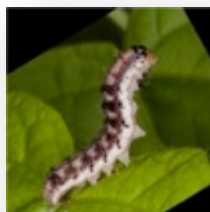




Insecticide Resistance Action Committee

IRAC Task Teams

50th IRAC International Meeting, Dublin
April 5-8th, 2016



Antitrust Law Reminder

for all CropLife International meetings

“IRAC Committees and IRAC Members should be aware that while some activities among competitors are both legal and beneficial to the industry, group activities of competitors are inherently suspect under the antitrust laws.

Agreements or combinations between or among competitors need not be formal to raise questions under antitrust laws, but may include any kind of understanding, formal or informal, secretive or public, under which each of the participants can reasonably expect that another will follow a particular course of action.

All IRAC Members have a responsibility to see that topics, which may give an appearance of an agreement that would violate the antitrust laws, are not discussed during meetings, conference calls or in any other forum.

It is the responsibility of each member in the first instance to avoid raising improper subjects for discussion and the purpose of the Antitrust Guidelines is to assure that participants are aware of this obligation”

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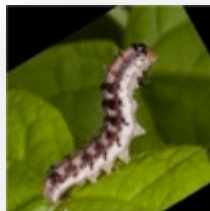
Agenda (PM)

- 1345 IRAC Task Team 1: Brazil. Summary of activities – R. Slater
- 1430** **Coffee/Tea**
- 1500 IRAC Task Team 2: Mediterranean - *Tuta absoluta* (tomatoes)
- 1545 IRAC Task Team 3: Lepidoptera Management in Puerto Rico
- 1630 Integrated IRM, chemistry foliar & seed treatment/trait/biological
- 1715** **End of day**



Insecticide Resistance Action Committee

**1st IRAC Task Team
IRM in Brazilian Corn, Soybean & Cotton
2015**



• 1st Task Team meeting

- Idea of IRAC task teams was first discussed in 2014 by IRAC International members.
 - Address key insecticide resistance issues globally.
 - Bring together key experts from: IRAC International, IRAC regional group & agronomy experts.
 - A temporary 'task team' to address a specific need.
- The importance of Brazilian agriculture and potential risks of insecticide resistance development in the soybean-cotton-corn cropping systems = number one priority.
 - STEP 1: Workshop with key stakeholders & influencers
 - STEP 2: IRAC use information to develop IRM advice & guidelines.
 - STEP 3: Communication of recommendations & feedback from stakeholders
 - STEP 4: Communication plan

IRAC Task Team Workshop: Objectives

PURPOSE

- To promote a sustainable and economically viable insect pest management program in the Soybean-Corn-Cotton crop complex in Brazil (Green-bridge cropping) for both transgenic and conventional crop systems.
- To minimize the risk of the development of insecticide resistance in 'green-bridge' crops, through the use of IRM & IPM.

OBJECTIVES

- **To provide agreed cross-industry advice for best practice insect control for economically important pests of cotton-corn-soybean (both transgenic & conventional varieties)**
- Co-ordinated communication of best practice to growers and grower influencers & product supply chain.
- To gain a better understanding of current grower practices and determine the level of IRM considerations when managing insect pests in the given crops.

OUTPUT

- Aligned IRM guidelines for different crop systems (Technology rather than product focused), communicated through multiple channels.
- Demonstration of benefits of applying IRM strategy (Modelling resistance dev. & value to growers).
- Educational materials to promote IRM to end-users and application decision makers.

OUTCOME

- Retardation of insecticide and insecticidal trait resistance development.
- Prolonged sustainability of insect control solutions
- Economic benefits for growers through reduced inputs and added grower convenience.
- Sustained IRM effort of industry and growers.

IRAC Task Team Workshop: Participants

SEED & CHEMICAL INDUSTRY

- IRAC company representatives (Global & Regional)
- IRAC Task team leadership & co-ordinator

INDUSTRY REPRESENTATIVES

- Croplife Brazil (Legal) ANDEF
- AENDA
- ABRASEN

GOVERNMENT

- Ministry of Agriculture representative (ANVISA)
- EMBRAPA
- Extension services (EMATER, CATI)

GROWERS REPRESENTATIVES

- Growers associations
- Foundation MT
- CCAB

TECHNICAL EXPERTISE (official research)

- Celso Omoto, Raul Guedes – IRAC Brazil
- Paulo De Grande.....others

IRAC Brazil Task Team Meeting: DAY 1

- Objective of 1st Day: Obtain a realistic view of current crop management practices & grower behaviours for each of the three crops & major regions of Brazil.
- Engage MAPA (Ministry of Agriculture) & EMBRAPA (Extension service) in IRM discussion.
- Key influencers and stakeholders from major regions invited to present.

	Session	Purpose	Presenter
Tuesday 3rd March	Welcome	IRAC.	Fabio Andrade
	Introduction	Agenda, Admin details, Objectives of meeting.	R.Slater
	Presentation 1	Agricultural practice & Grower behaviour of Corn-Cotton-Soybean growers in different regions of Brazil & LATAM	Dirceu Gassen
	BREAK		
	Presentation 2	Corn-Cotton-Soybean - Pests & Resistance situation	Celso Omoto
	Presentation 3	GTMR - Introduction, objectives and status	GTMR representative
	Close	Closing remarks and next steps	R.Slater / Fabio Andrade
	LUNCH		
	Presentation 4	Corn-Cotton-Soybean - Insect Management in BA	Celito Breda/Milton Ide
	Presentation 5	Corn-Cotton-Soybean - Insect Management in MT	Lucia Vivan
	BREAK		
	Presentation 6	Corn-Cotton-Soybean - Insect Management in MS/GO	Germison Tomquelski
	Presentation 7	Corn-Cotton-Soybean - Insect Management in Southern Region (RS/PR/SC and SP)	Jerson Guedes/Geraldo Papa
	Close	Closing remarks and next steps	R.Slater / Fabio Andrade
	GROUP DINNER		

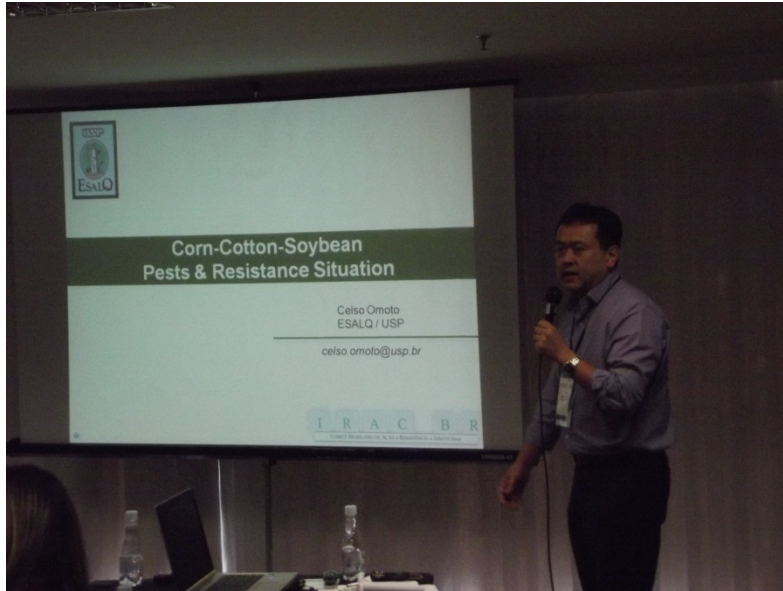
IRAC Brazil Task Team Meeting: DAY 2

- Objective of 2nd Day: To determine level of cross industry/independant advisor alignment of individual & cross-crop IRM.
- Aim was to provide basis for an IRAC International/Brazil IRM recommendation
- No expected to complete recommedations during meeting.
- All presentations will be made available on IRAC Brazil web-site.

		Session	Purpose	Presenter	
Day 2	Wednesday 4th March	Interactive Intro	Introduce interactive session & agenda	R.Slater	
		Presentation 8	Presentation of Draft IRM recommendations from IRAC	C.Pilcher/R.Slater/T.Dennehy	
		Group session 1	Group sessions (IRM recommendation development): 4 groups - Corn-Cotton-Soybean-Multi Crop	4 Groups	
		BREAK			
		Group session 1	Continuation - Group sessions (IRM recommendation development): 4 groups - Corn-Cotton-Soybean-Multi Crop	4 Groups	
		LUNCH			
		Group Feedback	Group Feedback (30 min each)	Group leads	
		BREAK			
		Team Work	Open discussion & IRM recommendation development	tbc	
		Close	Closing remarks and next steps	tbc	
		CLOSING APERO			

40-50 Participants

Information on resistance risks, agricultural practice, economics and concerns captured.



- Over following 9 months IRM guidelines for soybean, cotton & corn developed by working group of IRAC International & IRAC Brazil colleagues.
- Guidelines targeted to crop advisors, farm managers, influencers.
- Ongoing step to translate to Portuguese and disseminate information by IRAC Brazil.



NOTE: In the following document the word 'insecticide(s)' refers to chemical & biological insecticides which are applied as either foliar, soil or seed treatments. It does not include plant incorporated proteins (PIP) which have insecticidal activity.

- **Only apply insecticides at economic pest thresholds**

Follow locally established economic pest thresholds for the application of foliar insecticides in order to optimize insecticide use. Always use labeled rates and water volumes.

- **Use windows of insecticide application**

Use windows of application to minimize exposure of sequential generations of an insect pest species to the same insecticide modes of action. Each window should be approximately 30 days to coincide with a single generation of the target insects.

- **Rotate insecticides with different modes of action.**

If more than one insecticide application is required during an application window then it is recommended to use an insecticide which has a different mode of action. However, multiple applications of insecticides with the same mode of action within a single window are acceptable as long as combined effects (residual activity) of the applications do not exceed the 30-day window.

- **Insecticide seed treatments**

Seeds which have been treated with an insecticide seed coating may not provide control of insect pests for the duration of window 1 (30 days). If an additional foliar insecticide application is required in the window it is strongly recommended that the foliar insecticide be applied no later than 25 days after seeding and for best IRM practice belong to a different mode of action group to the insecticide seed coating. Insecticides with the same mode of action as the seed coating should not be used for at least 30 days after the end of the first window.

- **Insecticide mixtures**

Insecticide mixtures may offer benefits for pest control and/or IRM when appropriately incorporated into rotation strategies with additional modes of action, but generally a single mixture should not be relied upon alone.

- **Preserve non-target & beneficial organisms**

The use of selective insecticides with reduced impact on non-target and beneficial organisms is recommended whenever possible.

- **Avoid insecticides which have existing resistance problems**

Consult with local experts to determine which insecticides are affected by resistance in your locality. A preference to insecticides which are not affected by resistance should be given.

- **Manage crop post-harvest stubble & volunteers**

Scout the field during pre-sowing burn down with a herbicide and if insects are observed in the remaining crop residues, the use of foliar applied insecticides is recommended for their control.

- **Rotate crops**

It is recommended that subsequent or parallel crop sowings be of a different crop type. Sequential planting of the same crop can significantly increase both pest populations and the risk of resistance. Polyphagous insect pest species (e.g. *Spodoptera frugiperda*, *Helicoverpa armigera*) are particularly at risk from being exposed to insecticides and insecticidal proteins with the same mode of action across different crop plantings and special attention should be paid to minimize their exposure to insecticides and insecticidal proteins with the same mode of action.

Recommendations specific to soybean expressing Bt proteins

- **Refuge**

The sowing/planting of a minimum 20% area of soybean refuge (Non-Bt) within 800m of the Bt soybean is considered mandatory. An in-field strip refuge is recommended for maximum effectiveness.

- **Use of foliar insecticides in the refuge should be minimised**

The application of insecticides to the non-Bt refuge can reduce the resistance management benefits of sowing the refuge. Therefore it is recommended to minimize the use of insecticides applied to the refuge.

- **Follow seed suppliers guidelines on the foliar spray thresholds in the Bt crop and the refuge.**










Under high pest pressure the application of insecticides may be necessary in both the Bt crop and the refuge crop. It is recommended to follow the seed suppliers recommendations on the appropriate foliar spray thresholds.


- **Rotate crops**

It is recommended that subsequent or parallel crop sowings be either a non-host crop or a conventional variety of soybean, whenever feasible.



Foliar application of insecticides at locally agreed pest threshold.
Do not to use same insecticide MoA used in previous window and subsequent crop sowing

		Pre-Planting Window	Window 1 (VE-V5)	Window 2 (V6-R1)	Window 3 (R2-R4)	Window 4 (R5-R6)	
Conventional Soybean	Lepidoptera 	Foliar Insecticide MoA W	Insecticide Seed Treatment (MoA Y) Seed treatment or foliar	Foliar Insecticide MoA Z	Foliar Insecticide MoA Z	Foliar Insecticide MoA X	Foliar Insecticide MoA Z
	Stink Bug 			Foliar insecticide MoA Q		Foliar Insecticide MoA X	
	Whitefly 				Foliar insecticide MoA Q		
Bt Soybean MAIN CROP	Lepidoptera 	Foliar Insecticide MoA W	Foliar Insecticide (MoA Y) Seed treatment or foliar	Foliar Insecticide (MoA Y)	Foliar Insecticide MoA Z	Bt toxin (single or stacked): MoA Group 11	
	Stink Bug 			Foliar insecticide MoA Q		Foliar Insecticide MoA X	
	Whitefly 				Foliar insecticide MoA Q		
Bt Soybean REFUGE	Lepidoptera 	Foliar Insecticide MoA W	Insecticide Seed Treatment (MoA Y) Seed treatment or foliar	Foliar Insecticide MoA Z			
	Stink Bug 			Foliar insecticide MoA Q		Foliar Insecticide MoA X	
	Whitefly 				Foliar insecticide MoA Q		
		Pre-Planting (dessecação)	Plan ting	Vegetative	Reproductive		Harvest



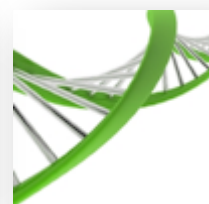
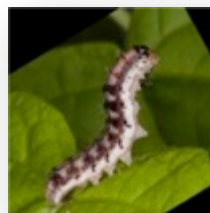
**What was good, what was difficult
and what should we
do differently in future IRAC Task teams ?**



Insecticide Resistance Action Committee

IRAC Task Team, Brazil
Summary of Activities
Good, Difficult, Different Analysis

50th IRAC International Meeting, Dublin
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Good, Difficult, Different Analysis

Good:

- An important IRM initiative with IRAC leading
- Enabled IRAC traits and chemistry teams to work together for the first time
- The alignment between the chemistry and trait teams was good
- Participation by everyone involved was great and created a good feeling
- External groups were very positive about being involved

Good, Difficult, Different Analysis

Difficult:

- Only working with countries as a whole rather than regional
- Estimating grower value
- Need more data
- High expectations of IRAC
- Lack of follow-through and implementation
- Next steps, working with external groups

Good, Difficult, Different Analysis

Different:

Pre-Meeting

- More pre-work needed, surveys before meeting
- How to measure success? What are the measurables? Carry out market surveys
 - What do people know about IRAC
 - Available literature out in the market

At the Meeting

- Fewer technical presentations - interesting but not a good use of time
- More time needed for breakout sessions
- Language issues – cost of translators would be worthwhile
- Move things along faster
- Use of a facilitator or consultant to speed up the process
- Some areas undecided - capture more information pre and post workshop
- Difficulty of working across companies
- We need the right people/groups attending - different reps from different regions
- More planning as to what will be the end product

Post Meeting

- Implementation - how to influence at the end of the day
- Use of demonstration trials sponsored by IRAC
 - Difficult however over several seasons
 - Perhaps only of benefit to demonstrate refuge
i.e. core concept - don't need to spray refuge
- Should output be published in a paper? e.g. farmers journals, newspapers etc.
- Better dissemination of information – need to plan for this
- Early feedback for growers
- Need follow-up workshops