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Organic Farming for Sustainable Agricultural Production

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Lecture 17 : Introduction to Pest and Disease Management

Typical Signs of Pest and Disease Incidence

Common pests in crop plants

Insects

Mites

Nematodes

Mammals

Birds

Others

Common disease in crop plants

Fungal

Bacterial

Viral



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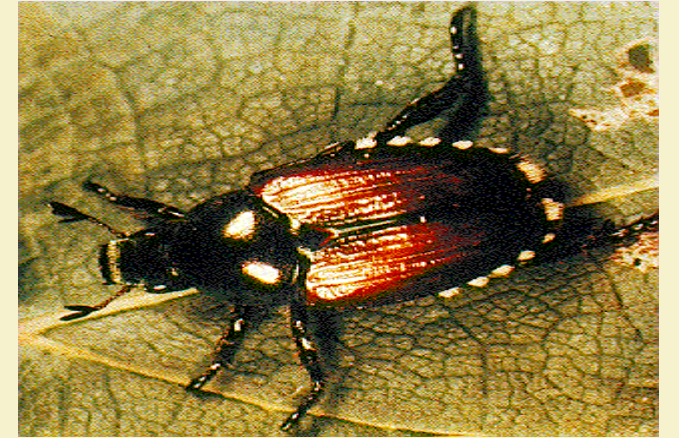


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Insect Damage

A. On the basis of feeding mechanism insects are classified as

- **Biting and chewing (e.g. caterpillars, weevils)**
- **Piercing and sucking (e.g. aphids, psyllids)**
(Curled leaves in Aphid attack)
- **Boring (e.g. borer, leaf miner)**
(Withered Plants by borer)



Insect Damage (cont..)

Some typical symptoms

- Leaves with holes or missing parts by caterpillar or weevil damage
- curled leaves in case of aphids
- damaged/rotten fruits in case of fruit flies
- withered plants by larvae of noctuids or the stem borer
- holes in trunks/stems due to lignivorous insects



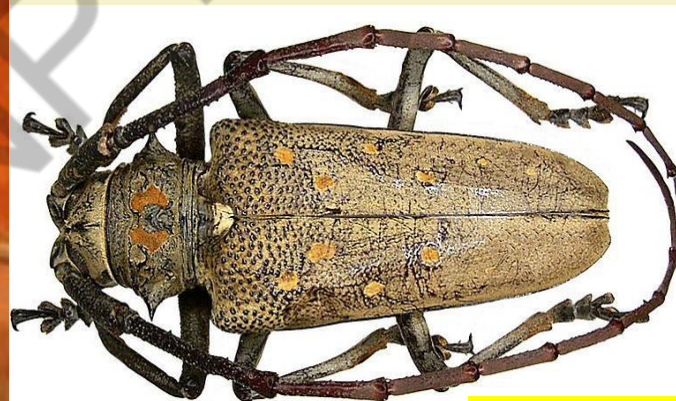
Gram Pod Borer



Bore holes in sugarcane



Mango fruit fly



Mango Stem Borer



Insect Damage (cont..)

B. On the basis of movements insects are classified as

- Slowing (e.g. caterpillars)
- Fast moving (e.g. fruit flies)

C. On the basis of ease of observance Insects are classified as

- Hidden (e.g. stem borer)
- Easy to Observe (e.g. Caterpillars, Weevils)

Mite Damage

- Tiny, microscopic organisms
- Leaves and fruits become yellowish

Nematode Damage

- Tiny, mostly microscopic organisms
- Attack plant roots, plants become yellow, wither and die.



Mite attack



Root galls by Root knot nematode

Disease Incidences

Bacteria

They cause any of the following Problems

- Some produce enzymes that breakdown the cell wall of the plants. This causes rotting.
- Some produce toxins which cause early death of the plant.
- Some produce sticky sugary substances that travel through the plant and block the narrow channels preventing uptake of water and nutrients.
- Some produce proteins that mimic plant hormones, leading to overgrowth and tumours.



Moko wilt in Banana



Scab diseases in Potato

Disease Incidence (cont..)

Fungi:

- It causes great majority (2/3rd) of infectious plant diseases
- It includes all white and true rusts, smuts, needle casts, leaf curls, mildew, sooty moulds and anthracnose
- They are responsible for most leaf fruit and flower spots, cankers, blights, wilts, scabs and root wood rots

Viruses:

- It mostly causes systemic disease
- It shows chlorosis or change in colour of leaves and other green parts
- Light green or yellow patches of various shades, shapes and sizes appear in affected leaves



Leaf spot



Powdery mildew

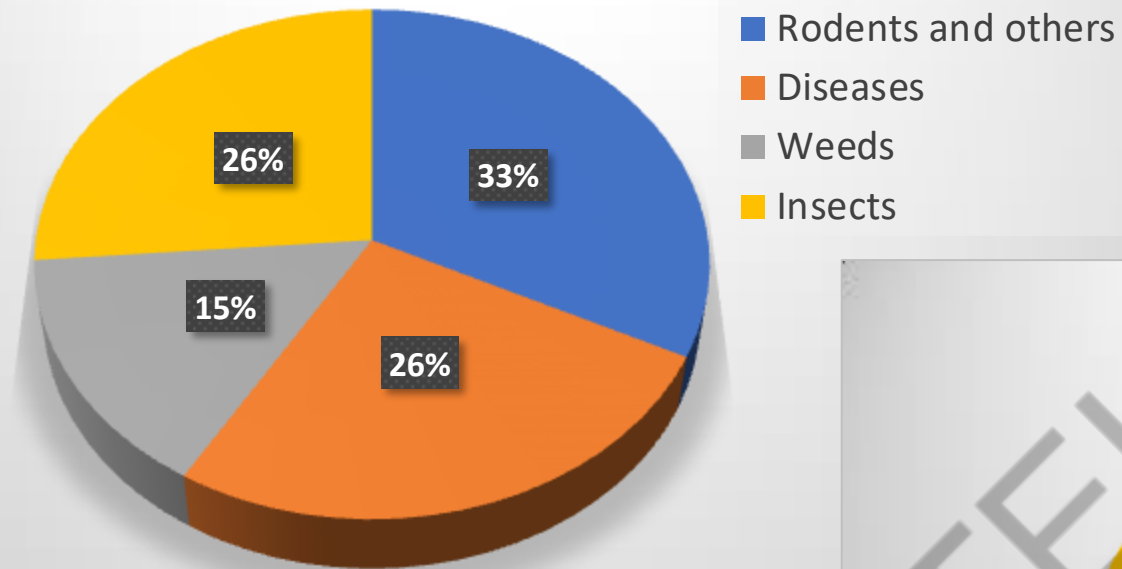


Mosaic virus on Chilli



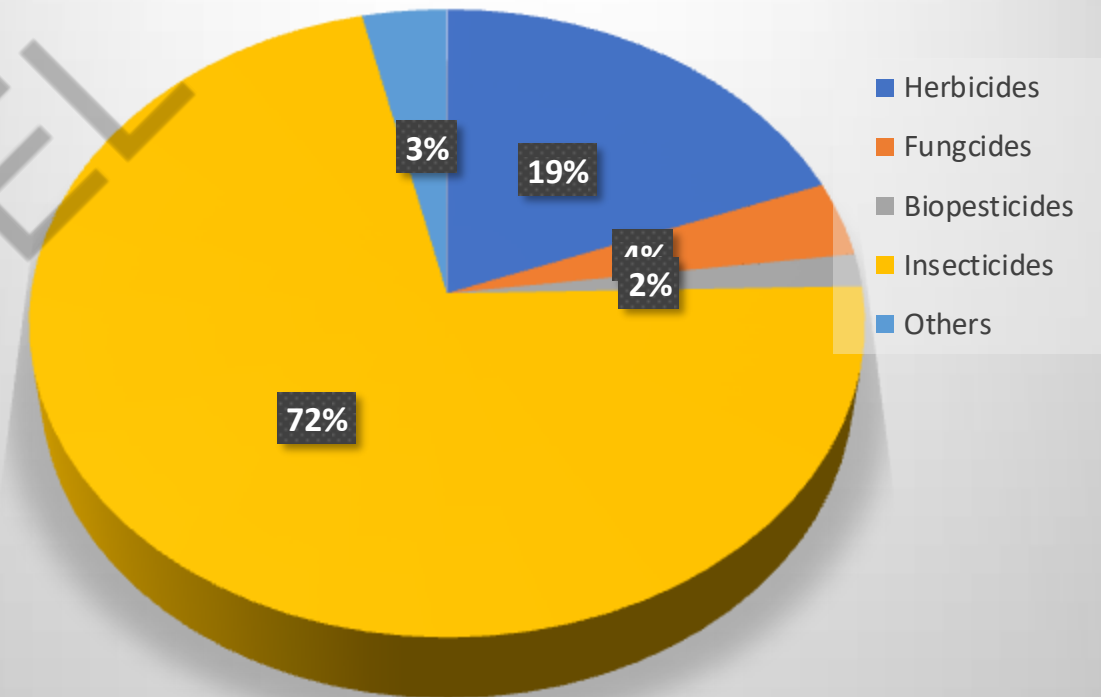
Mosaic virus

Crop Losses Due to Pests and Diseases



National Rice Research Institute (NRRI)

Indian Crop Protection Market

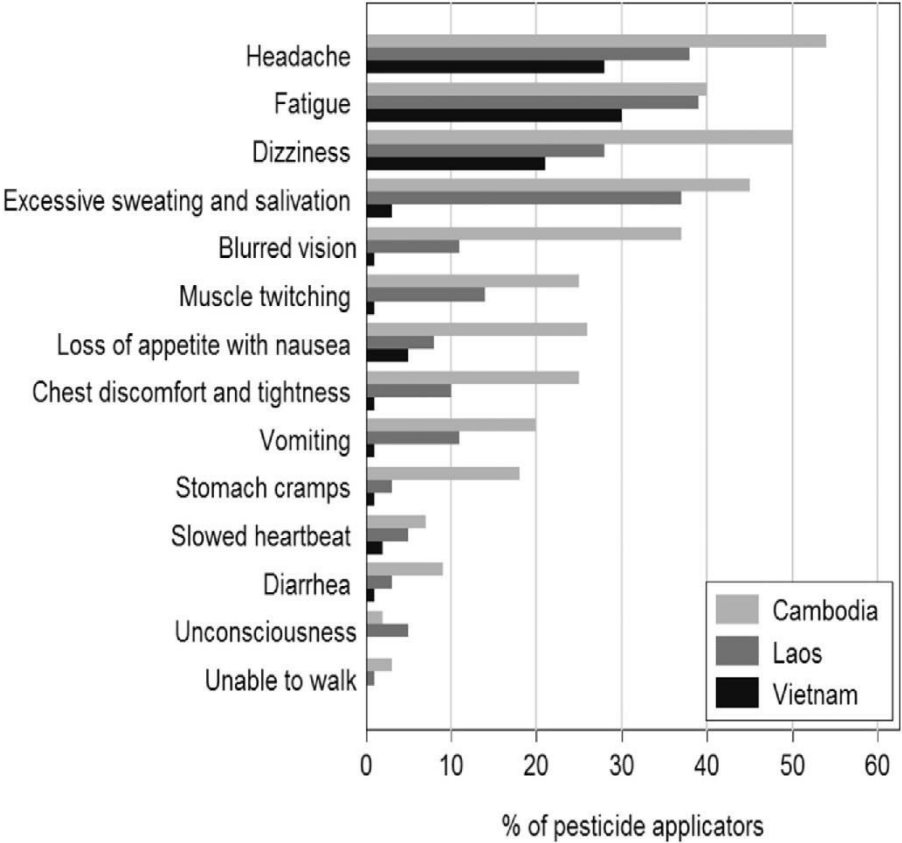


Source: *Industry reports, Analysis by Tata Strategic*

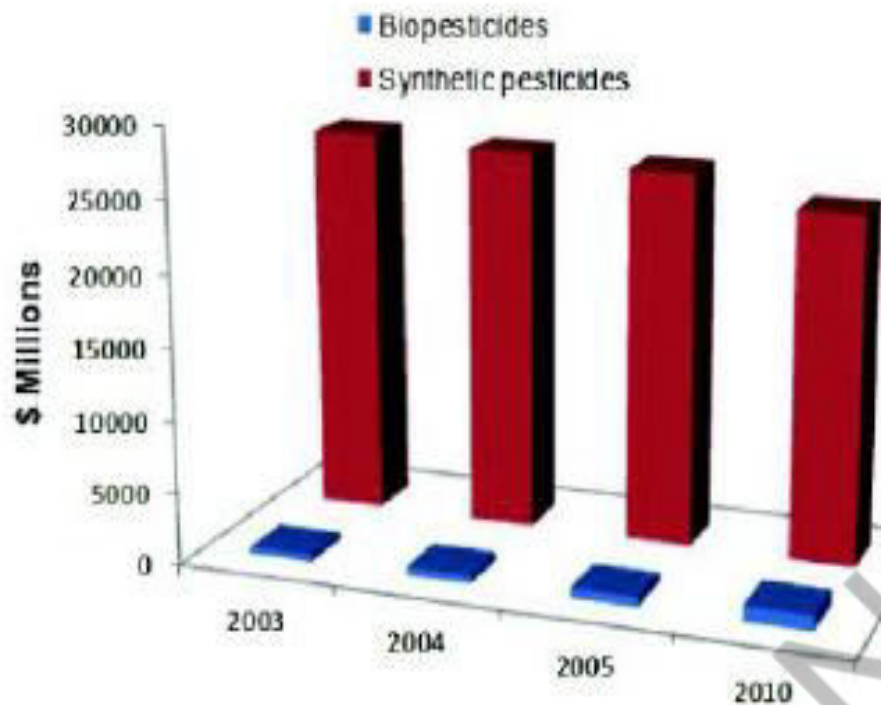
Pesticide dependence of smallholder vegetable farmers in Southeast Asia

Farmers association	Chemical Pesticide use, %
Advice from friends and neighbor	-45
Advice from shopkeeper	+251
Woman was in-charge of pest control	-42
Knowledge of bio pesticide	-31

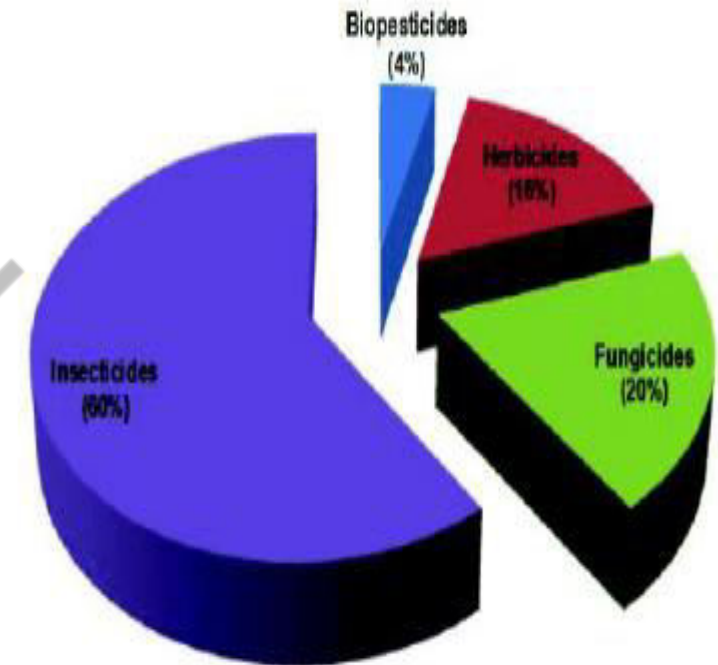
Sign and symptoms	Pesticide application in India (Assam), %
Chest pain/burning feeling	37.9
Burning/stinging/itching eyes	37.2
Excessive sweating	36.8
Skin redness/white patches	35.4
Excessive salivation	35



[PepijnSchreinemachers](#) et al, 2017: Too much to handle? Pesticide dependence of smallholder vegetable farmers in Southeast Asia, Science of Total environment, 593-594: 470-477
Dey et al., 2013. Impact of pesticide use on the health of farmers: A study in Barak valley, Assam (India), Journal of Environmental Chemistry and Toxicology, 5(10): 269-277



Global biopesticides and synthetic pesticides market 2003-2010 (\$ Millions) Source :BCC Inc.



Present scenario of the use of biopesticides and synthetic pesticides use in India

Source: Singh. 2014. *Management and plant pathogen with microorganisms Proceeding of National academic of sciences* 80:443-454

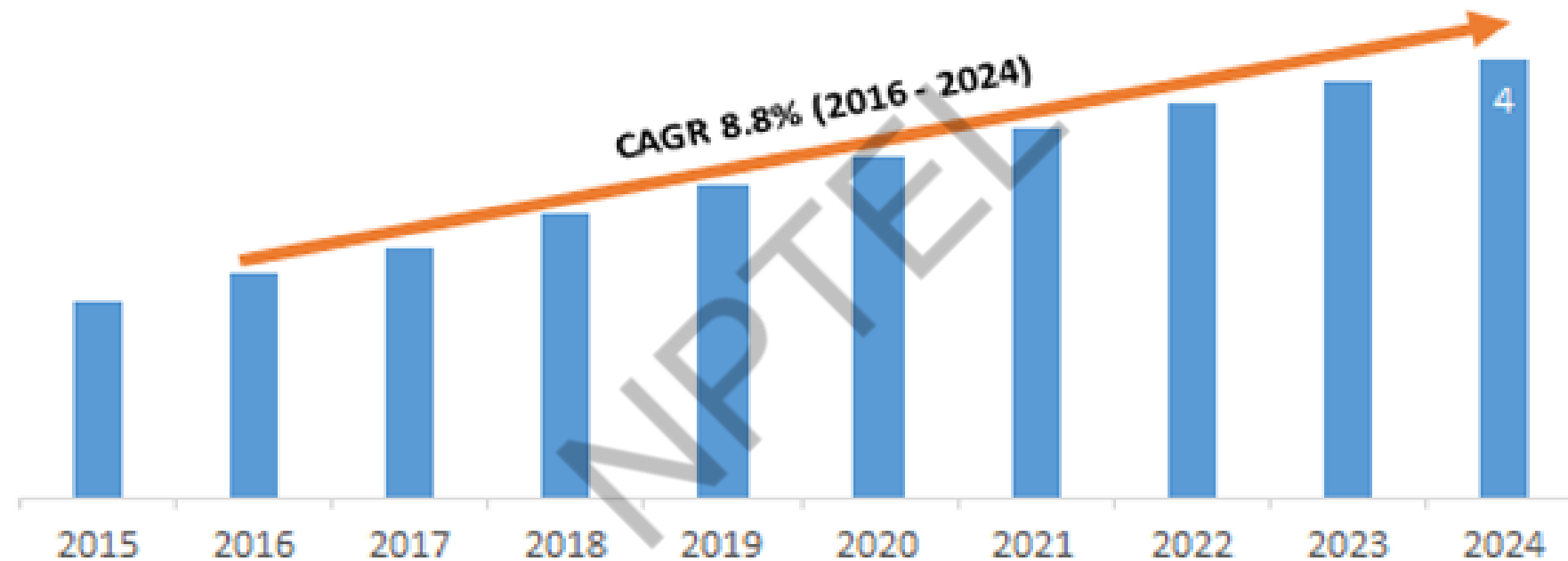


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Biopesticides Market Size and Forecast, 2015 - 2024 (US\$ Billion)



Source: Variant Market Research



Some stories....

Silent Spring is an environmental science book by Rachel Carson. The book was published on 27 September 1962 and it documented the adverse effects of the indiscriminate use of pesticides on the environment. Carson accused the chemical industry of spreading disinformation and public officials of accepting industry claims unquestioningly.

In the late 1950s, Carson turned her attention to conservation, especially environmental problems that she believed were caused by synthetic pesticides. The result was *Silent Spring* (1962), which brought environmental concerns to the American public. *Silent Spring* was met with fierce opposition by chemical companies, but it spurred a reversal in national pesticide policy, led to a nationwide ban on DDT for agricultural uses, and inspired an environmental movement that led to the creation of the U.S. Environmental Protection

In 1996, a follow-up book, *Beyond Silent Spring*, co-written by H.F. van Emden and David Peakall, was published. In 2006, *Silent Spring* was named one of the 25 greatest science books of all time by the editors of [*Discover Magazine*](#).



Rachel Carson

