

# **Resistance management**

**Development of an ability to tolerate a dose of an insecticides, which would prove lethal to the majority of individuals in the normal population of the same species.**

# How do resistance develop?



# History

- With the discovery of Miracle powder “DDT” – people thought that the problem of pest is solved for ever. They have won the war against insects.
- But, Scientist got their first jolt in 1946, when house fly showed resistance against their Miracle powder , DDT.
- Earlier, in 1914, Melander found San Jose Scale showing resistance to Lime Sulphur sprays.

## CAN INSECTS BECOME RESISTANT TO SPRAYS?<sup>1</sup>

By A. L. MELANDER, *Entomologist, Washington Agricultural Experiment Station*

- Later, 1941 – Colorado potato beetle
- 1944 – *Pediculus humanus* shown resistance to DDT
- After 1946 – a succession of resistance reports just poured in.

## First Resistance Reports

	Insect pests	Insecticide	Place	Author
International	Sanjose scale. <i>Quadraspidotus perniciosus</i> L.	Lime Sulfur	Washington	Melander (1914)
National	Singhara beetle, <i>Galerucella birmanica</i> (Jacoby)	DDT, BHC	Delhi	Pradhan <i>et al.</i> , 1963

# List of Resistant Insects in Abroad

Common name	Scientific name	Resistant to	Location	Authors
<b>Sanjose scale</b>	<i>Quadraspidiotus perniciosus</i> L.	Lime-sulphur	Washington	Melander (1914)
<b>Tobacco bud worm</b>	<i>Heliothis virescens</i> (F.)	Pyrethroids, OP and Carbamates	Mississippi	Elzen et al., 1990
<b>Pear Psylla</b>	<i>Cacopsylla pyri</i> L.	OP compounds	France	Bues and Boudinhon (2002)
<b>Tobacco bud worm</b>	<i>Heliothis virescens</i> (F.)	Pyrethroids	Mexico	Teran Vargas et al., 2005
<b>DBM</b>	<i>Plutella xylostella</i> L.	Chlorantraniliprole	China	Wang and Wu (2012)
<b>Lady beetle</b>	<i>Eriopis connexa</i> (Germer)	Lambda cyhalothrin	Brazil	Agna et al., 2013
<b>DBM</b>	<i>Plutella xylostella</i> L.	Flubendiamide	China	Wang et al., 2013

## List of resistant insects in India

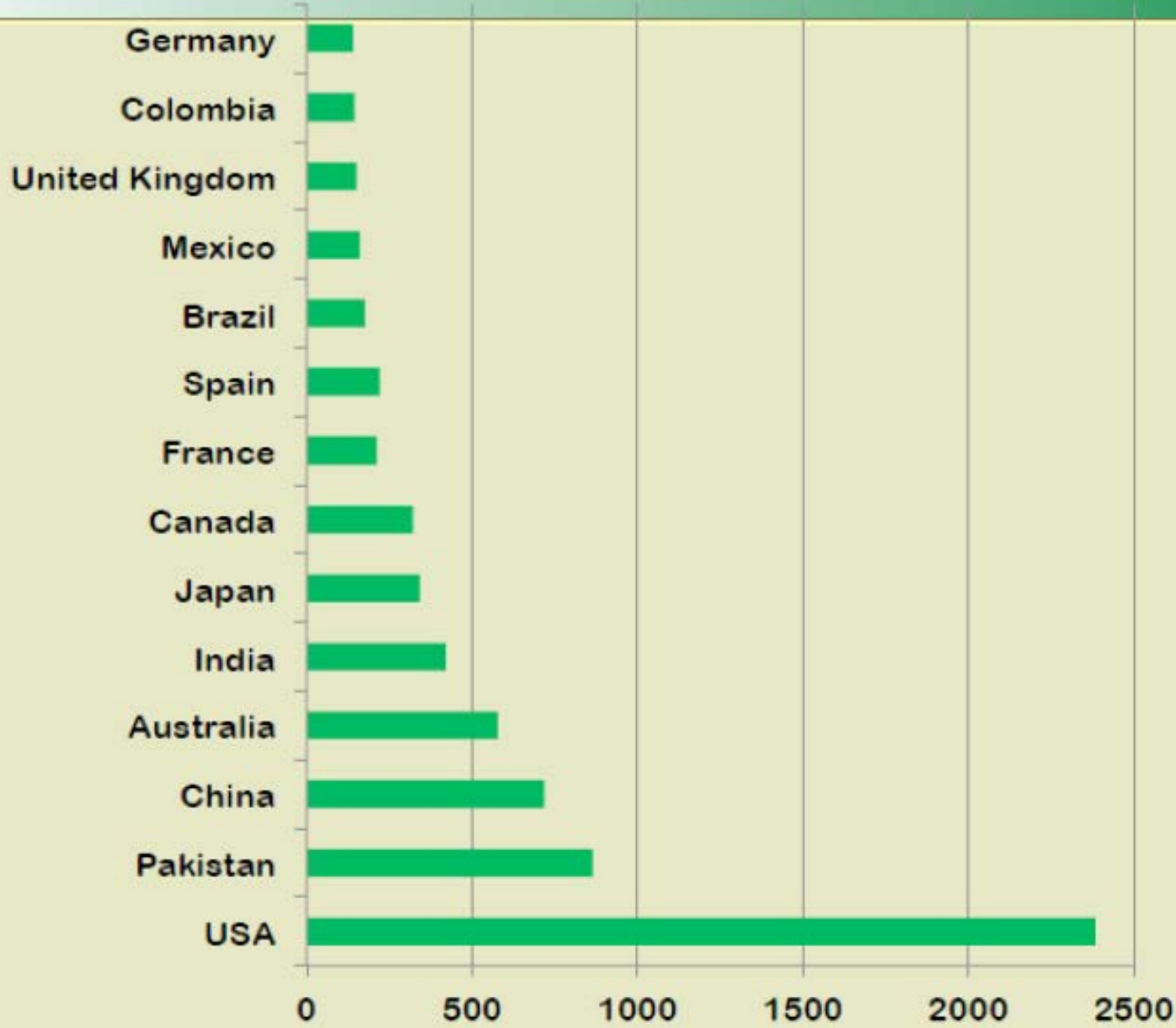
Common name	Scientific name	Resistant to	Author
Singhara beetle	<i>Galerucella birmanica</i> (Jacoby)	DDT, BHC	Pradhan et al., 1963
Rice leaf folder	<i>Cnaphalocrocis medinalis</i> (Guenee)	Chlorpyrifos, Quinalphos	Anandan and Regupathy, 1997
Cotton bollworm	<i>Helicoverpa armigera</i> (Hubner)	OP, Carbamates	Ren et al., 2002
Diamond Back Moth	<i>Plutella xylostella</i> (Lin.)	Monocrotophos	Shivaramabhatt (1999 )
Tobacco caterpillar	<i>Spodoptera litura</i> (Fab.)	Chlorpyrifos, fenvalerate	Niranjan Kumar & Regupathy, 2001
Rice BPH	<i>Nilaparvata lugens</i> (Stal)	Imidacloprid	Liu et al., 2005
Cotton whitefly	<i>Bemisia tabaci</i> (Gennadius)	Imidacloprid	El Kady et al., 2003
Spotted bollworm	<i>Earias vittella</i> (Fabricius)	Carbamates	Kranthi et al., 2001



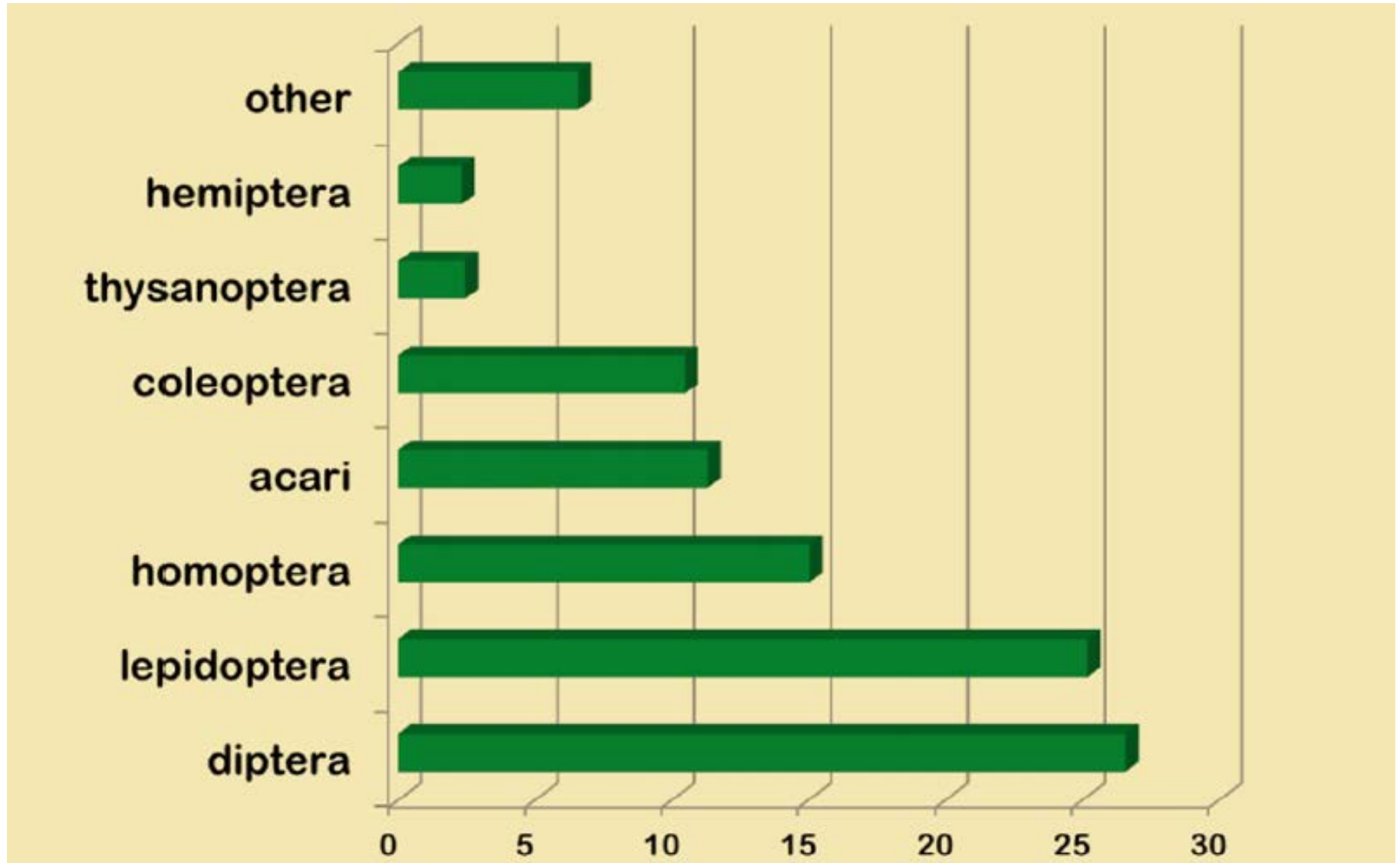


Insecticide Resistance Action Committee

# Top 14 countries by number of resistance cases



## Resistance across pest orders





# Reasons for insect developing resistance

- Continued and frequent use of a pesticide
- Use of application rates -below or above those recommended on the label.
- Poor coverage of the area being treated
- Frequent treatment of organisms with large populations and short generation times.
- Failure to incorporate non-pesticidal control practices when possible
- Simultaneous treatment of larval and adult stages with single or related compounds.
- Genetic mutation and inheritance

# IRM Strategies

- **Use of judicious and Recommended dose of insecticides**
- **Mode of action, target-site resistance and cross-resistance: use insecticide having different target sites.**
- **Alteration of chemistry: Alternate use of chemical groups with different MoAs will slow down the process of selection for resistance.**
- **Use of cultural practices: incorporate all available methods of control will reduce selection pressure from the insecticide.**
- **Understanding of the insect life cycle**
- **Use of insecticide mixtures**
- **Use of synergists to suppress the insects' detoxification mechanism**
- **Protect beneficial insects.**