



# Major uses of pesticides in Sugarcane Crop

(Registered under the Insecticides Act, 1968)

by

**Dr. LOKESH BABAR**

J.S.O. (Agriculture Chemistry)

Email: [lokesh.babar@gov.co.in](mailto:lokesh.babar@gov.co.in), [drlokeshbabar.nsi2025@gmail.com](mailto:drlokeshbabar.nsi2025@gmail.com)

**NATIONAL SUGAR INSTITUTE, KANPUR**



## What is Pest ?

- **Pest - Derived from French word 'Peste' and**
- **Latin term 'Pestis' meaning plague or contagious disease**
- ✓ **Pest is any animal which is noxious, destructive or troublesome to man or his interests .**
- ✓ **A pest is any organism which occurs in large numbers and conflict with man's welfare, convenience and profit.**
- ✓ **A pest is an organism which harms man or his property significantly or is likely to do so (Woods,1976).**

**Insects are pests when they are sufficiently numerous to cause economic damage (Debacli, 1964).**

**Pests are organisms which impose burdens on human population by causing**

- **Injury to crop plants, forests and ornamentals,**
- **Annoyance, injury and death to humans and domesticated animals**
- **Destruction or value depreciation of stored products.**
- **include insects, nematodes, mites, snails, slugs, etc. and vertebrates like rats, birds, etc.**
- **Depending upon the importance, pests may be**
- ✓ **agricultural forest, household, medical, aesthetic and veterinary pests.**



## CATEGORIES OF PESTS:

Based on occurrence following are pest categories:

- ✓ **Regular pest:** Frequently occurs on crop - Close association  
e.g. Rice stem borer, Brinjal fruit borer
- ✓ **Occasional pest:** Infrequently occurs, no close association  
e.g. Caseworm on rice, Mango stem borer
- ✓ **Seasonal pest:** Occurs during a particular season every year  
e.g. Red hairy caterpillar on groundnut, Mango hoppers
- ✓ **Persistent pests:** Occurs on the crop throughout the year and is difficult to control  
e.g. Chilli thrips, mealy bug on guava
- ✓ **Sporadic pests:** Pest occurs in isolated localities during some period.  
e.g. Coconut slug caterpillar



## Based on level of Pest infestation

- **Epidemic Pest: Sudden outbreak of a pest in a severe form in a region at a particular time.**  
e.g. RHC in Madurai, Pollachi, BPH in Tanjore
- **Endemic Pest: Occurrence of the pest in a low level in few pockets, regularly & confined to particular area.**  
e.g. Mango hoppers in Periyakulam, Rice gall midge in Madurai

## Parameters of Pest population levels

- **General equilibrium position (GEP):** The average density of a population over a long period of time, around which the pest population tends to fluctuate due to biotic and abiotic factors and in the absence of permanent environmental changes.
- **Economic threshold level (ETL):** Population density at which control measure should be implemented to prevent an increasing pest population from reaching the ETL.
- **Economic injury level (EIL):** The lowest population density that will cause economic damage.
- **Damage boundary (DB):** The lowest level of damage which can be measured. **ETL is always less than EIL.**  
Provides sufficient time for control measures.



## PEST CATEGORIES BASED ON PEST POPULATION LEVELS

### (1) **Key pest : Most severe and damaging pests**

- GEP lies above EIL always
- Spray temporarily bring population below EIL
- These are **persistent pests**
- The environment must be changed to bring GEP below EIL  
e.g. Diamond backmoth, Cotton bollworm,

### (2) **Major pest: Economic damage can be prevented by timely and repeated sprays**

- GEP lies very close to EIL or coincides with EIL  
e.g. Rice stem borer, Cotton jassid

### (3) **Minor pest/Occasional pest :Can be controlled by spraying**

- GEP is below the EIL usually
- Rarely they cross EIL  
e.g. Ash weevils, Cotton stainers, Rice hispa

### (4) **Sporadic pests: GEP generally below EIL**

- Sometimes it crosses EIL and cause severe loss in some places/periods  
e.g. Sugarcane pyrilla, Hairy caterpillar, White grub

### (5) **Potential pests:They are not pests at present**

- GEP always less than EIL If environment changed may cause economic loss  
e.g. *S. litura* is potentia pest in North India



## What is pesticide ?

**Pesticide:** Pesticide is a substance which kills a pest.

Any substance or mixture of substances intended for **preventing, destroying, repelling, or mitigating any pest (insect, rodent, nematode, fungus, weed, other forms of terrestrial or aquatic plant or animal life or viruses, bacteria, or other microorganisms on or in living man or other animals**, which the administrator declares to be pest, and any substance or mixture of substances intended for **use as a plant regulator, defoliant, or desiccant.**

As per the Insecticides Act 1968, any substance which is in the schedule, or Such other substances as the central government may, after consultation with the Board, by notification in the official gazette, include in the schedule from time to time or Any preparation containing any one or more of such substances is a pesticide.

**The Pesticides can be classified** in many ways **on the basis of use, toxicity, mode of entry, mode of action, chemistry and formulations.**

### **Pesticide: Pest + cide**

- **Pest meaning insect, rodent, nematode, fungus, weed, other forms of terrestrial or aquatic plant or animal life or viruses, bacteria, or other microorganisms on or in living man or other animals**
- **cide: meaning intended for preventing, destroying, repelling, or mitigating**



## Pesticide classification based on the basis of their use :

- **Acaricides:** are the substances that are used to kill mites and ticks, or to disrupt their growth or development. e.g. Fipronil, bifenthrin, cyhalothrin, fluvalinate, permethrin & chlorfenapyr etc.
- **Algicide:** are the substances that are used to kill or inhibit algae. e.g. copper sulfate, diuron & isoproturon etc.
- **Antifeedants:** are the chemicals which prevent an insect or other pest from feeding. e.g. Fentin and azadirachtin etc.
- **Avicides:** are the chemicals that are used to kill birds. e.g. fenthion & strychnine etc.
- **Bactericides:** are the compounds that are isolated from or produced by a microorganism (e.g. a bacterium or a fungus), or a related chemical that is produced artificially. which are used to kill or inhibit bacteria in plants or soil. e.g. copper hydroxide, kasugamycin, streptomycin & tetracycline etc.
- **Bird repellents:** are the chemicals which act as the bird repellants e.g. copper oxychloride, diazinon, methiocarb, Thiram & ziram etc.
- **Chemosterillant:** are the chemicals that renders an insect infertile and thus prevents it from reproducing. e.g: diflubenzuron
- **Fungicides:** are the chemicals which are used to prevent, cure eradicate the fungi e.g. Bordeaux mixture, copper oxychloride & captan etc.
- **Herbicide softeners:** A chemical that protects crops from injury by herbicides, but does not prevent the herbicide from killing weeds. e.g. benoxacor, cloquintocet, cyometrinil & cyprosulfamide etc.



- **Herbicides:** are the substances that are used to kill plants, or to inhibit their growth or development. e.g. Paraquat, atrazine, isoproturon, linuron, metoxuron, chlorimuron & sulfosulfuron etc.
- **Insect attractant:** A chemical that lures pests to a trap, thereby removing them from crops, animals or stored products. e.g. Gossyplure, Gyplure, Muscalure (name ends with lure as they lure the pests)
- **Insect repellents:** A chemical that deters an insect from landing on a human or an animal. e.g. Citronella oil & Permethrin etc.
- **Insect Growth regulator:** A substance that works by disrupting the growth or development of an insect e.g. Diflubenzuron & buprofezin etc.
- **Insecticides:** A pesticide that is used to kill insects, or to disrupt their growth or development. e.g. azadirachtin & deltamethrin etc.
- **Mammal repellents:** A chemical that deters mammals from approaching or feeding on crops or stored products.
- **Mating disrupters:** are the chemicals that interfere with the way that male and female insects locate each other using airborne chemicals (pheromones), thereby preventing them from reproducing.
- **Molluscicides:** are the substances used to kill slugs and snails. e.g. copper sulfate, metaldehyde & thiodicarb etc.
- **Nematicides:** are the chemicals which are used to control Nematodes. e.g. abamectin, benomyl & triazophos etc.





- **Plant growth regulators:** are the substances that alters the expected growth, flowering or reproduction rate of plants. e.g. 2,4-D, $\alpha$ -naphthaleneacetic acid, ethephon, metoxuron & gibberellic acid etc.
- **Rodenticides:** are the substances used to kill rats and related animals. e.g. strychnine, bromadiolone, coumachlor, coumatetralyl, warfarin, zinc phosphide, Lindane & aluminium phosphide etc.
- **Synergists:** A chemical that enhances the toxicity of a pesticide to a pest, but that is not by itself toxic to the pest. e.g. piperonyl butoxide
- **Virucide:** an agent having the capacity to destroy or inactivate viruses. e.g. Ribavirin (not available in India)
- **Miscellaneous:** e.g. aluminium phosphide, sodium cyanide etc.
- **Biologicals:** e.g. Viruses, bacteria, fungi, and plants Nematodes, insects and other parasites or predators

**Fertilizers and other plant nutrients are not included in term “Pesticides”**



**The pesticide use and legislation was studied in 1964-67 by an Expert Committee of Indian Council of Agricultural Research headed by Prof. M.S. Thacker.**

Based on the recommendations of the Expert Committee **a comprehensive Insecticides Act was passed in 1968**

- to regulate the import, manufacture, sale, transport, distribution
- use of insecticides with a view to prevent risks to human beings and animals and for other matters connected therewith.

For the effective enforcement of the Insecticides Act, the two bodies have been constituted at the Central level viz.

[Central Insecticides Board](#) and

[Registration Committee.](#)

[Insecticides Act, 1968](#)

[Insecticides Rules, 1971](#)



## Central Insecticide Board and Registration Committee (CIB&RC)

### Organizational Chart of Central Insecticides Board And Registration Committee



## Latest information about Pesticides use in India (till 29.02.2020)



- 40 Pesticides Banned for manufacture, import and use
- 04 Pesticide formulations banned for import, manufacture and use
- 02 Pesticide / Pesticide formulations banned for use but continued to manufacture for export
- 08 Pesticides Withdrawn
- 18 Pesticides refused registration
- 09 Pesticides restricted for use in country
- 06 Pesticides to be phase out by 31st December, 2020
- 289 Pesticides Registered under section 9(3) of the Insecticides Act, 1968 for use in the Country
- 736 Total Formulation Registered for use in the Country under Insecticides Act, 1968

## Major Insecticides uses in Sugarcane crop



S. No.	Technical Name	Common name of the pest	Dosage / ha			Waiting Period (days)
			a.i (gm)	Formulation (gm/ml)	Dilution in Water (Liter)	
1.	<b>BIFENTHRIN 10% EC</b>	Termites	100	1000	500	300
2.	<b>BROMADIOLONE 0.25% CB</b>	Field Rat, Large bandicota	0.005	-	-	-
3.	<b>BROMADIOLONE 0.005% RB</b>	Field Rat, Large bandicota	0.005	-	-	-
4.	<b>CARBOFURAN 3% CG</b>	Top borer	2000	66600	-	-
5.	<b>CHLORANTRANILIPROLE 18.5% SC</b>	Termite	100-125	500-625	1000	208
		Early shoot borer	75	375	1000	208
		Top borer	75	75	1000	208



S. No.	Technical Name	Common name of the pest	Dosage / ha			Waiting Period (days)
			a.i (gm)	Formulation (gm/ml)	Dilution in Water (Liter)	
6.	<b>CHLORANTRANILIPROLE 0.4% GR</b>	Early shoot borer	75	18.75	-	147
7.	<b>CHLORPYRIFOS 20% EC</b>	Black bug	150	750	500-1000	-
		Early shoot & stalk borer	250-300	1250-1500	500-1000	-
		Pyrilla	300	1500	500-1000	-
8.	<b>CLOTHIANIDIN 50% WDG (Soil drench)</b>	Termite	125	250	1000	310
9.	<b>FIPRONIL 5% SC</b>	Early shoot borer & root borer	75-100	1500-2000	500	270
10.	<b>FIPRONIL 5% SC</b>	Early shoot borer Root borer	75-100	1500-2000	500	270
11.	<b>FIPRONIL 0.3% GR</b>	Early shoot borer Root borer	75-100	25000- 33300	-	09
12.	<b>IMIDACLOPRID 70% WS PER 100KG SEED</b>	Termite	70 –105	100 – 150	-	-

(Cont.)



S. No.	Technical Name	Common name of the pest	Dosage / ha			Waiting Period (days)
			a.i (gm)	Formulation (gm/ml)	Dilution in Water (Liter)	
13.	IMIDACLOPRID 17.8% SL	Termite	70	350	1875	45
14.	MONOCROTOPHOS 36% SL	Shoot borer	600-800	1500-2250	500-1000	-
		Mealy bug	600	1500	500-1000	-
		Pyrilla	200	500	500-1000	-
		Scale Insect	600	1500	500-1000	-
		Stalk borer	750	1875	500-1000	-
15.	PHORATE 10% CG (The use of Phorate shall be completely banned with effect from the 31st December, 2020 )	Top borer	3000	30000	-	-
		White grub	2500	25000	-	-
16.	THIAMETHOXAM 75% w/w SG	Termites and Early shoot borer	120	160	500-1000	230
17.	FIPRONIL 40% + IMIDACLOPRID 40% WG	White grub ( <i>Holotrichia consanguinea</i> )	175+175-200+200	437.5-500	1000-1250	296



## Major Fungicides uses in Sugarcane crop

S. No.	Technical Name	Common name of the pest	Dosage / ha			Waiting Period (days)
			a.i (gm)	Formulation (gm/ml)	Dilution in Water (Liter)	
1.	Metalaxyl 35% WS	Sugarcane downy mildew	Slurry seed treatment with 240g/ 100 kg seed	700g/100 Kg seed	0.75-1.0/100 Kg seed	3½-4 months Depending on the variety
2.	Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC	Red rot, Smut and Rust	0.03% or 0.3 g/L	0.1% or 1 ml / Litre water	400	265





## Major Plant Growth Regulators uses in Sugarcane crop

S. No.	Name of Plant growth regulator Approved fro Sugarcane	Time of application/Purpose	Dosage / ha			Waiting Period (days)
			a.i (gm)	Formulation (gm/ml)	Dilution in Water (Liter)/ preparation of solution	
1.	<b>Gibberellic Acid</b> 0.001% L for planted Sugarcane	a)First spray 40-45 days after planting b)Second spray 70-80 days after planting	0.018	180	450-500	-
2.	<b>Hydrogen Cyanamide</b> 49% AS ( Import )	Dipping of setts	0.50	1.00%	Mix 1000 ml of the product per 100 litres of water	319 days

## Major Herbicides/Weedicides uses in Sugarcane crop



S. No.	Technical Name	Common name of the pest	Dosage / ha			Waiting Period (days)
			a.i (gm)	Formulation (gm/ml)	Dilution in Water (Liter)	
1.	<b>Clomazone 50% EC</b>	<i>Enchinochloa colonum</i> <i>Brachiaria repens</i> <i>Dactyloctenium aegyptium</i> <i>Trianthema portulacastrum</i>	0.75-1.00 kg a.i./ha	1.5-2.0 ltr/ha	500 Lit	296
2.	<b>2,4-D Dimethyl Amine salt 58% SL</b>	<i>Cyperus iria</i> <i>Digitaria sp.</i> <i>Dactylactenium aegyptium</i> <i>Digera arvensis</i> <i>Portulaca oleracea</i> <i>Commelina benghalensis</i> <i>Convolvulus arvensis</i>	3.5	6.3	500	-
3.	<b>2,4-D Sodium salt Technical (having 2,4-D acid 80 % w/w) (Earlier Registered as 80% WP)</b>	<i>Boerhaavia diffusa</i> <i>Chenopodium album</i> <i>Tribulus terrestris</i> <i>Portulaca oleracea</i> <i>Xanthium spp.</i> <i>Convolvulus arvensis</i> <i>Amaranthus spinosus</i> <i>Digera arvensis</i> <i>Celosia argentea.</i>	2.0-2.6	2.5-3.25	600-900	300



S. No.	Technical Name	Common name of the pest	Dosage / ha			Waiting Period (days)
			a.i (gm)	Formulation (gm/ml)	Dilution in Water (Liter)	
4.	2,4-D Ethyl Ester 38 % EC (having 2,4-D acid 34 % w/w)	<i>Cyperus iria</i> , <i>Digitaria sp.</i> , <i>actyloctenium</i> , <i>Aegyptiana</i> , <i>Digera arevensis</i> , <i>Portulacaoleeracea</i> , <i>Commelina benghalensis</i> , <i>amaranthus sp.</i> , <i>Convolvulus arvensis</i>	1.2 to 1.8	3.53- 5.29	500	300-330
5.	Diuron 80% WP	<i>Cyperus iria</i> , <i>Portulaca racea</i> , <i>Echinochloa rusgalli</i> , <i>Cynotis spp</i> , <i>Amaranthus spp</i> , <i>Convonvulus spp</i> , <i>Digitaria spp.</i>	1.6-3.2kg	2.0-4.0 kg.	600	-
6.	Halosulfuron Methyl 75% WG	<i>Cyperus rotundus</i>	60-67.5	80-90	375	294
7.	Metsulfuron Methyl 20% WP	<i>Cyperus esculentus</i> , <i>Amaranthus viridis</i> , <i>Portulaca oleracea</i> , <i>Parthenium hysterophorus</i> , <i>Trianthema sp.</i> , <i>Cleome viscosa</i> , <i>Solanum sp.</i> , <i>Commelina benghalensis</i> , <i>Euphorbia sp.</i> , <i>Digeria sp.</i>	6	30	500-600 (Add non - Ionic surfactant Iso-octylphenoxy- Poloxethanol 12.5% @ 2ml per liter of spray volume (0.2%))	346



S. No.	Technical Name	Common name of the pest	Dosage / ha			Waiting Period (days)
			a.i (gm)	Formulation (gm/ml)	Dilution in Water (Liter)	
8.	<b>Sulfentrazone 39.6% w/w SC</b>	<i>Trianthema sp., Digera spp., Amaranthus spp., Phyllanthus spp., Euphorbia spp., Dactyloctenium spp., Digitaria spp., Brachiaria spp., Echinochloa spp., Cynodon spp and Cyperus spp.</i>	720	1500	500	306
9.	<b>Hexazinone 13.2% + Diuron 46.8 % WP</b>	<i>Enchinochloa colonum, Dactyloctenium Aegyptium, Trianthema monogyna Amaranthus viridis, Ipomea spp Cyperus rotundus, Cyperus esculentus Setaria spp, Parthenium hysterophorus Euphorbia hirta</i>	1200 gm (264+936)	2 Kg	500	282-306
10.	<b>Sulfentrazone 28% + Clomazone 30% WP</b>	<i>Amaranthus viridis, Trianthema spp., Digera arvensis, Physalis spp., Brachiaria spp., Cynodon dactylon, Echinochloa spp., Dactyloctenium aegyptium, Cyperus rotundus.</i>	700+750	2500	500	302

THANK YOU !!!!!!