newsletters were first introduced by IRAC International in 2004 as one page updates on insecticide resistance news and the activities of IRAC but have increased in popularity, content and distribution over the last 5 years, reflecting the greater membership of IRAC and increased importance placed on resistance management.

In this issue we include the normal updates on IRAC membership, news snippets and upcoming conferences but we also have news on the latest version of the MOA Classification Scheme, an article on the spread of the tomato leafminer, *Tuta absoluta* and an overview of the activities of IRAC-US. At the end of the newsletter is a copy of the latest poster from the new Sucking Pest WG on the mechanisms of resistance of *Myzus persicae*.

Remember if you have any news or resistance topics of interest please let us know so that we can inform others in the IRAC Network. We hope you enjoy the issue.

IRAC Membership News

Company membership of the IRAC Executive remains at 15 (see the end of the newsletter for company names) as previously reported but there has been interest expressed from further companies in Japan which would be very welcome. There has also been interest in forming new resistance Country Groups (CGs) in France and Argentina although this is still in the early stages and the type of group and format is still being discussed.

The number of IRAC International Working Groups (WGs) has dropped from 13 to 12 with the combining of the Sucking Pest and Neonicotinoid WGs, but a new Lepidoptera WG is in the process of being formed which will bring the number back to 13 (see the *Tuta absoluta* article later in the newsletter for details). The WGs and CGs is where most of the resistance management and education activities of IRAC are carried out and we currently have around 160 active team members from the Crop Protection companies as well as from the various institutes and organisations around the world. 26 of the company representatives sit on the IRAC Executive.

IRAC Mode of Action Classification Updated - Version 6.3

The IRAC Mode of Action (MOA) Classification Scheme is considered the definitive reference for insecticide classification and their modes of action. The scheme has become a cornerstone of effective insecticide resistance management and it has been adopted by countries and regulatory authorities around the world.

Version 6 of the scheme was issued in June last year but since then the IRAC MOA WG has continued to discuss and refine the scheme and consider the addition of new insecticides. The latest edition of the scheme, version 6.3, has now been published which includes some minor changes to the classification descriptors as well as the addition of a new *Group 25: Mitochondrial complex II electron transport inhibitors* which includes the active cyenopyrafen. The active cyflumetofen has also been included in the scheme but in the group for *Compounds of unknown or uncertain MOA* until further information is available on its MOA.

IRAC Mode of Action Classification v 6.3, July 2009		
Main Group and Primary Site of Action	Chemical Sub-group or exemplifying Active Ingredient	Active Ingredients

The MOA WG is currently working on updating and producing new pest-group specific MOA posters covering Lepidoptera, sucking and mite pests. An updated version of the MOA "structures" poster showing the groups, actives and chemical structures has also been produced based on Version 6.3 of the scheme and this will be printed for distribution shortly. For the latest versions of the MOA scheme and posters check the IRAC website www.irac-online.org.

IRAC News Snippets

- The Public Health Team is in the process of updating and re-issuing the publication "Prevention and management of inspective resistance in vectors and pests of public health importance". The new edition should be available for distribution early next year.
- The International Diamide WG continues to establish local WGs around the world focusing on resistance risk pests and crops. They have also formed three sub-groups looking at a) developing susceptibility test methods for Group 28 actives, b) compiling a decision tree response plan to tackle any reported shifts in susceptibilities and c) making IRM recommendations for multiple cropping scenarios or short-cycle crops.
- The Sucking Pest and Neonicotinoid WGs have combined to form a new Sucking Pest WG covering the goals and objectives of both teams. The new WG has so far held two conference calls and work is underway on developing several pest-specific posters (see the poster at the end of the newsletter). They are also compiling a questionnaire to survey the status of resistance in *Myzus persicae* in stone fruit and vegetables.
- IRAC Susceptibility Test Methods have been updated with a new numbering system (001 - 016) and further test methods described in journal papers etc. have been added to the eMethods search tool available on the IRAC website.

Tuta absoluta on the move

The tomato leafminer, *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) is a serious endemic tomato pest in South American countries, but recently its geographical distribution has expanded to Europe, where for the first time at the end of 2006 it was found in Spain. By 2009 it had spread to several other Mediterranean countries such as Italy, Algeria, France, Greece, Tunisia, Morocco, Libya and Malta. In addition, in 2009, it was also detected for the first time in the Netherlands and Switzerland. *T. absoluta* is considered to be a neotropical pest, oligophageous on solanaceous crops, attacking primarily tomato production systems, but also potatoes and more recently the common bean plant (*Phaseolus vulgaris*), as reported in Italy.


Larva of *Tuta absoluta.* *


Damage of *Tuta absoluta* on tomatoes *

T. absoluta is a particular problem in tomatoes, infesting plants throughout the entire crop cycle with the damage primarily visible on the leaves, but also on the stems, leading to leaf abscission and plant malformation. Whereas other leafminers such as the dipteran pest *Liriomyza trifolii* usually causes a yield decrease of 10-20%, *T. absoluta* can damage tomatoes by 90-100%. Usually the life-cycle from egg to adult completes within 30-40 days depending on temperature, thus allowing up to 12 generations per year in closed conditions. Females lay approx. 250 eggs during their lifetime, and feeding damage is caused by four larval instars until pupation.

Within the IRAC Mode of Action Classification Scheme several groups of insecticides are known to have potential for effective control of this pest. At least 12 chemical classes of insecticides addressing a similar number of different target sites (nerve, muscle, growth & development, midgut) are known for *T. absoluta* control. Several nonchemical measures are available to control or limit the impact of this pest, e.g. Predatory bugs such as *Macrolophus caliginosus* or the use of pheromone traps to catch male adults. Furthermore the removal of old plants, fruits and weeds as well as the use of insect nettings stopping adults from entering greenhouses, are important preventive measures.

The insecticide resistance status of tomato leafminer populations has not been widely investigated in detail, but control failures with established chemical classes have been described in Latin America. Laboratory investigations on insecticide resistance in field strains of *T. absoluta* revealed reduced insecticidal efficacy particularly for pyrethroids, organophosphates, nereistoxin analogues and avermectins (e.g. Siqueira et al., 2000, 2001; Lietti et al., 2005). Newer classes of insecticides introduced for leafminer control often provide good activity but these modes of actions need to be conserved by implementing resistance management strategies for sustainability, both of the insecticidal efficacy and crop production.

Partly as a response to the increasing global threat from *T.* absoluta but also considering wider problems, IRAC is currently in the process of establishing a Lepidoptera Working Group where the initial focus will be the investigation of the resistance status of *T. Absoluta* and the development of resistance management strategies for this pest.

References

Lietti MMM et al. (2005) *Neotropical Entomol* **34**: 113
Siqueira HAA et al. (2000) *Agric Forest Entomol* **2**: 147
Siqueira HAA et al. (2001) *Int J Pest Manag* **47**: 247

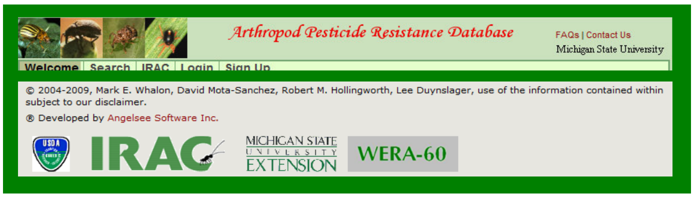
Photographs: Courtesy: Francisco Lozano, Bayer CropScience, Brazil.

IRAC-US Update

IRAC-US was the first Country Group organized after the formation of IRAC International in 1984. The purpose of IRAC-US is twofold: first, to facilitate education and communication on insecticide resistance, and second, to promote the development of resistance management strategies to preserve the efficacy of crop protection and public health pest control products.

As IRAC-US has matured, the emphasis of the organization has shifted from its original focus on cotton to a wide range of other crops and now includes resistance in disease vectors and urban pests. It is now realized that in order to maintain the effectiveness of current products the frequency of resistance genes must be kept low. To do this all pest control methods must be incorporated into any resistance management program.

IRAC-US has collaborated with IRAC International, and other IRAC Country Groups and teams to develop standard resistance test methods, the Mode of Action classification scheme, and the IRAC website. IRAC-US has also worked with commodity groups such as the National Cotton Council, Cotton Incorporated, the National Potato Growers Association, the EPA and others to improve our knowledge of resistance issues. These efforts have been accomplished by funding limited resistance research, giving presentations on resistance to crop associations, e.g., the NAICC (National Association of Crop Consultants), providing forums for the discussion of resistance issues, sponsoring of symposia, and conducting a few focused resistance-monitoring programs. Symposia sponsored at the National Meeting of the Entomological Society of America have touched a wide range of topics. For instance, in 2005 the symposium was entitled, “Insecticide Sustainability: Neonicotinoids.” In 2006 the symposium was, “Lessons Learned from Long-Term Insecticide Resistance Management Programs,” in 2007 it was “Overview of Global Public Health Problems,” and last year was “Entomology Without Borders - The Next Stage in Resistance Management.”



IRAC US, in cooperation with IRAC International, has worked closely with Michigan State University (MSU) and supported the development of the MSU Arthropod Pesticide Resistance Database (APRD). This is accessed via a website (www.pesticideresistance.com) as a public service, for use by resistance management practitioners around the world. The database contains reports of resistance cases from 1914 to the present and in addition to the historical database of published instances, IRAC is adding an annual expert survey of key geographies. The IRAC companion survey will attempt to put the current status and significance of resistance issues into perspective.

IRAC US continues to sponsor research focused on resistance issues in the region. For the past 4 years or so IRAC-US has sponsored research on the resistance of *Heliothis zea* to pyrethroids at Texas A&M University and recently agreed to sponsor a survey of resistance in *Spodoptera frugiperda* as part of a resistance management program in Puerto Rico.

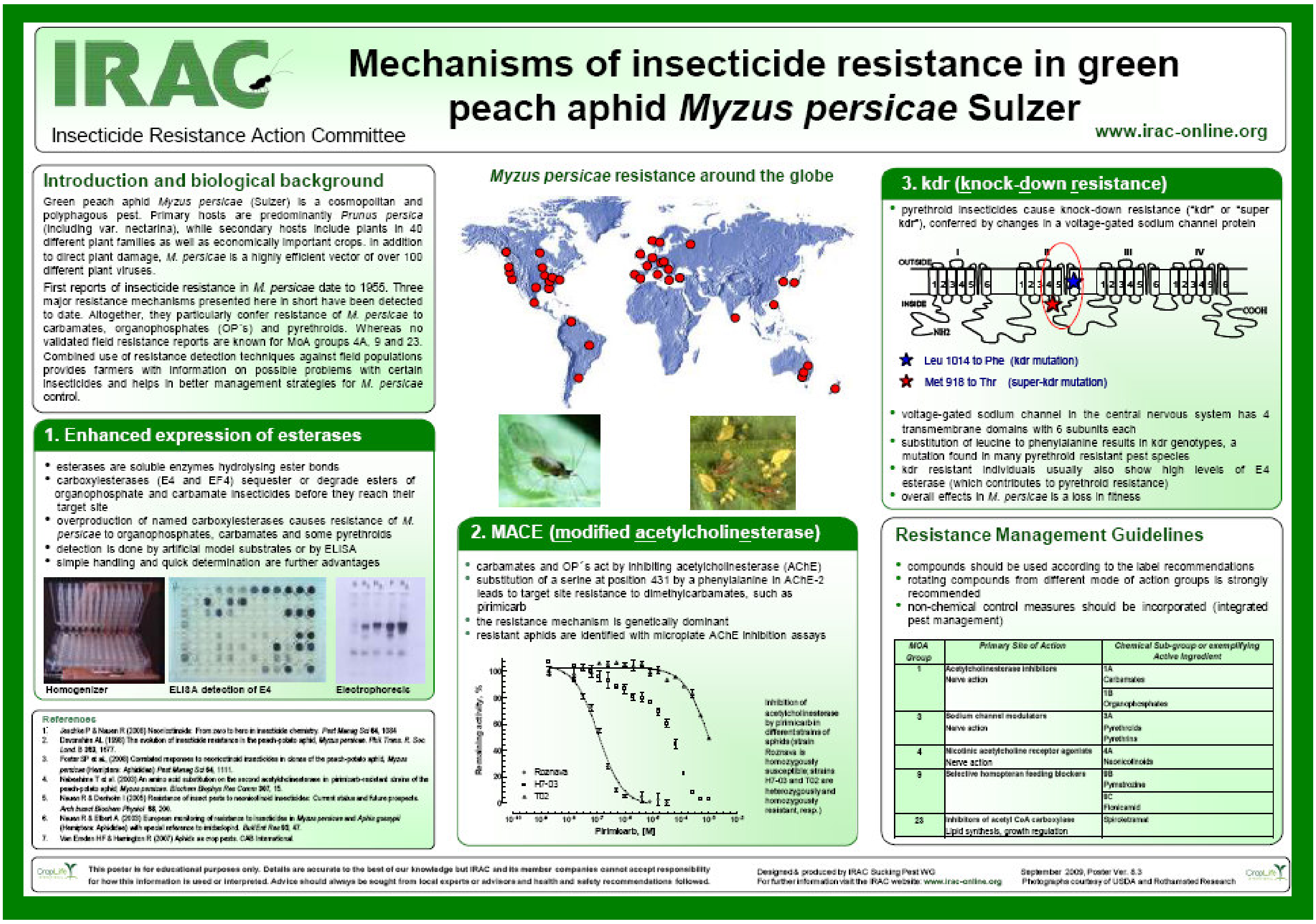
What’s next for IRAC-US? This country group will continue its efforts to educate users on resistance management principles. It will encourage the development of truly integrated resistance management programs that will, of necessity, be more sophisticated than current programs including the pest, the crop, surrounding crops and agricultural practices, etc.

Conferences & Symposia

- 5th International Congress of Vector Biology, Belek-Antalya, Turkey, October 11-16, 2009
- North American Plant Protection Organization (NAPPO) Annual Meeting, Chicago, October 19-23, 2009
- Pan Africa Malaria Vector Control Conference,Tanzania, October 25 - 29 2009
- NPMA, PestWorld, Las Vegas, USA, October 26-29, 2009
- 4th Meeting of EPPO Resistance Panel (by invitation only), Vienna, October 27-28, 2009
- 5th MIM Pan-African Malaria Conference, Nairobi, Kenya, November 2-6, 2009
- BCPC Congress and Exhibition, Glasgow, Scotland, November 9-11, 2009
- 5th International Bemisia Workshop, Guangzhou, China, November 9-12, 2009
- Entomological Society of America, Indianapolis, USA, December 13-17, 2009
- Beltwide Cotton Conferences, New Orleans, US, January 4-7, 2010
- 76th Meeting American Mosquito Control Assoc, Lexington, Kentucky, US, March/April 28-1, 2009
- IUPAC Pesticide Chemistry, Melbourne, Australia, July 4-8, 2010
- IXth European Congress of Entomology (ECE2010), Budapest, Hungary, August 22-27, 2010

Links to the conference websites where available can be found on the events page of the IRAC website.

Recent poster on *Myzus persicae* produced by the IRAC Sucking Pest WG



Feedback

The eConnection is prepared by the IRAC Communication & Education WG and supported by the 15 member companies of the IRAC Executive. If you have information for inclusion in the next issue of eConnection or feedback on this issue please email aporter@intraspin.com.

IRAC Executive Member Companies

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