Industry's Effort to Preserve Insecticides: Global IRAC Diamide Working Group Activities and IRM Guidelines

Insecticide Resistance Action Committee (IRAC)

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Chair, Diamide Working Group (Group 28 Insecticides) in IRAC

Insecticide Resistance Action Committee

Contents

- The Diamide Working Group: structure and objectives
- Our challenges
- The Diamide IRM guidelines

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International Diamide Working Group

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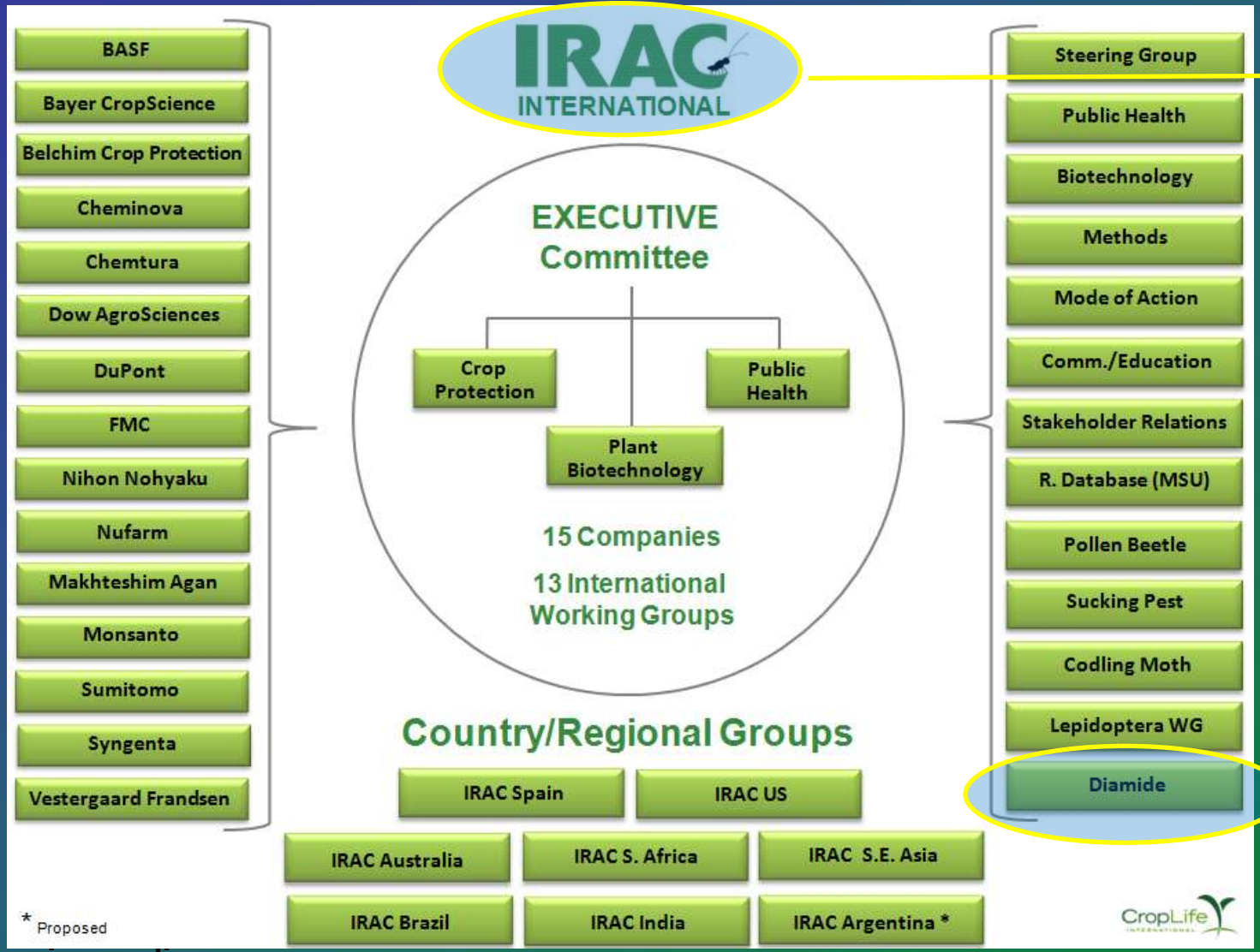

Diamide Working Group

- Four companies

- Two actives (chlorantraniliprole and flubendiamide)
- Several commercial products
  - Single active ingredients and pre-mixtures
  - Example (US registrations): 12+ commercial products available
- Same MOA IRAC Group 28 (Ryanodine Receptor Activators)
- Active area of insecticide research and development (several other active ingredients in the same MOA group likely to be available in the next decade)

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Global Diamide Working Group

OBJECTIVE:

Development of IRM strategies for Group 28 insecticides (Ryanodine Receptor Modulators) to proactively maintain insect susceptibility and delay the evolution of resistance

- **2008 August: IRAC Response to Intensity of Use**
  - New global committee formed prior to major registrations of a new MOA class
- **2008 September: Global Action**
  - Published Global IRM Guidelines for Diamides several "high risk" species
  - Identified high risk situations and emerging pest issues
- **2009 January: Country Action**
  - Initiated country Diamide working groups - develop local IRM guidelines
  - Engage industrial and technical communities – Align IRM

Diamide Working Team

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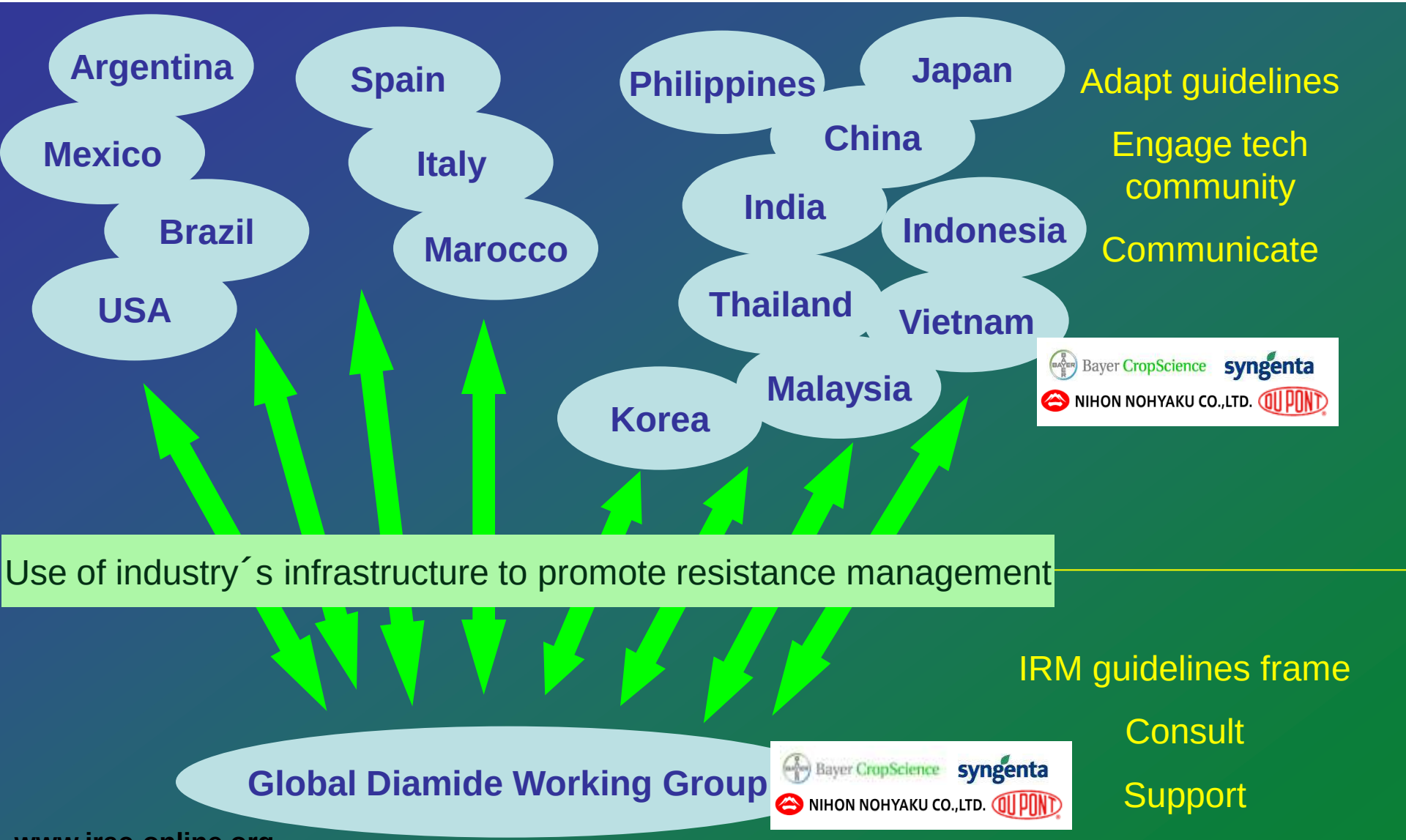

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Country Diamide Working Groups

Country Diamide Working Groups (CDWG's) are being established globally and will be industry's main advocates to maintain diamide susceptibility

15 CDWG's exist as of May 2010

1	**Argentina**	**Jorge Morre**	**DuPont**
1	Argentina	Guillermo Fucci	DuPont
1	Argentina	Earle Gastaldi	Bayer
1	Argentina	Ruben Meoni	Bayer
1	Argentina	Daniel Ferreras	Syngenta
1	Argentina	Matias Balsa	Syngenta
1	Argentina	Daniel Courreges	Syngenta
1	Argentina	Liliana Cichon	Consultant
1	Argentina	Gamundi Juan Carlos	Consultant
1	Argentina	Mariana Sosa	Consultant
1	Argentina	Daniel Igarzabal	Consultant
2	**Brazil**	**Fabio Silva**	**DuPont**
2	Brazil	Amauri Peloia	Syngenta
2	Brazil	Alexandre José da Silva	Syngenta
2	Brazil	Luiz Weber	Bayer
2	Brazil	Paulo Aramaki	Syngenta
2	Brazil	Waldemar Sanchez	Bayer
3	China*		
3	China*	Yong C Hahn	DuPont
3	China*	Yong Zhang	DuPont
3	China*	Ya-Fei Pan	DuPont
3	China*	De-You Zhao	DuPont
3	China*	Wang Tao	Syngenta
3	China*	Meng Xiangqing	Syngenta
3	China*	Quansheng Hu	Bayer
3	China*	Motomu Moriya	Nihon Nohyaku
3	China*		Nihon Nohyaku
	* Note. Group not yet formed (need to appoint Chair vs. members)		
4			
4	India*	Rajul Edoliya	DuPont
4	India*	Vineet Singh	DuPont
4	India*	Satyanarayana	Bayer
4	India*	Subhrabitan	Bayer
4	India*	Rakesh Goel	Syngenta
4	India*	Deshmukh Rajendra	Syngenta
4	India*	Asaithambi Manickam	Nihon Nohyaku
	* Note. Group's first meeting will be March 5th (need to appoint Chair vs. members)		
5	Indonesia	Fei Ling	Syngenta
5	Indonesia	A. Marsudi	Syngenta
5	Indonesia	Agus Triwiyono	Syngenta
5	Indonesia	Iskandar Zulkarnain	DuPont
5	Indonesia	Guntur Sinaga	DuPont
5	Indonesia	Tatang Rukmana	Bayer
5	Indonesia	No representation from Nihon Nohyaku	
6	Japan	**N. Nonaka**	**Nihon Nohyaku**
6	Japan	M. Nishizuka	Bayer
6	Japan	M. Shiraishi	DuPont
6	Japan	T. Katori	DuPont
6	Japan	S. Sugii	Syngenta
6	Japan	H. Nishino	Syngenta

7	Korea*	Yong C Hahn	DuPont
7	Korea*	Ik Hwan Chang	DuPont
7	Korea*	Ung Park	DuPont
7	Korea*	SangSu Kang	Syngenta
7	Korea*	YongGwon Kim	Syngenta
7	Korea*	SangSoon Park (mkt)	Bayer
7	Korea*	JongRyul Bang (R&D)	Bayer
7	Korea*	Yeong Seok	Sojita Agro Corp for Nihon Nohyaku
8	Malaysia*	Ooi Kok Eng	DuPont
8	Malaysia*	Lee Kam Loong	DuPont
8	Malaysia*	Ngim Jeremy	Syngenta
8	Malaysia*	Mohd Hezri Sairi	Bayer
8	Malaysia*	No representation from Nihon Nohyaku	
	* Note. Group not yet formed (need to appoint Chair vs. members)		
9	Mexico	Abel Toledo	Bayer
9	Mexico	Andres Flores	Bayer
9	Mexico	Maurilio Flores	Syngenta
9	Mexico	Jose Del Refugio Munoz	DuPont
9	Note. Leadership of the team will be rotated every semestre (2nd semestre 2009: A. Toledo		
10	Philippines	**Florence Vasquez**	**Bayer**
10	Philippines	Nap Saavedra	Syngenta
10	Philippines	Rodelio Macatula	DuPont
10	Philippines	Oscar Edralin	DuPont
10	Philippines	No representation from Nihon Nohyaku	
11	**Spain**	**Josep Izquierdo**	**Bayer**
11	Spain	David De-Scals	DuPont
11	Spain	Elena Astor	DuPont
11	Spain	Luis Martin	Syngenta
11	Spain	Federico Gonzalez	Syngenta
11	Spain	Jose Luis Robles	Bayer
11	Spain	Pablo Bielza	Consultant
12	**Thailand**	**D. Dumrongsak**	**Syngenta**
12	Thailand	S. Jumroon	Bayer
12	Thailand	T. Saroch	DuPont
12	Thailand	T. Tanaka	Nihon Nohyaku
12	Thailand	S. Sahaya	Entomologist from DOA
12	Thailand	S. Sukonthabhirom	Entomologist from DOA
	Note. DOA (Department of Agriculture)		
13	**USA**	**Caydee Savinelli**	**Syngenta**
13	USA	Ralph Bagwell	Bayer
13	USA	Dan Sherrod	DuPont
13	USA	James Adams	Nichino America
14	**Vietnam**	**Dao Xuan Cuong**	**Syngenta**
14	Vietnam	Pham Quang Hung	DuPont
14	Vietnam	Bui Van Kip	Bayer
14	Vietnam	Tran Quang Hien	Nihon Nohyaku
14	Vietnam	Nguyen Trung Thanh	Consultant

Insecticide Resistance Action Committee

Contents

- The Diamide Working Group: structure and objectives
- Our challenges
- The Diamide IRM guidelines

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Factors That Affect Evolution of Diamide Resistance

- **Target Organism:**
  - Several "high risk" species
  - Genetic variability
- Product:
  - Insecticidal activity and length (residual) of control

We have no control over these conditions

- Intensity of Use:
  - Over-dependency on single mode of action
  - Number of applications per crop cycle and per year
  - Use rate per application, spray interval
  - Four companies offering two actives with same mode of action

Here is where we have the only opportunity to prevent or delay the evolution of resistance !!

Maintaining Insect Susceptibility is an Industry Priority

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Range of Diamide-containing products

Global formulations that contain Diamide chemistry are increasing and not obvious to growers

- **Multiple Diamide products are often labeled for the same crop**
- **Growers are unable to determine that the active ingredients chlorantraniliprole, flubendiamide and all the various formulations contain the same MOA**

- DuPont - 5 formulations of Chlorantraniliprole
- Syngenta - 2 formulations Chlorantraniliprole + 6 formulated mixtures
- Nihon Nohyaku - Flubendiamide + 2 premix products
- Bayer CropScience - Flubendiamide + 2 premix products

In total 20+ different trade names with products containing Diamides and potentially 2+ new Diamide actives in 2012 – 2020

***Rynaxypyr® is the registered Trade name for the technical material chlorantraniliprole**

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Global Diamide IRM Guidelines

Do not expose 2 consecutive generations to diamides

Available to download at www.irac-online.org

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Global Guidelines Published

(I) Use diamides in IPM and IRM Programs

- Prevention is the best strategy: Before planting, consider *options for minimizing insecticide use*, incorporating as many different control mechanisms as possible
  - Select insecticides with care based on spectrum, effectiveness, selectivity
  - Watch the pest population during the growing season
  - At the end of the season, remove crop residues to eliminate food sources and over-wintering habitats for pests

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Group 28 Insecticides Global Guidelines

(II) Ensure proper label language and correct use of the label

- Indication of MoA IRAC Category (GROUP 28 ICON)

GROUP	28	INSECTICIDE

- Where possible, inclusion of a comprehensive IRM statement
- Where possible, inclusion of the maximum number of applications per crop cycle
- Where possible, inclusion of the maximum seasonal use rate per crop cycle

Communicate IRAC MOA (Group 28) to Users

(II) Ensure proper label language and correct use of the label

→ Labeling and Identification of Group 28 Insecticides:

- Growers need to recognize and understand which products they can rotate.
- Identification of the insecticide MOA should be on the label; either on the first page or in the IRM section and included in technical brochures.

Example 1

Insecticide A® 50 SC

Active Ingredient: [Compound name]

Formulation details

Group	**28**	**Insecticide**

Example 2

Insecticide A ® 50 SC
Insecticide B ® 25 SC

Active Ingredients: [Compound names]

Formulation details

Group	**3**	**Insecticide**
Group	**28**	**Insecticide**

Group 28 Insecticides Global Guidelines

Example 2: Short Version

Insecticide Resistance Management (IRM)

General Recommendations:

____ (product name) contains _____ (active ingredient name), a Group 28 Insecticide.

Unless directed otherwise in the specific crop/insect sections of the label, the following practices are recommended to prevent or delay the development of insecticide resistance to ____ (product name) and to Group 28 insecticides:

- Apply ____ (product name) or other Group 28 insecticides using a "window" approach to avoid exposure of consecutive insect pest generations to the same mode of action. Multiple successive applications of ____ (product name) are acceptable if they are used to treat a single insect generation.
- Following a "window" of ____ (product name) or other Group 28 insecticide, rotate to a "window" of applications of effective insecticides with a different mode of action.
- The total exposure period of all "Group 28-active windows" applied throughout the crop cycle (from seedling to harvest) should not exceed 50% of the crop cycle.
- Incorporate IPM techniques into the overall [pest management program.
- Monitor insect populations for loss of field efficacy.

For additional information on insect resistance, modes of action and monitoring visit the Insecticide Resistance Action Committee (IRAC) on the web at http://www.irac-online.org.

General Positioning Guidelines

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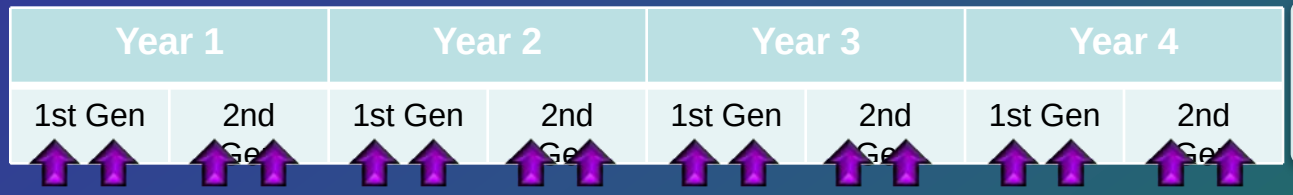
IRM guidelines below show least to best product rotaton recommendations

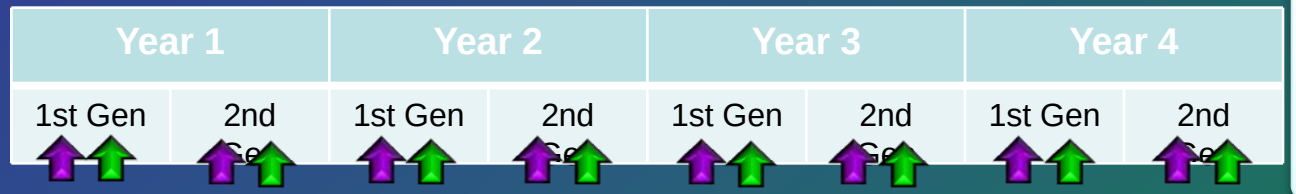
(III) Rotate by Insecticide Mode of Action (MOA) Group



No alternation/rotation

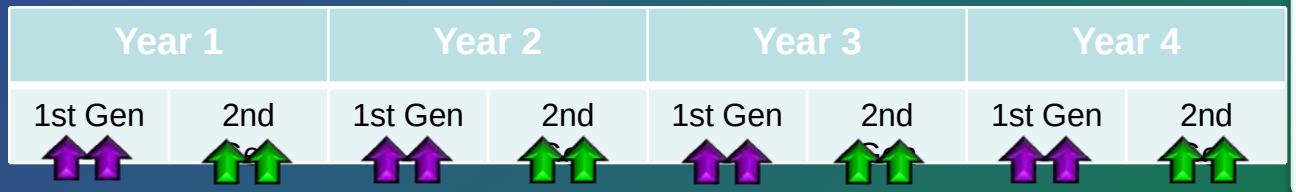
High selection pressure

No recover of sensitive population



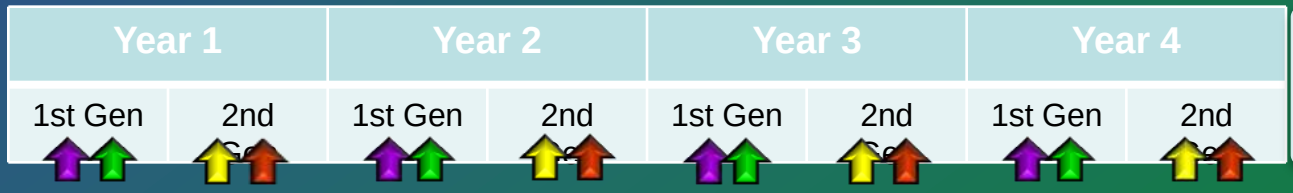
Rotation within generation

Consecutive generation exposed to same MoA. Selection pressure doesn't change between generation. Risk of resistance development for both ai's



Rotation among generations

Following generation are not exposed to same MoA. Selection pressure doesn't increase within the generation. Recovery of susceptible population



Rotation within and between

Ideal situation (very low risk) Not alway applicable with good efficacy

MoA 1 MoA 3

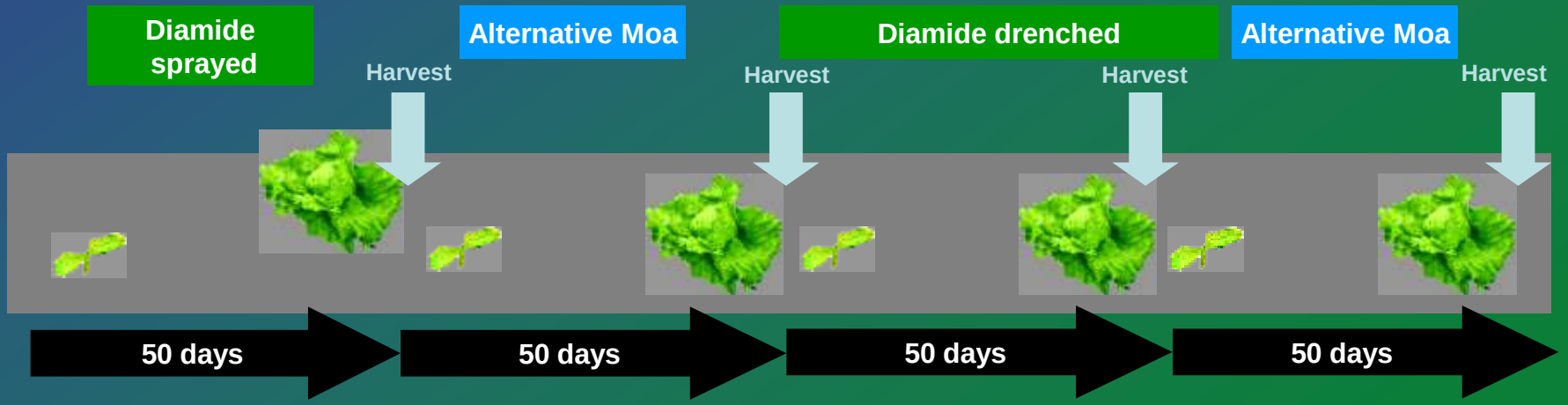
MoA 2 MoA 4

www.irac-online.org

Multi-cropping scenarios

(III) Rotate by Insecticide Mode of Action (MOA) Group

- Specific guideline:
- **In case of repeated cultivation of short cycle crops (less than 50 days)** do not treat consecutive crops**, but alternate with different mode of actions.**
- **The residual control by group 28 compounds in multi-cropping situations has to be** less than 50% of the cropping time per year **irrespective of the application method.**



India Cabbage Strategy *(under review)*

- For management of diamondback moth (DBM), there are **4 main windows** when insecticide applications are required to protect the crop from damage by this pest. The first window is from nursery to 20 days after transplanting (DAT) , the second window is from 21-50 DAT, third window is from 51-80 DAT and 4th window is from 80 DAT and beyond
- **Diamides should be applied either in the '1st ' and ' 3rd window' or in '2nd ' and ' 4th window'**
- The main reason is to avoid exposure of two consecutive generations of the target pest by the Diamides. If diamides are applied in the first window, they should not follow with diamide insecticides in the 2nd window. However, he **can use two 'back to back' diamide applications in the 'diamide active window'**
- Alternatively, if a grower chooses to apply a diamide insecticide for the control of DBM in the 2nd window, then he should not apply diamide insecticides in the 1st or 3rd windows
- **The total exposure period by diamide insecticides should never exceed 50% of the crop cycle**
- In case, several cabbage crops are grown successively, application of diamides should be avoided in the 1st window of next season crop if it was applied in the last window of the previous crop season.

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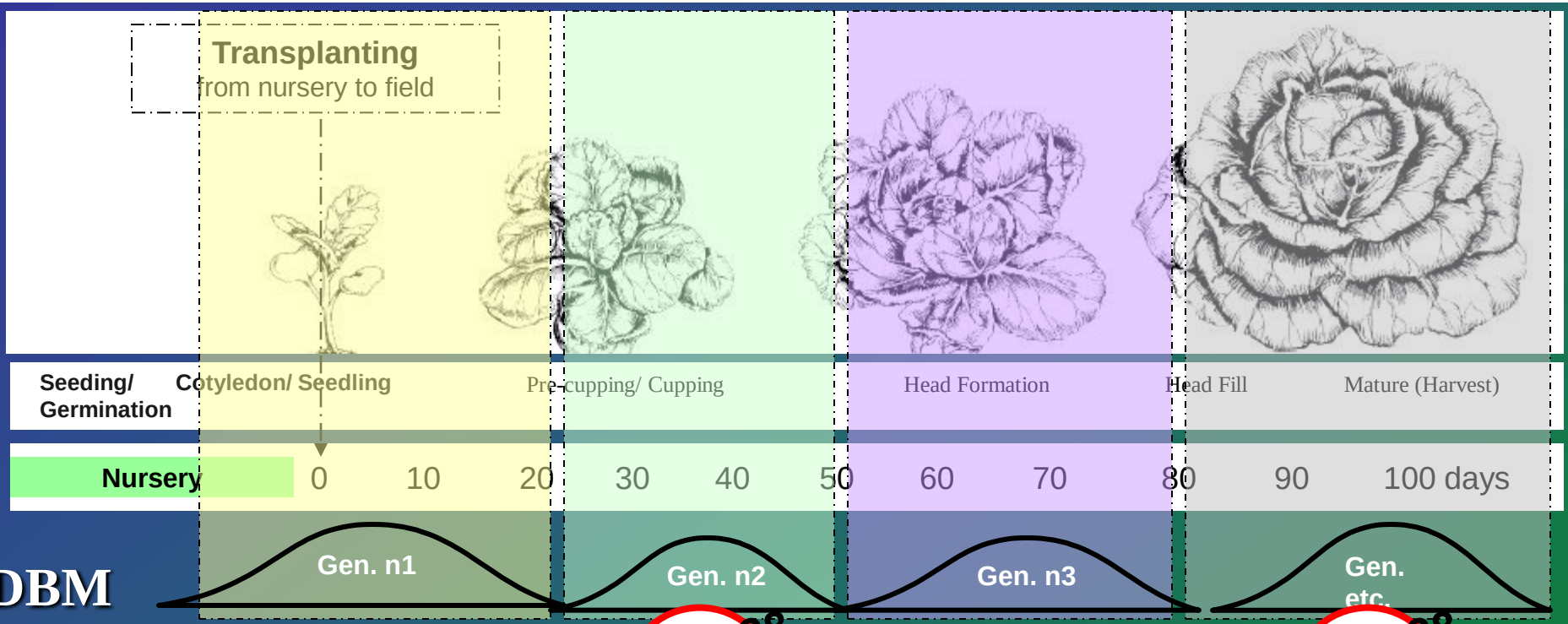
Example 1

INDIA WG Update

India Cabbage Strategy *(under review)*



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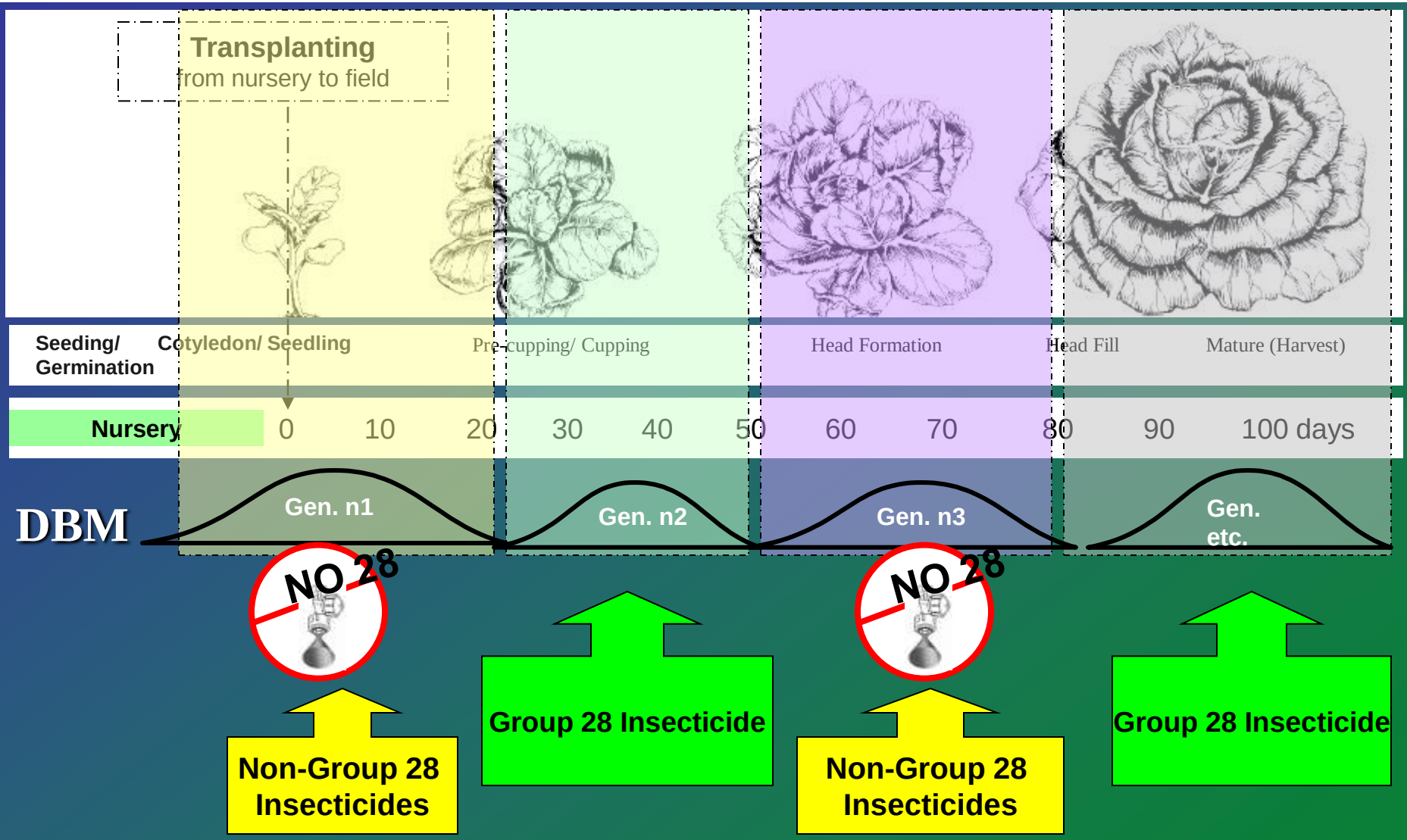
Example 2

INDIA WG Update

India Cabbage Strategy *(under review)*



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Diamide Working Team

Facts:

- New Mode of Action with excellent fit in IPM and IRM programs
- Responsible stewardship will be key to the sustainability of diamides

What we are doing:

- Start early, establish country working groups, involve local technical experts
- Develop adequate labels
- Identify high risk areas & manage resistance risk proactively at the local level
- Educate, Educate, Educate!

Thank you for your attention