

# INTRODUCTION

## Toxicity of Pesticides

Pesticides are poisonous chemicals; therefore, special attention is required during handling spraying, mixing and storage. In Pakistan there is a label on every registered pesticides container, with a special sign of toxicity. It is skull and cross bones symbol with a coloured circle around it. The colour of the circle indicates the toxicity of the products in the container. Therefore, it is suggested that more care should be taken according to their toxicity class given below. It is also very important to read carefully the label and strictly follow the instructions.

## Toxicity Classification Sign

Red	=	Class IA = Extremely hazardous (Special care and handling is required)
Blue	=	Class B = Highly hazardous (Special care is required)
Yellow	=	Class II = Moderately hazardous (Maximum possible care is required)
Brown	=	Class III = Slightly hazardous (Optimum care is required)

## Treatment of Pesticides Poisoning

The following action may be taken in case of poisoning:

- ❖ Remove contaminated clothing immediately and thoroughly wash the body preferably with soap and plenty of water.
- ❖ Keep patient warm and quite, preferably in a sheltered airy place.
- ❖ If a pesticide is splashed into eyes, immediately wash them with plenty of clean water for at least 10 minutes.
- ❖ If poison has taken orally (Not in case of EC'S products), patient should be made to vomit by giving, for example, saline solution (2 table spoons of Salt 1 glass of warm water).

## NEVER ADMINSTER ANY THING TO UNCONSCIOUS PERSON

- ❖ Immediately contact the Doctor and show him the label or container of pesticide used.
- ❖ In case of chlorinated hydrocarbon poisoning, avoid oils, Oil laxatives and epinephrine (Adrenalin). Do not give stimulants or atropine. Do not induce emesis if the ingested poison is principally a hydrocarbon solvent (e.g. Kerosene).
- ❖ In case of organophosphorus and carbamate compounds, avoid morphine, theophyllin aminophylline, barbiturates or phenothiazines.

## ANTIDOTES

### Chlorinated Hydrocarbon Compounds

- ❖ Diazepam or barbiturates in appropriate dosages repeated as necessary for restlessness or convulsions (Phenobarbitone 100 mg or diazepam 10 mg I.M. or I.V.). It may be necessary to continue treatment for up to weeks of the poisoning.
- ❖ Give calcium gluconate 10% in 10 ml ampules I.V. every four hours.
- ❖ Cholestyramine 4 gm, 4 times/day, before meals and bed time to accelerate biliary fecal excretion. Prolonged treatment may be needed for several weeks.

### Organophosphorus and Carbamate Compounds

- ❖ Inject massive doses for Atropine. I.V. 13 mg every 510 minutes until signs of Atropinizations occur. (This is Essential).
- ❖ Protopamchloride (2PAM or Toxignon) 1 gm I.V. slowly over a period of 5 minutes. (This must not be used as alternate in presence of Atropine).
- ❖ 2PAM or Toxignon is contraindicated in case of carbamates compounds. Therefore, do not use it.
- ❖ Do not give atropine to a cyanotic patient in organophosphorous poisoning.

### Pyrethroid Compounds

- ❖ Symptomatic treatment.
- ❖ Atropine sulphate to suppress salivation reduces severity of some of the signs of poisoning.
- ❖ Diazepam for convulsions.

### General Instruction for Safe Handling of Pesticides

- ❖ Always read the Pesticides label and follow its instructions carefully.
- ❖ Wear clean and appropriate protective clothing, including hand gloves, and protection for eyes, nose, mouth and face.
- ❖ Never leave pesticide unattended in an insecure place.
- ❖ Never transfer pesticides to other container especially liquor, soft drink or other beverage and edible materials bottles, containers etc.
- ❖ Never work alone when handling, very toxic insecticides.
- ❖ First inspect pesticide container for leaks and handle them with care.
- ❖ Do not keep food, drink, tobacco or eating utensils any where in the working area or in working clothes.
- ❖ Never eat, drink, smoke, rub your eyes, inhale or touch your mouth while working with pesticides.
- ❖ Always have soap, and plenty of water available and a change of clothing.
- ❖ Always discard heavily contaminated clothing and faulty protective covering, especially gloves and respirators.
- ❖ Keep away unauthorized persons especially children from pesticides.
- ❖ Never work with leak or faulty spray machines for spraying.
- ❖ Do not spray against wind.

## Guide Line for Proper Spray Operations

The entire success of chemical control programme depends on the following.

### a) Selection of Proper Insecticides:

While selecting the insecticides, due consideration is given to pest complex. The insecticide should be selected which is effective against existing complex. The basic criteria of selecting a pesticide are its effectiveness, safety and cost per treatment. As far as possible safe and effective products should be preferred.

### b) Correct Dose

The dose of insecticides for different target pests is generally not the same. It varies with the crop condition and its growth stage. It may be made clear that the effective recommended dose of pesticide be used. It should never be less or more than the recommended effective dose. For field crops, dose should be on the basis of per unit area, like 500 ml per acre, and for orchards it should be in concentrations, e.g. 100 ml of insecticides in 100 liter of water.

### c) Timely Application

The crop pest relationship has to be understood for carrying out plant protection measures. Control operations are only needed when pest has attained such populations, where, if not controlled may cause economic losses. This level is known as “economic injury level”, (ETL) which varies for different crops and pests. If level of pests is low and predators and parasites are active in the field and exercising the check on the pest buildup, spraying may be delayed till pest attains the economic threshold level (ETL).

Start spray at economic threshold level of the pest, not before it, and do not let it left more than economic injury level.

Spray at the right stage of the pest i.e. at proper stages, so that effective control is obtained. Always spray the crops in the early hours or late hours of the day, when the temperature is generally low.

#### d) Proper Coverage

Despite timely application and correct selection of insecticides and its dose, the desired results could not be obtained, if spray operations are not done correctively. To attain proper coverage, it is essential to determine water requirement per unit area, so as to have even and uniform spray to the whole crop and plants with proper dosage. If it is not properly done, distribution of insecticides would not be even and uniform, thus ultimate objective of applying insecticides for obtaining the most economical and satisfactory control of pest would not be achieved. During spray, overlapping should be avoided. Nozzle should be checked after each filling of sprayer on waste land.

Spray machines; be in proper working conditions, especially the pressure, nozzle type and discharge, for making proper distribution of spray mist and effective droplet size, required for effective control of the target pests.

#### e) Calibration of Sprayers:

Different types of machines are used by farmers in spraying operation, which may vary in their performance in respect of water requirement. The volume of water in general will provide adequate coverage to cotton crop through different type of spray machines, and methods of spraying is as under:

#### f) Spray Nozzles:

For insecticides & fungicide application always use “HollowCone” Nozzles. But for weedicides application apply product with TJet for Tractor Mounted Sprayer and FJet (Flood Fan Jet) for H.N.Sack (Knap Sack Hand Sprayer).

<b>Methods of Spraying</b>	<b>Machine Type</b>	<b>Average amount of Water/acre required</b>
High volume	Knapsack hand sprayers and compression hand sprayers.	100 – 120 Liter
Medium volume (Low Volume)	Power Knapsack Sprayer (Mist blowers)	45 – 90 Liters
Ultra low volume	ULV Sprayer	Without water

The procedure to calculate the amount of water which provides adequate coverage to field crops is given here under:

Check that the machine is in proper working condition, the nozzle type and orifice aperture is desired one, the pressure is optimum, and there is no leakage in the tank, spray lance, nozzles etc; of the machine being used for spray operations.

Take empty sprayer, fill with plain water, and spray on the crop with normal walking speed, giving proper coverage to all plants/crops, evenly and uniformly. Now measure the area covered by one machine, on this basis the volume of water required per acre, be determined. For example, if sprayer filled with water becomes empty on area of 5 ghunta, then for one acre (40 ghunta), the volume, of water required would be 8 machines.

If insecticides are used is recommended @ 400 mls. per acre, then per machine insecticide would be required  $400/8 = 50$  mls. Its means 8 sprayers would be required to cover one acre area by putting 50 mls. insecticide in each spray machine.

**i.e.  $8 \times 50 \text{ mls} = 400 \text{ mls per acre}$**

### **g) Care and Maintenance of Spray Machines**

- ❖ Follow the instructions given by the manufactures provided in booklets or leaflets.
- ❖ Always use clean water during spraying, or filter through thick muslin cloth and strainer, if canal water is being used.
- ❖ When spraying operations are over, wash machines thoroughly and keep its tank mouth downward to drainout the water.
- ❖ Insecticide and water be poured in sprayer through strainer, to avoid blockage of nozzles.
- ❖ The mixing of the insecticide in water be made thoroughly, making the solution even and uniform.
- ❖ If mixing is made directly in machine tank, then first fill half of tank with water, and then put the required quantity of insecticide and stir thoroughly, to make even and uniform solutions. Then add remaining quantity of water in the tank and stir again to make homogenous solution.
- ❖ In hand operated sprayer machine, tank may be filled  $3/4$  and rest capacity should be left for air.
- ❖ Before starting motorized sprayer, Mobil oil may be checked.
- ❖ If any defect appeared in engine during spraying in motorized sprayer always in first step, clean spark plug.
- ❖ Frequent on-and-off of Motorized sprayers during spraying operation may be avoided.
- ❖ Necessary servicing of machine may be done as per the instruction of manufactures.

## h) Economic Threshold Levels for Cotton Pests

Jassids	1 nymph or adult per leaf
Whitefly	35 nymphs / adults per leaf
Thrips	810 thrips per leaf
Mites	1-2 mites for leaf at vegetative phase of crop. 2-3 mites per leaf in advance stage of growth.
Spotted bollworm	510% infestation on terminals, squares, flowers and bolls or 3 larvae/25 plants
Pink bollworm	5-10% infestation in flowers and bolls
American bollworm (Heliothis Sp.)	10 brown eggs or 5 small larvae per 25 plants
Army worm	As soon as infestation comes in notice, control measures should be initiated. Applied products in patches
Leaf roller	As soon as infestation comes in notice, control measures should be initiated.
<b>NOTE:</b>	In case of pesticide sprayers in cotton, pyrethroids Should not be used before 90 DAP (days after planting)

## i) General economic threshold levels for fruit and vegetable crops

<b>Mango: Thrips</b>	5 thrips/plant terminal (Nursery) 5 thrips/leaf (Mature plants)
Shoot borer	10% attacked shoots
Mango leaf hopper	23 hoppers per shoot or inflorescence
Scales & mealy bugs	510 leaf attacked
Mango leaf blister	56 percent leaf attacked
<b>Citrus: Citrus psylla</b>	5 per shoot
Leaf miner	35% leaf attacked
Black fly	2 colonies/leaf
<b>Vegetables (Nursery)</b>	
Aphids	2/seedling
Whitefly	2/seedling
Thrips	5/seedling
Jassids	23/seedling
Cutworm	5% seedling attacked
Leaf miner	1% seedling attacked
<b>Vegetable (Field)</b>	
Aphids	4/leaf
Leaf miner	10%/leaf attacked
Whitefly	4/leaf
Thrips	9/leaf
Jassids	23/leaf
Fruit borer (Heliothis Sp.)	50% fruit attacked

**Brassica Vegetables  
(Nursery)**

Painted bug 5% seedling attacked  
Armyworm 4 larvae/100 seedling

**Brassica Vegetable  
(Field)**

Diamond back moth 2 larvae/plant  
Cabbage worm 2 larvae/plant  
Armyworm 2 larvae/plant  
Whitefly 2/leaf  
Aphids 2/leaf

**Chillies (Nursery)**

Thrips 5/seedling  
Whitefly 2/seedling  
Aphids 2/seedling

**Chillies (Field)**

Thrips 14/terminal  
Whitefly 5/terminal  
Aphids 5/terminal  
Fruit borer 58% attacked fruits

**Tomato (Nursery)**

Cutworm 5% seedling attacked  
Whitefly 23/seedling  
Aphids 23/seedling

**Tomato (Field)**

Cutworm 5% plant attacked  
Whitefly 2/leaf  
Leaf miner 10% leaf attacked  
Jassids 23/leaf  
Aphids 45/leaf  
Fruit borer 510% attacked fruit

**Onion (Nursery)**

Cutworm 510% attacked seedling  
Leaf worm 510% leaf attacked

**Onion (Field)**

Thrips 810/plant  
Lyphygma 5% plant attacked  
Shoot fly 810% plant attacked  
Army worm 5% plant attacked

## **SPECIAL INSTRUCTIONS FOR PESTICIDE APPLICATION**

- ❖ Do not mix pesticides with foliar fertilizers.
- ❖ Do not allow spray mixtures to stand overnight before use.
- ❖ Fixed copper and Bordeaux are generally not compatible with OP compounds.
- ❖ Thuricide and Dipel (*Bacillus thuringiensis*) are generally compatible with most insecticides and fungicides if mixed in the tank just prior to application.
- ❖ Rotenone breaks down in sunlight.
- ❖ When mixing a wettable powder and an emulsifiable concentrate, put the Powder into solution first.

### **Interval between Pesticide Application & Harvest**

#### **(Preharvest interval with holding period)**

- ❖ Organo phosphate pesticides      14 days
- ❖ Carbamate pesticides                10 days
- ❖ Pyrethroid pesticides                07 days
- ❖ Nitrogonidin                            07 days

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