Session 3

International Working Group & Country Group Review

46th Meeting of IRAC International, Brussels, Belgium

Wednesday - March 30th, 2011

Mode of Action WG

Tom Sparks

Insecticide Resistance Action Committee

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.

Mode of Action WG

Insecticide Resistance Action Committee

- **Team Members 2010 / 2011**
  - Nigel Armes - BASF
  - Georgina Bingham – Vestergaard Frandsen
  - Dan Cordova - DuPont
  - Fergus Earley - Syngenta
  - Peter Luemmen - Bayer
  - Danny Karmon - MAI
  - Nobuaki Mito – Sumitomo
  - Ralf Nauen - Bayer
  - Vincent Salgado – BASF - Deputy
  - Tom Sparks – Dow - Chair
  - Jerry Watson – Dow
  - Alan Porter (IRAC)

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MoA Team Activities 2010/11

- **Since 2010**
  - Washington D.C meeting (12 participants and several guests)
  - Three conference calls
    - July . 2010 (8 participants)
    - Oct. 2010 (8 participants)
    - Jan. 2011 (9 participants)
  - This week – F2F meeting + concall
    - (9 participants and several guests)
    - Session 2D (Brussels, March 29th)
- **Company participation since 2008 has expanded from four (4) to eight (8) companies**
  - BASF, Bayer, Dow, DuPont, Makhteshim-Agan, Sumitomo, Syngenta, Vestergaard Frandsen
  - Other company representatives have also participated and are welcome to join.

MoA Team Activities 2010/11

- IRAC Website - Most popular web page - Mode of Action
  - MOA Team page was viewed 8,557 (-18%)
  - MOA classification scheme was downloaded 2,190 (+15%)
- Most popular resource - IRAC Posters: total downloads = 5,240
  - 61% (3,188) were related to MoA
  - MOA structure poster downloads = 1,227
    - Spanish = 592, English = 499 (-29%), Portuguese = 76, Chinese = 58
  - MoA Sucking Insects = 300
  - General MoA = 298
  - MoA Leps = 296
  - MoA Mites = 259
  - MoA Mosquito = 193

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Goals & SMART Objectives
(for 2010/11)

Goals	Objectives	Timeline
Continue to review and update the MOA scheme as required.	• Update as needed the current Version 7.0 to include any changes and / or new actives.	In progress
Develop new versions of the MOA Structure Poster as needed	• Using the new version of the scheme (V7.0) update the MOA Structure poster • Work with the C&E WG to print copies (v7.0) for distribution	Completed On hold
Develop non English versions of the MOA Structure Poster – with C&E WG	• Develop Portuguese-language version of the MoA Structure poster • Develop other language versions of the MoA structure poster	Completed Under discussion
Update other MOA posters	• Work with C&E Team to incorporate any updates from new versions of the MoA Scheme into Pest MOA posters • Update General MoA Poster	In progress Competed
Develop MoA Diagrams.	• Provide MoA diagrams for the different broad MoAs (IGR, vs.. neural, vs. respiration) for use in MoA publications and presentations.	Still in progress

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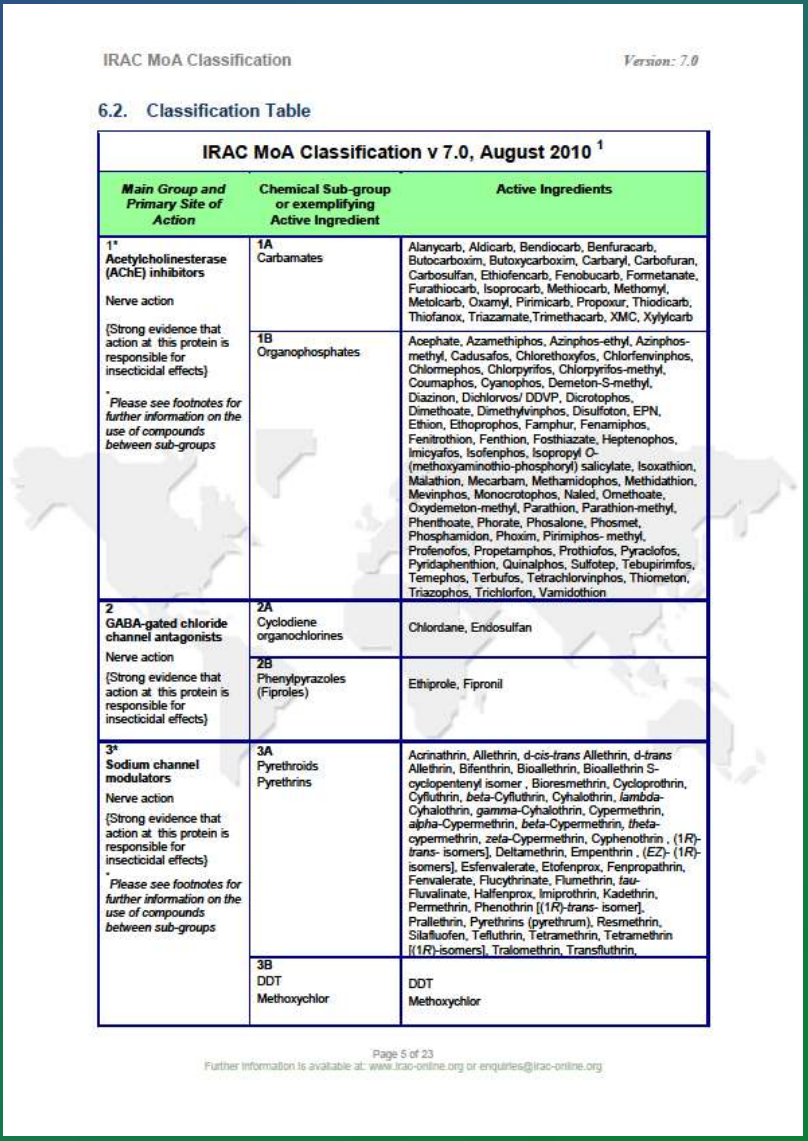
Goals & SMART Objectives
(for 2010/11)

Goals	Objectives	Timeline
Develop MoA WG presentation	• Develop a general MoA oral presentation that can be used at scientific meetings	In progress
Develop Resistance mechanisms Poster	• Develop a general poster on mechanisms of insecticide resistance	In progress

MoA Team Activities 2010/11

- Updated MoA Scheme
  - Aug. 2010 (version 7.0)
    - addition of new compounds to some groups
      - e.g. Group 13 – sulfoluramid
    - addition of procedures as an appendix
    - addition of a compound index
    - addition of MoA descriptors
    - other minor revisions of wording
  - Next version (8.0)
    - Potential addition of several compounds to existing groups
      - Group 25 - cyflumetofen
      - Group 28 - cyanthriliprole
      - Group UN - pyrifluquinazon
      - Group 6 - lepimectin
    - other minor revisions



IRAC MoA Classification Version: 7.0

6.2. Classification Table

IRAC MoA Classification v 7.0, August 2010 [1]

Main Group and Primary Site of Action	Chemical Sub-group or exemplifying Active Ingredient	Active Ingredients
1* Acetylcholinesterase (AChE) inhibitors Nerve action {Strong evidence that action at this protein is responsible for insecticidal effects} * *Please see footnotes for further information on the use of compounds between sub-groups*	**1A** Carbamates	Alanycarb, Aldicarb, Bendiocarb, Benfuracarb, Butocarboxim, Butoxycarboxim, Carbaryl, Carbofuran, Carbosulfan, Ethiofencarb, Fenobucarb, Formetanate, Furathiocarb, Isoprocarb, Methiocarb, Methomyl, Metolcarb, Oxamyl, Pirimicarb, Propoxur, Thiodicarb, Thiofanox, Triazamate,Trimethacarb, XMC, Xylylcarb
	1B Organophosphates	Acephate, Azamethiphos, Azinphos-ethyl, Azinphos-methyl, Cadusafos, Chlorethoxyfos, Chlorfenvinphos, Chlormephos, Chlorpyrifos, Chlorpyrifos-methyl, Coumaphos, Cyanophos, Demeton-S-methyl, Diazinon, Dichlorvos/ DDVP, Dicrotophos, Dimethoate, Dimethylvinphos, Disulfoton, EPN, Ethion, Ethoprophos, Famphur, Fenamiphos, Fenitrothion, Fenthion, Fosthiazate, Heptenophos, Imicyafos, Isofenphos, Isopropyl O-(methoxyaminothio-phosphoryl) salicylate, Isoxathion, Malathion, Mecarbam, Methamidophos, Methidathion, Mevinphos, Monocrotophos, Naled, Omethoate, Oxydemeton-methyl, Parathion, Parathion-methyl, Phenthoate, Phorate, Phosalone, Phosmet, Phosphamidon, Phoxim, Pirimiphos- methyl, Profenofos, Propetamphos, Prothiofos, Pyraclofos, Pyridaphenthion, Quinalphos, Sulfotep, Tebupirimfos, Temephos, Terbufos, Tetrachlorvinphos, Thiometon, Triazophos, Trichlorfon, Vamidothion
2 GABA-gated chloride channel antagonists Nerve action {Strong evidence that action at this protein is responsible for insecticidal effects}	**2A** Cyclodiene organochlorines	Chlordane, Endosulfan
	2B Phenylpyrazoles (Fiproles)	Ethiprole, Fipronil
3* Sodium channel modulators Nerve action {Strong evidence that action at this protein is responsible for insecticidal effects} * *Please see footnotes for further information on the use of compounds between sub-groups*	**3A** Pyrethroids Pyrethrins	Acrinathrin, Allethrin, d-*cis-trans* Allethrin, d-*trans* Allethrin, Bifenthrin, Bioallethrin, Bioallethrin S-cyclopentenyl isomer , Bioresmethrin, Cycloprothrin, Cyfluthrin, *beta*-Cyfluthrin, Cyhalothrin, *lambda*-Cyhalothrin, *gamma*-Cyhalothrin, Cypermethrin, *alpha*-Cypermethrin, *beta*-Cypermethrin, *theta*-cypermethrin, *zeta*-Cypermethrin, Cyphenothrin , (1*R*)-*trans*- isomers], Deltamethrin, Empenthrin , (*EZ*)- (1*R*)-isomers], Esfenvalerate, Etofenprox, Fenpropathrin, Fenvalerate, Flucythrinate, Flumethrin, *tau*-Fluvalinate, Halfenprox, Imiprothrin, Kadethrin, Permethrin, Phenothrin [(1*R*)-*trans*- isomer], Prallethrin, Pyrethrins (pyrethrum), Resmethrin, Silafluofen, Tefluthrin, Tetramethrin, Tetramethrin [(1*R*)-isomers], Tralomethrin, Transfluthrin,
	3B DDT Methoxychlor	DDT Methoxychlor

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Further information is available at: www.irac-online.org or enquiries@irac-online.org

MoA Team Activities 2010/11

- Updated MoA Structure Poster (currently v7.0)
  - minor revisions of some wording
  - addition of new compounds to some groups
    - e.g. UN – pyrifluquinazon
- Next version – when needed
- MoA Structure Poster Translations (version 2 - based on scheme 6.3)
  - Portuguese – completed this year
  - Other languages (Spanish and Chinese were completed last year) – will need updating
  - Other languages under consideration
    - French, German, Japanese

MoA Team Activities 2010/11

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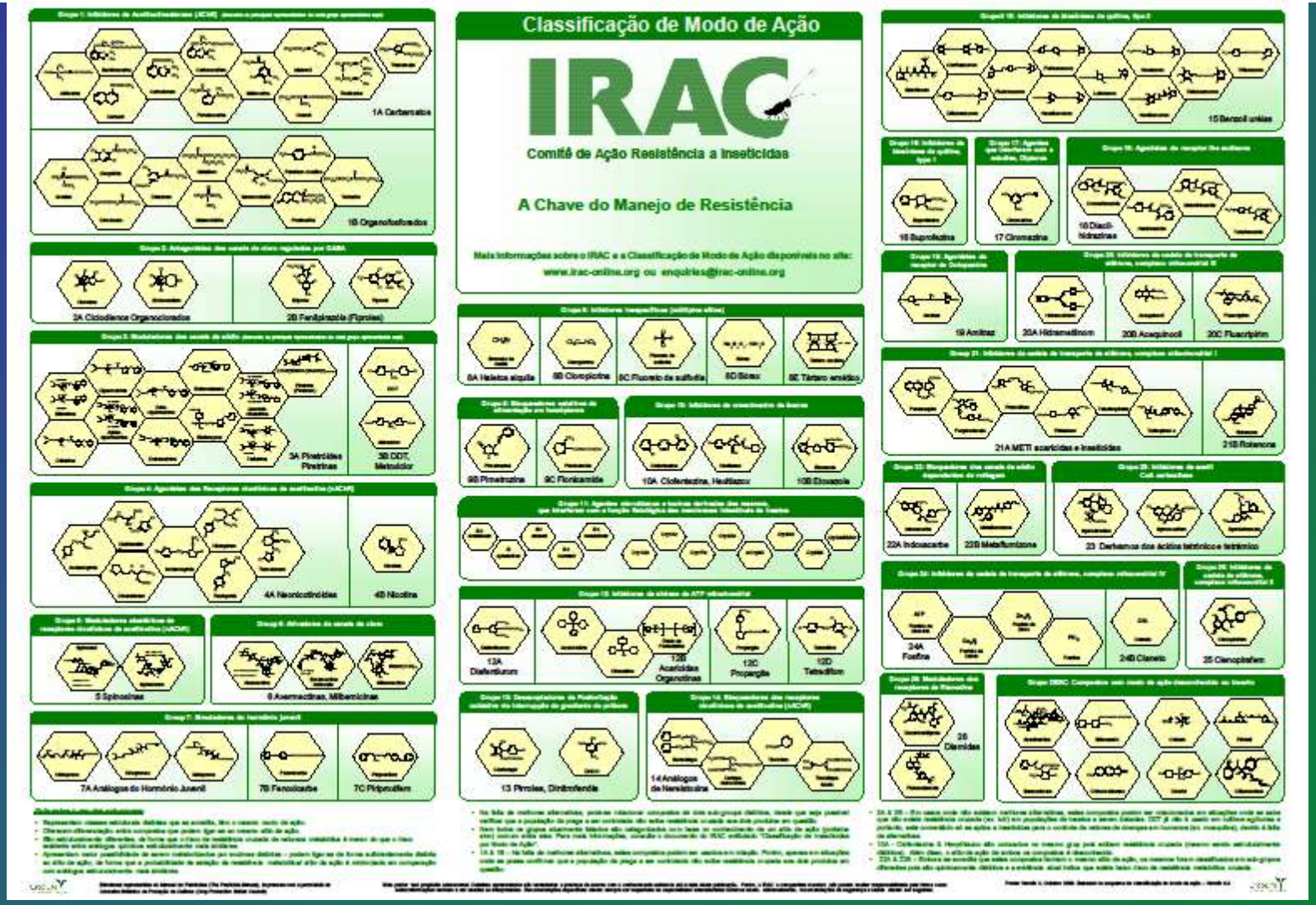

Portuguese Version of MoA Structure Poster

MoA Team Activities 2010/11

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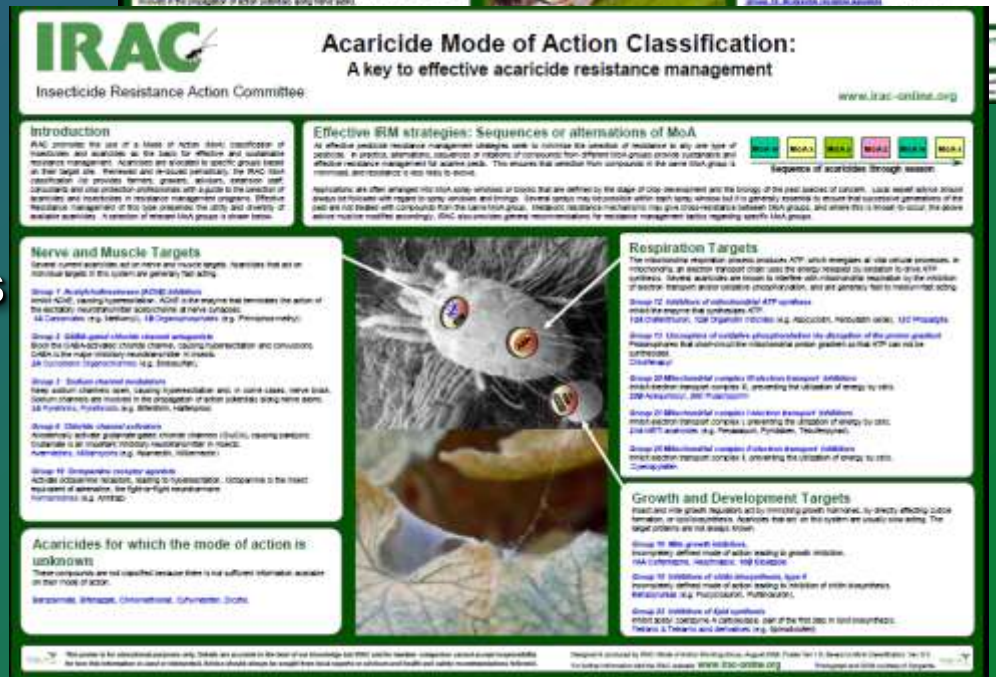
- Pest Group MoA Posters Completed
  - Lepidoptera
  - Sucking Insects
  - Mites
  - Mosquitoes
  - General MoA poster
    - Two versions
- Next versions
  - Resistance Mechanisms
  - Updates on current posters as needed



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MoA Team Activities 2010/11

- MoA Booklet – 1st edition completed last year
  - pocket sized
  - Includes more information
    - MoA classification
    - aspects from Pest group MoA posters
    - alphabetical listing of ai's with MoA classification
  - 2010/11 >3000 copies distributed
- MoA Booklet – 2nd edition
  - updating in progress
  - A Spanish version being considered

MoA Team Activities 2010/11

- Presentations on IRAC MoA WG & MoA Scheme
  - 29th Meeting of the Entomological Society of Israel
    - 4 Posters - D. Karmon
    - Beit Dagan, Israel, Oct. 2010

  - 2011 Beltwide Cotton Conference
    - Poster - T. Sparks - Atlanta, GA, Jan. 2011
  - 2011 Texas Consultants meeting
    - Part of oral presentation - G. Thompson – Mar. 2011

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Goals & SMART Objectives
(for 2011/12)

Goals	Objectives	Timeline
Continue to review and update the MOA scheme as required.	• Update as needed the current Version 7.0 to 7.1 to include new actives / classifications	On-going
Continue to review & update MoA Booklet	• Update MoA booklet (2nd ed) – incorporate changes in 7.1	asap
Develop new versions of the MOA Structure Poster (with C&E WG) as needed	• Using the new version of the scheme (V7.1) update the MOA Structure poster • Work with the C&E WG to print copies (v7.1) for distribution • Update current non-English versions • Develop other language version of the MoA Structure poster • (French, *Japanese, German*)	2Q 2011 2-3Q 2011 3Q 2011 4Q 2011
Update other MOA posters	• Work with C&E WG to incorporate updates from new versions of the MoA Scheme into Pest MoA posters • Update General MoA Poster	3Q 2011 3Q 2011
MoA Presentation	• Develop MoA presentation for general use in IRAC covering broad MoAs (IGR, vs. neural, vs. respiration) for use in MoA publications and presentations. • Web-based then slide set • Develop MoA diagrams (from above) for use in publications	4Q 2011 4Q 2011

Insecticide Resistance Action Committee

Goals & SMART Objectives
(for 2011/12)

Goals	Objectives	Timeline
E-classification	• Update e-classification on IRAC website as needed	On-going
MoA reference list	• Establish as MoA reference (references for the different MoA Groups) – to be posted on the IRAC web-site	3Q 2011
Resistance mechanisms presentation	• Develop a general presentation on resistance mechanisms involved with insecticide resistance	4Q 2011