Insecticide Resistance Action Committee

Mode of Action WG

48th IRAC International Meeting

19th March 2013

- Session -





IRAC

MoA WG Team Members: 2012-2013

- Dan Cordova - DuPont
- Fergus Earley - Syngenta
- Peter Luemmen - Bayer
- Danny Karmon - MAI
- Shigeru Saito – Sumitomo
- Ralf Nauen - Bayer
- Vincent Salgado – BASF - Deputy
- Tom Sparks – Dow - Chair
- Jerry Watson – Dow
- Georgina Bingham Zinanovic – Vestergaard Frandsen

- Excellent support from Alan Porter

MoA WG Activities

2012 - 2013

- Indianapolis F2F – Mar. 2012 (8 participants and ~12 guests)
- Three conference calls
  - June . 2012 (7 participants)
  - Oct. 2012 (7 participants)
  - Jan. 2013 (9 participants)
- This week - face-to-face meeting
  - Session 3B (Jealotts Hill, March 20th)

Company participation has been relatively constant for the past 5 years - eight (8) companies

- BASF, Bayer, Dow, DuPont, Makhteshim-Agan, Sumitomo, Syngenta, Vestergaard Frandsen

MoA Classification Objectives

The IRAC Mode of Action (MoA) classification provides farmers, growers, advisors, extension staff, consultants and crop protection professionals with a guide to the selection of insecticides or acaricides for use in an effective and sustainable insecticide or acaricide resistance management (IRM) strategy.

MoA WG Activities

- **IRAC MoA Working Group Charter**

- Resistance management strategies require a rigorous classification of insecticides based on parameters that reflect the likelihood of common resistance mechanisms between groups. Because mode of action is the most fundamental property of an insecticide family, the Mode of Action Working Group is charged with developing and maintaining this classification. The classification is to be based on the best available information about the target site, but may incorporate any additional information that helps IRAC better achieve its mission of developing sound resistance management strategies.

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IRAC Insecticide Resistance Action Committee

eConnection

What are Mode of Action (MoA) Subgroups?

The IRAC MoA Classification ensures that insecticide and acaricide users are aware of MoA groups and that they are a sound basis on which to implement season-long sustainable resistance management strategies. But what are subgroups?

There are multiple instances of subgroups within MoA groups in the IRAC MoA Classification Scheme. Subgroups represent distinct chemical classes which share a common insecticidal target site and are sufficiently unique so as to have a reduced risk of cross-resistance when resistance is mediated by metabolic rather than target site based mechanisms. As insecticides from different subgroups may be metabolized by distinct enzymes, they have reduced risk for cross-resistance over insecticides within a subgroup.

Is it appropriate to rotate between subgroups?

The cross-resistance potential between subgroups is higher than between different MoA groups, therefore it is not advisable to rotate between subgroups unless there are no alternatives among other MoA groups. In the absence of a suitable rotation group option, it may be possible to rotate insecticides between subgroups if it is clear that cross-resistance mechanisms do not exist in the target insect populations. Knowledge and experience of cross-resistance patterns, resistance mechanisms, and furthermore pest, crop and region should be considered. Consequently, consultation with local experts for advice and information as to existing resistance mechanisms in the pest population being treated, is strongly recommended.

Where can I find more information on subgroups and their use?

For details on specific subgroups and their use, please consult the MoA Classification scheme: (http://irac-online.org/teams/mode-of-action/).

Additionally, a recent publication provides an excellent overview of the objective of the MoA working group and the use of the MoA Classification Scheme:

R. Nauen, A. Elbert, A. Mccaffery, R. Slater, T.C. Sparks, IRAC: Insecticide resistance, and mode of action classification of insecticides, In W. Kramer, U. Schirmer, P. Jeschke, M. Witschel (Eds.), Modern Crop Protection Compounds: Vol. 3 Insecticides, 2nd ed., Wiley-VCH, Weinheim, GR, (2012), pp.935-955.

IRAC

MoA WG

Updated MoA Structure Poster

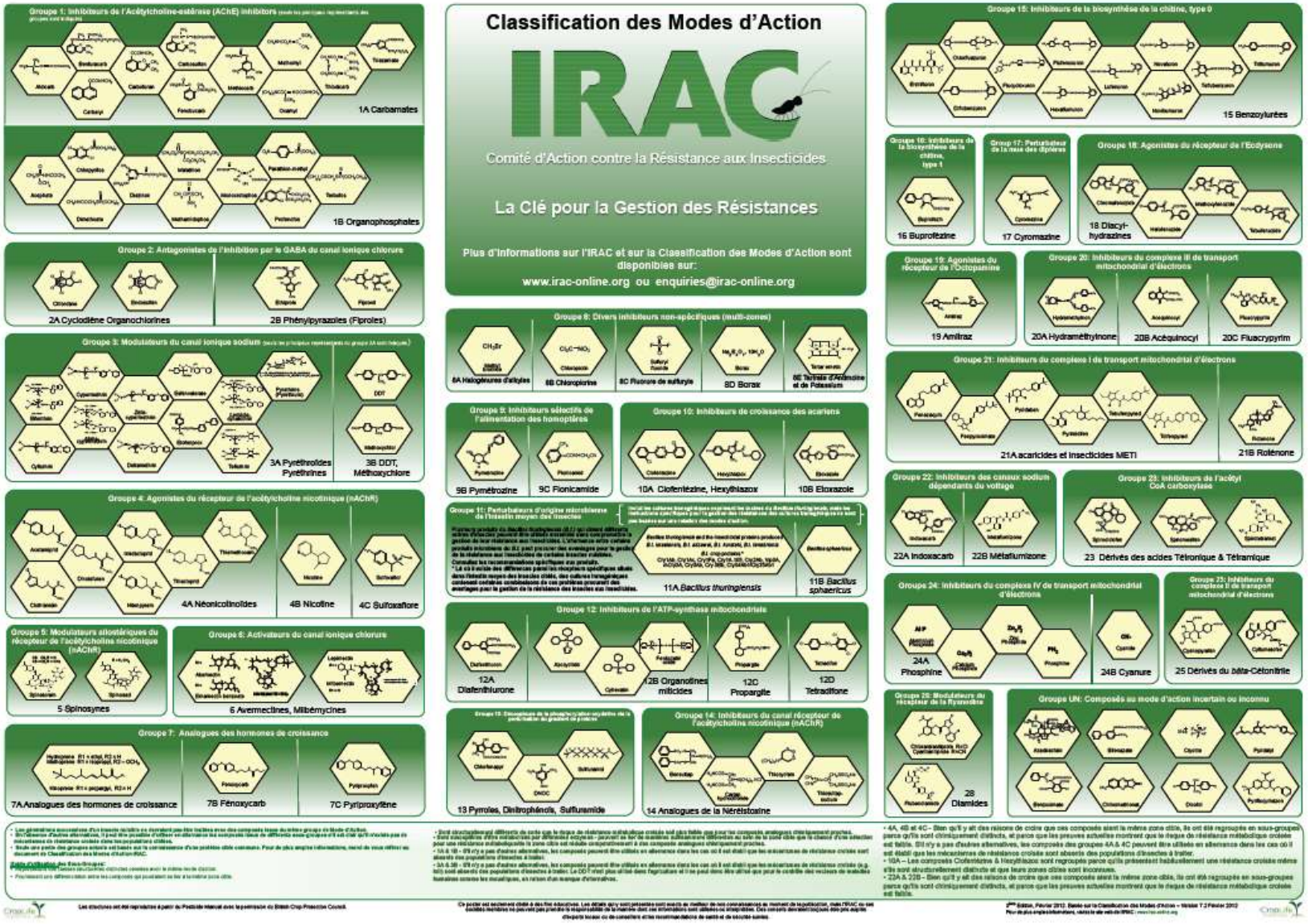
- minor revisions of some wording - Clean-up of some structures

Next version – when needed

MoA Structure Poster Translations (all recent or updated)

- Chinese
- French
- Japanese
- Portuguese
- Spanish
- Other languages – as needed (suggestions welcome)

MoA Structure Poster - French



MoA WG – Web Usage

Numbers in black are from 2011, those in **blue from 2012**
Numbers shown are unque page views as distinct from total page views

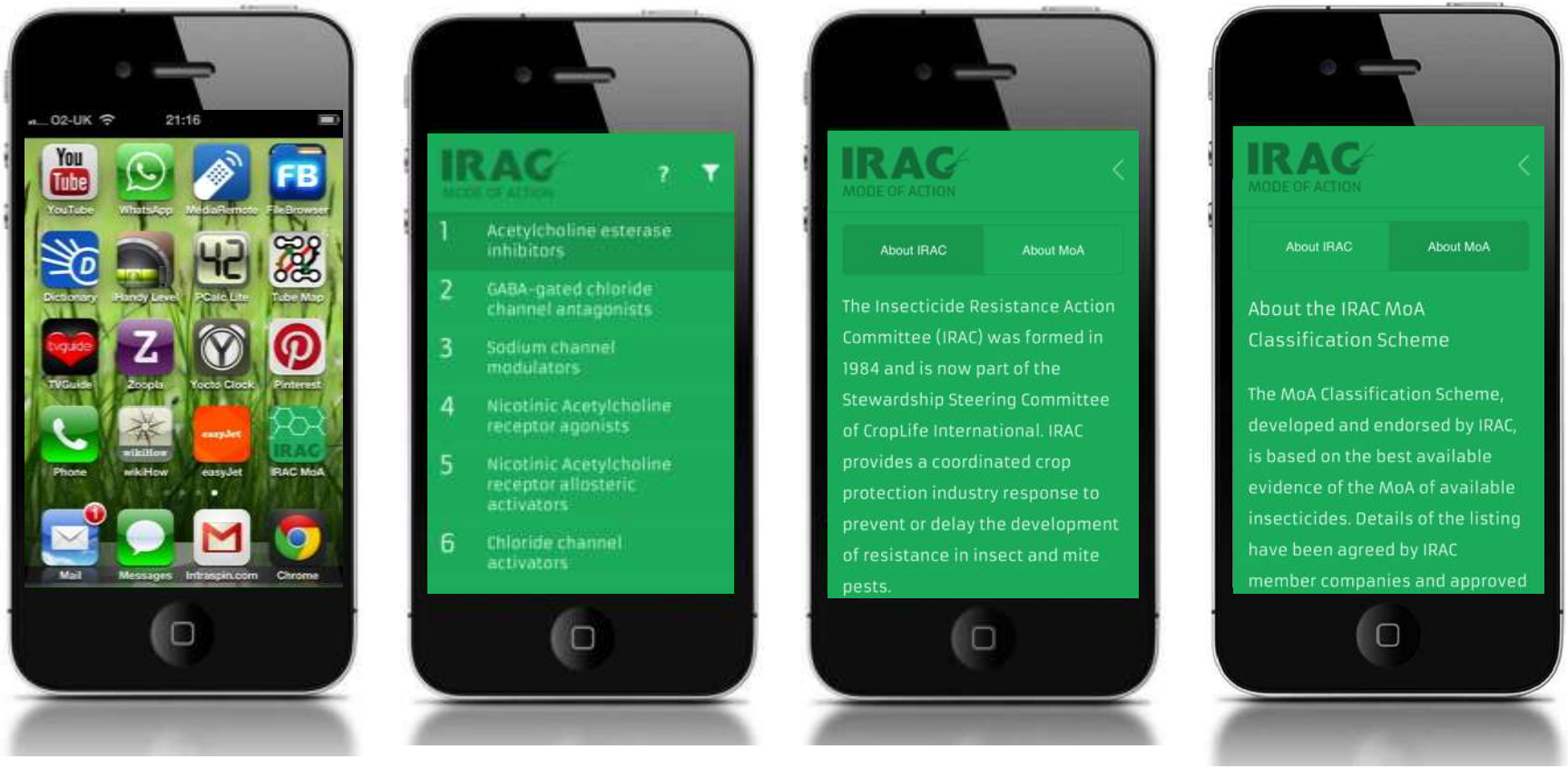
- MoA Team page = 9484 page views (12,376)
  - (3rd most popular page - 1st = home, 2nd = Resources) (2nd most popular page)
- MoA Classification = 3986 (Most popular download) (5798) + Vectors (905)
- MoA Posters
  - MoA General = 296 (596)
  - MoA Leps = 301 (235)
  - MoA Sucking Pest = 295 (235)
  - MoA Acaricides = 278 (290)
  - MoA Mosquito = 337 (483)
  - Structures (English) = 618 (1088)
  - Structures (Chinese) = 62 (70)
  - Structures (Portuguese) = 89 (141)
  - Structures (Spanish) = 820 (435)
  - Structures (Japanese) = (35)
- MoA Booklet = 268 (233)

Total MoA Poster downloads ~ 3600

Data from Alan Porter

IRAC

MoA Phone App
in Cooperation with C&E Team



MoA WG Activities

- Target site mutations Listings
  - Includes references for each listing / mutation
- Lead by Dan Cordova

IRAC Group	Target Site	Mutation	Mutation Common Name	Affected Organisms	Field Relevance	References
1	Acetylcholinesterase					
		S431F, A302S		A. gossypii	Yes	Andrews et al 2004 Insect Mol Biol, 13:555; Toda et al 2004, Insect Mol Biol, 13:549;
		Δ3Q		B. oleae	Yes	Kakanie et al 2008 Insect Biochem Mol Biol, 38:781
		G119S, A201S, A280T, F331C/Y/W, G328A, F331W		T. urticae, T. evansi	Yes	Khajehali et al 2010, Pest Manag Sci, 66:220; Carvalho et al 2012, Pest Biochem Physiol, in press
2	GABA-gated Cl- channel					
		A302S (A301G), T350M	rdl	D. melanogaster, D. simulans, B. tabaci	Yes	ffrench-Constant et al 1993, Nature 363:44; Le Goff et al 2005, J Neurochemistry 92:1295; Anthony et al 1995. Pest Biochem Physiol 51:220
3	Voltage-gated Na+ Channel					
		V410M		H. virescens		Soderlund & Knipple 2003, Insect Biochem Mol Biol, 33:563; Park et al 1997, Biochem Biophys Res Commun 239:688
		M918T	kdr	M. domestica, H. irritans, T. evansi, B.	Yes	Nyoni et al 2011, Pest Manag Sci 67:891; Morin et al 2002, Insect Biochem Mol Biol 32:1781; Eleftherianos et al 2007. Bull Entomol Res 98:183
		L925I		B. tabaci	Yes	Roditakis et al 2006, Pest Biochem Physiol 85:161; Morin et al 2002, Insect Biochem Mol Biol 32:1781
		T929I/C/V		P. xylostella, F. occidentalis, B.	Yes	Roditakis et al 2006, Pest Biochem Physiol 85:161
		L1014F/H	super-kdr (M9810 & L1014F/H)	L. decemlineata, M. persicae, P.	Yes	Lee et al 1999, Pest Biochem Physiol 63:63; Schuler et al 1998, Pest Biochem Phsiol 59:169

MoA WG Activities

- Projects in the works
  - Mode of Action Presentation
    - On-hold pending outcome of UNL project
  - Resistance Mechanisms
    - Poster / presentation – in flight
  - Coleoptera MoA poster
    - In flight