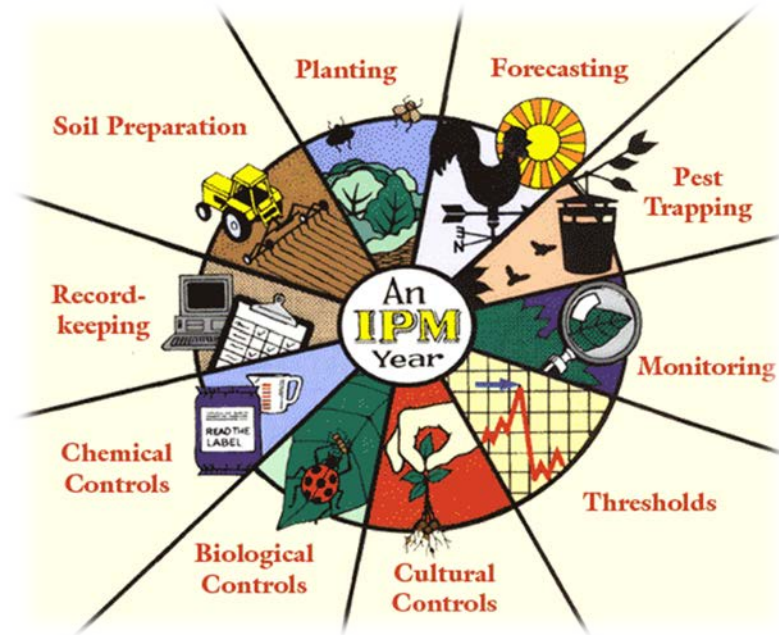


Chemical control in IPM



What is chemical control of pests?

- It is the pest control using chemical pesticides.
- A pesticide is a chemical used to prevent, destroy or repel insect pests.
- They combat pests and diseases occurring on our crops, livestock and our possessions.



HISTORY OF CHEMICAL CONTROL

1867

Paris green for the control of Colorado potato beetle in USA



1892

Arsenic compound, lead arsenate was first used against Gypsy moth in USA



1936

Lethane



1940

Chlorinated Hydrocarbons: DDT, Lindane, Chlordane, dieldrin, Heptachlor

Contd...

1946

Organophosphates: Malathion, parathion, dichlorvos, metasystox



1956

Carbamates: Aldicarb, methomyl, carbaryl, pirimicarb, bendiocarb



1965

Formamidines



1972

Synthetic pyrethroids: Bioresmethrin, phenothrin, allethrin, permethrin, deltamethrin, cypermethrin



Since 1992

New chemistry insecticides : neonicotinoids, IGR's, spinosyns, fiproles, avermectines, oxadiazine, pymetrozine, diamides, pyrroles, phenyl pyrazoles, tetrazines, tetrionic acid derivatives and ketoenols

“Age of Pesticides”



3 Phases

The era of traditional approaches (Ancient-1938)

- ✓ Cultural & mechanical methods- by farmers
- ✓ Neem, chrysanthemum, rotenone, tobacco, etc.,
- ✓ Synthetic inorganic: arsenic, mercury, tin & copper

The era of doubt (1962-1975)

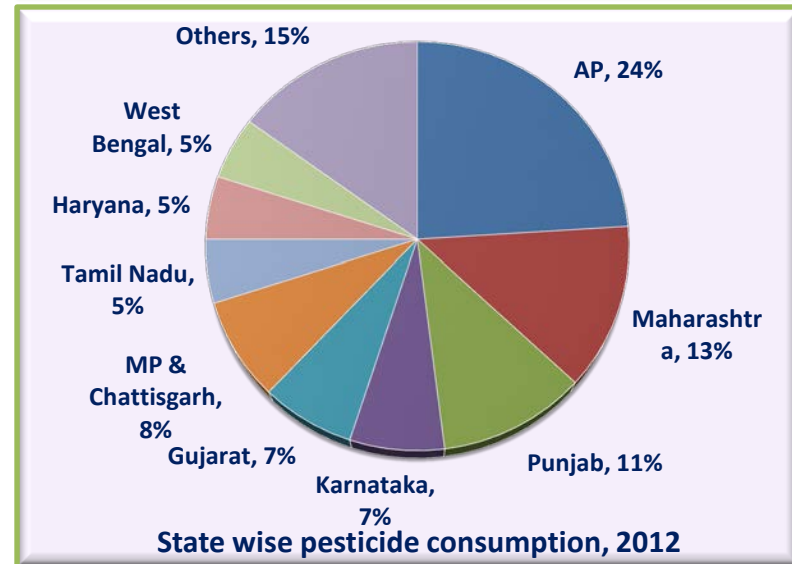
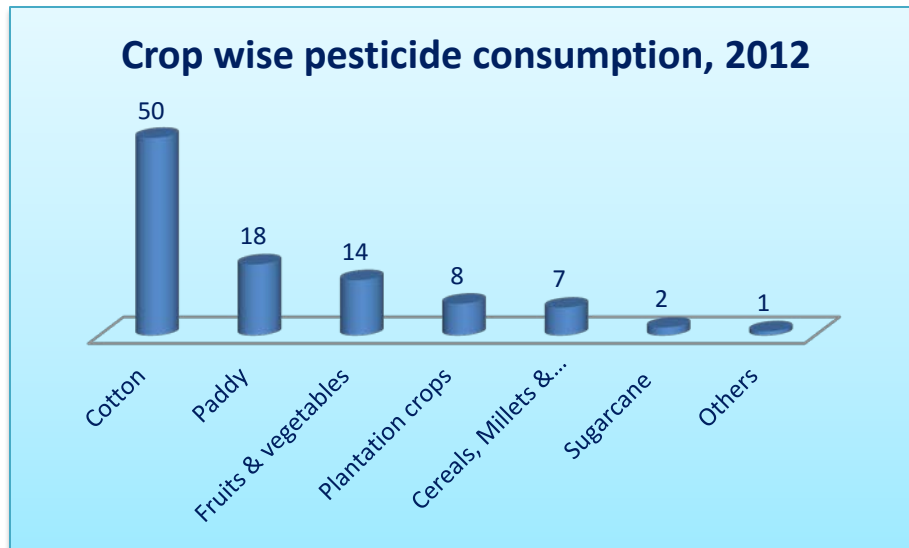
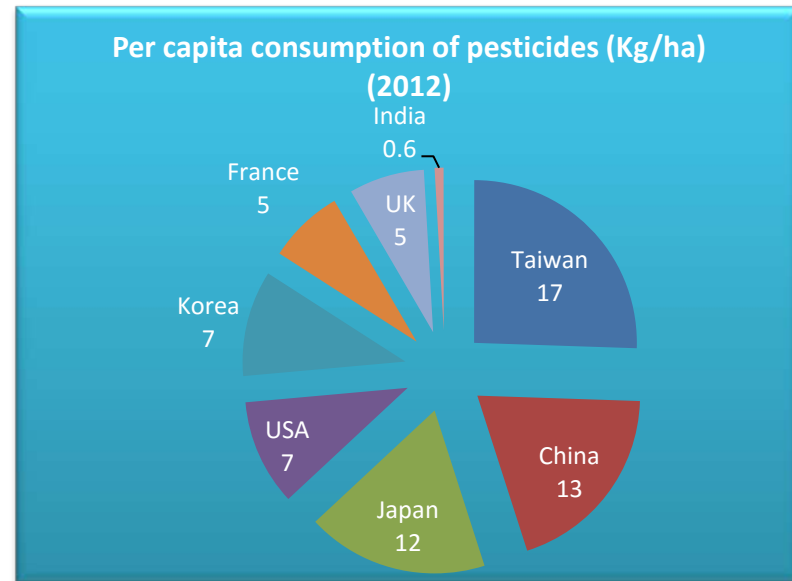
- ✓ Discovery of insecticidal properties DDT
- Resistance development
- ✓ OC, OP & synthetic Pyrethroids

The era of IPM (1976 onwards)

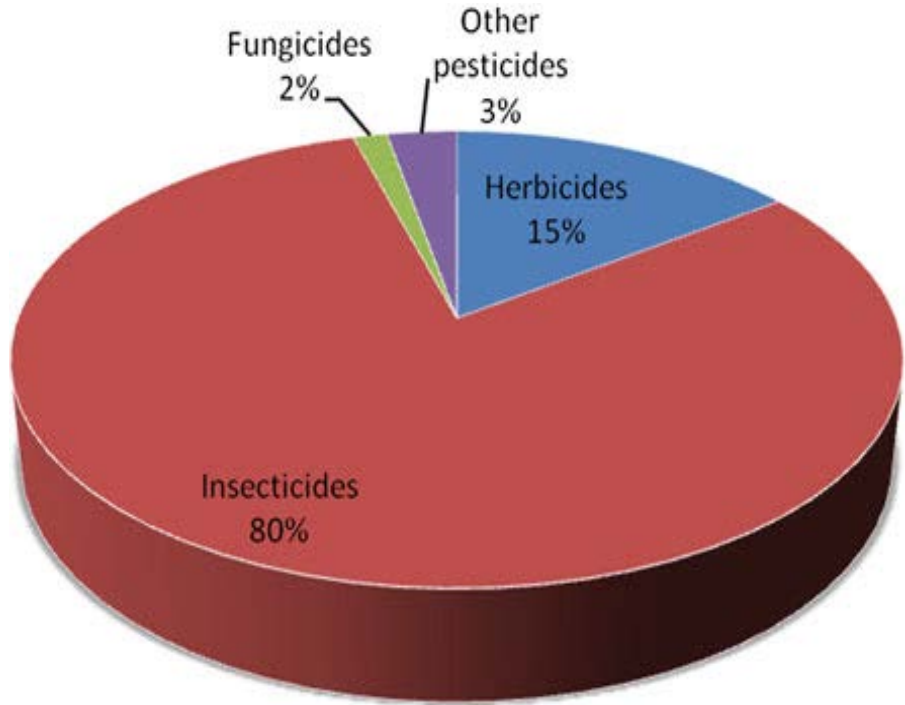
- ✓ IPM gained momentum in late 1970s
- ✓ Huffaker project: I IPM project
- ✓ FAO-IPM programme for Rice in Southeast Asia

Pesticides use scenario

- 260 pesticides registered for use and 585 pesticide formulations(11/08/2015)
- Pesticide consumption in India - very low
- World wide pesticide: 45,390 MT (2012-13)

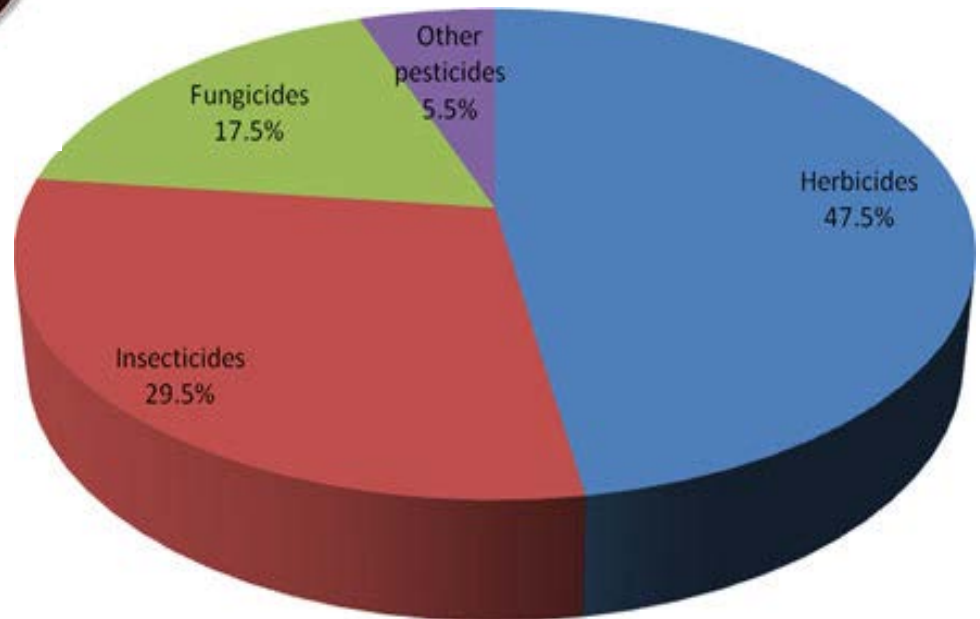


Consumption of pesticides



Indian scenario

World



2014

Classification of pesticides

Pesticides are classified in different ways

1. Based on usefulness

- **Acaricides : Ticks and Mites eg: Carbophenthion**
- **Insecticides: Insects eg: Carbofuron**
- **Fungicides: Fungal diseases eg: Mancozeb**
- **Herbicides: Weeds eg: 2,4-D, betachlor**
- **Nematicides: Nematodes eg: Phenamiphos**
- **Rodenticides: Rats eg: Coumarin**

2. Mode of action

- **Contact poison: eg: Carbaryl**
- **Stomach poison: eg: Zinc phosphide**
- **Systemic poison: eg: Carbofuran**
- **Fumigants: eg: Methyl bromide**

Chemical constituents

- **Botanical compounds**
- **Synthetic organic compounds**
- **Microbial compounds**
- **Insect Growth regulators**
- **Synthetic pyrethroids**

Classification of old Insecticides

Organochlorines
(DDT, aldrin, HCH,
endrin)

Organophates
(Dichlorvos, parathion,
chlorpyrifos, acephate)

Carbamates
(carbaryl, aldicarb,
isolan, carbofuran)

Synthetic pyrethroids
(allethrin, cypermethrin,
cyfluthrin)

Drawback of Conventional insecticides

- Residue
- Resistance
- Resurgence

New Chemistry insecticide classes

New Insecticide classes

Sl.no	Group	Chemical	a.i.
1	2B	Phenylpyrazoles	Fipronil, Ethiprole
2	3 A	Pyrethroids	Pyrethroids, pyrethrins
3	4A	Neonicotinoids	Acetamiprid, imidacloprid, thiacloprid, thiamethoxam, clothianidin, dinotefuron,
	4 B	Nicotine	Nicotine
4	5	Spinosyns	Spinosad, Spinetoram
5	6	Avermectins, Milbemycins	Abamectin, Emamectin Benzoate, milbemectin, lepimectin
6	7 B JHM	Fenoxycarb	Fenoxycarb
	7C JHM	Pyriproxyfen	Pyriproxyfen
7	8 *	Alkyl halides,	Methyl bromide, alkyl halides
8	9B	Pyridines	Pymetrozine (fulfil, relay, sterling, plenum,chess)
	9C	Pyridine carboxamide	Flonicamid
9	10A	Tetrazines Thiazolidines	Clofentezine , Diflovidazin Hexythiazox
	10B	Oxazolines	Etoxazole

Contd...,

Sl.no	Group	Chemical	a.i.
10	11A	Transgenic insecticides	B.t.
	11 B	<i>Bacillus sphaericus</i>	<i>Bacillus sphaericus</i>
11	12A	Thioureas	Diafenthiuron
	12B	Organotin	Azocyclotin, Cyhexatin, Fenbutatin- oxide
	12C	Propargite	Propargite
	12 D	Tetradifon	Tetradifon
12	13*	Pyrroles Dinitrophenoles	Chlorfenapyr, DNOC, Dinocap (karathane) , Sulfuramid
13	14	Neriestoxin analogues	Cartap hydrochloride , Bensultap, Thiocyclam, Thiosultap-sodium
14	15	Benzoylureas	Diflubenzuron, flufenoxuron, lufenuron, novaluron, teflubenzuron, triflumuron
15	16	Thiadiazine	Buprofezin
16	17	Triazine	Cyromazine

Contd...,

Sl.no	Group	Chemical	a.i.
17	18 MHM	Diacylhydrazine	Methoxyfenozide (intrepid), tebufenozide
18	19	Formamidines	Chlordimeform, Amitraz
19	21A METI	Pyrazoles/ Quinazolines	Fenpyroximate, Pyridaben, pyrimidifen Fenazaquin
	21 B	Rotenone	Rotenone (Derris)
20	22A	Oxadiazine	Indoxacarb
	22 B	Metaflumizone	Metaflumizone
21	23	Tetronic acid derivatives	Spirotetramat,
	23	Ketoenols	Spiromesifen
22	25	Beta-ketonitrile derivatives	Cyenoxyrafen, Cyflumetofen
23	28	Diamides	Flubendiamide, chlorantraniliprole (rynaxypyr)

Contd...,

Sl.no	Group	Chemical	a.i.
24	UN*	Pyridalyl	Pyridalyl
		Pyrifluquinazin	Pyrifluquinazin
		Azadirachtin	Azadirachtin
		Cryolite	Cryolite
		Dicofol	Dicofol
		Bifenazate	Bifenazate