PLANT PATHOLOGY NOTE: No:37

Pesticides

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Chemicals that are used to kill pests are called pesticides. In agriculture the name pest includes insects, weeds, micro-organisms, nematodes, snails and rodents. Pests cause crop loss and they should be controlled to avoid or minimize the loss.

Insects are small invertebrate (without backbone) organisms with six legs eg. flies, butterflies, ants, beetles etc. Insects useful to agriculture are known as beneficial insects eg. honeybees, butterflies and those causing harm to plants are pests.

Weeds are plants that are not wanted among the cultivated ones. For example in a garden where only aibika is cultivated any other plant whether useful or not is considered as a weed.

Micro-organisms are very small living things which normally cannot be seen by the naked eye but require a microscope to see them. Examples of micro-organisms are fungi, bacteria, nematodes, viruses and MLOs (mycoplasma like organisms). Some micro-organisms cause diseases in plants.

Snails are slow moving molluscs having a spiral shell on their back. Rodents are gnawing animals that include rats, mice, beavers etc. Pesticides are broadly classified according to their target to kill.

Target	Pesticide
insects	insecticide
fungi	fungicide
weeds	weedicide or herbicide
nematodes	nematicide
snails	molluscicide
mites	acaricide
rodents	rodenticide

Always it should be remembered that correct pesticide should be used on the target to kill. To control an outbreak of insects if fungicides are used there will be no control but waste of money, chemical, labour and time. Pest problems should be anticipated, crops examined regularly for the presence of pests and necessary control measures taken in time.

Pesticide formulations: Pesticides are sold in the market in different forms. They may be in the form of powder, liquid, paste, dust, granules, pellets etc. Whatever the formulation each pesticide will have a trade name, a common name and a chemical name. For any pesticide sold in the market all the three names are required to be written on the label.

Trade name: The manufacturer producing the pesticide gives a trade name under which it will be sold in the market. Some pesticides have several trade names.

Common Name: It is a simple name internationally recognised and all pesticides have a single common name.

Chemical Name: It is the technical name which is long and complicated and used by pesticide chemists and in pesticide books.

Examples of pesticides with three types of names are given below:

Trade Name: Bayleton; Amiral

Common Name: triadimefon

Chemical Name: 1-(4-chlorophenoxy)-3,3-dimethyl -1-(1,2,4-triazol-1-yl) butanone

Bayleton is a fungicide recommended for the control of coffee rust in PNG.

Trade Name: Cythion; Malathion; Sumitox

Common Name: malathion

Chemical Name: S-1,2-bis (ethoxycarbonyl)ethyl o,o-dimethyl phosphorodithioate

Malathion is an insecticide recommended for the control of various insect pests of crops in PNG.

Trade Name: Gramaxone; Dextrone-x; Pillarxone

Common Name: paraquat dichloride

Chemical Name: 1.1'-dimethyl-4,4'-bipyridylium dichloride

Gramaxone is a weedicide recommended for the control of weeds in PNG.

The formulation of a pesticide is usually written on the label as wettable power (WP), emulsifiable concentrate (EC) and granules (G) etc. For example BAYLETON 25 WP means it is a wettable powder and can be mixed with water for application as spray. The numeral 25 represents the percentage of active chemical present in the formulation. It contains 250 grams of triadimefon and remaining 750 grams of other materials in a kilogram of Bayleton.

Types of pesticides: Pesticides can be classified according to their target of application as insecticides, weedicides, fungicides etc as described earlier. Further they can be grouped according to their mode of action. Insecticides are grouped as stomach poisons, contact poisons and fumigants.

Stomach Poisons: These act on the insects when the chemical is swallowed. The poison is swallowed when a treated leaf or parts of a plant is eaten or the juice or sap is sucked by the insects. A stomach poison is also known as systemic insecticide because it can travel within the plant system from the site of application. Systemic insecticides can be applied as spray on the plants or mixed with soil around the roots.

Contact Poisons: These get into the body of the insect through the skin. When sprayed or dusted the poison covers the plant surface and the insect comes in contact with it while moving over the surface.

Fumigants: The poison gets into the insect's body through breathing holes known as spiracles. Fumigants act as a gas and are used to control insects in the warehouses where food grains are stored.

Fungicides fall into two groups: protectants and eradicants or systemics.

Protectant fungicides act by preventing the fungus from infecting the plants to cause disease. The entire plant surface should be covered by spraying the chemical for better protection. The fungus comes in contact with the poison, absorbs it and dies.

Systemic or eradicant fungicides get into and move through the plant and control the established disease. The fungus is killed and eradicated from the site of infection.

Weedicides can be grouped according to their action. Contact weedicide acts by killing the parts of the plant with which the chemical comes in contact when sprayed. Systemic weedicides get absorbed and translocated within the plant system and kill it. Residual weedicides are usually applied to the soil and are absorbed by the germinating weed seeds. Such weedicides can remain active in the soil for a prolonged period.

Equipment used for applying pesticides: Pesticides are applied by means of machines known as sprayers, dusters, fumigators etc. To spray pesticides hand operated or motorized hydraulic, compression and mist blowing spray machines are used. Pesticides in the form of dust are applied by means of dusters. For soil fumigation injecting or fumigating guns are used.

Roles of pesticides in agriculture: Pesticides play a major role in protecting crops from pests and diseases. Their use is recognised world wide as an effective, simple and quick method of pest control. If pesticides are not used to protect the crops, the ravage of insects, diseases and weeds will go unchecked resulting in huge losses to the agriculture sector and also to the national economy. There are examples of pest and disease outbreaks which ruined the economy of the nation. The disease coffee rust devastated coffee cultivation in Srl Lanka and ruined the coffee industry during the 1890s. The famous Irish famine was due to the outbreak of potato blight. Asa result thousands of people died of starvation and many migrated to other countries for survival. At that time chemical control was unknown and as a result catastrophic devastation occurred. Nowdays very effective chemicals are available to control the ravages of pests and diseases.

Weed competition in the initial stages of crop growth can be so severe that plants remain stunted and final yields are far below the true potential. With the use of weedicides many kinds of weeds can be effectively controlled for better growth and production of crops.

Weedicides are very useful for intra-row weeding when it is difficult to hoe in the planted rows without damaging the crop. Shortage and increased cost of labour especially at critical periods will make the farmer depend upon the use of weedicides.

The outbreak of locusts in the Markham Valley in Morobe Province in 1988 was effectively controlled by the use of malathion. The outbreak posed a potential threat to the grain crops in the Markham Valley and sugarcane at the Ramu Sugar Ltd. Coffee rust in the highlands of PNG is kept under control by spraying fungicides without which the production of coffee would be greatly effected.

Chemical control is still the only effective method of controlling most insects, diseases and weeds for better and increased production of crops. Pesticides have no doubt contributed to the higher standards of living of people by rendering good protection to crops and increasing their yield. Pesticides are a valuable resource and must be used more wisely and effectively in agriculture for better and increased production of crops.

Hazards of pesticides: Indiscriminate or unscrupulous use of pesticides pose a serious hazard to the environment. Pesticides are highly poisonous and can kill plants when applied at higher rates and can accumulate as residue in the plant parts such as fruits, seeds, leaves stems and roots and become toxic when consumed by man and animals. Pesticides especially insecticides and weedicides are poisonous to beneficial insects like honeybees, butterflies and biological control agents. Pesticides can pollute water, air and the surroundings and pose a threat to fish and bird life. Air and water pollution by pesticides will pose a hazard to human and animal health.

To avoid any type of danger due to pesticides it is advisable to follow the safety precautions described below.

GENERAL INSTRUCTIONS AND GUIDELINES FOR SAFE USE OF PESTICIDES.

For safe and effective use of pesticides it is essential to follow the safety precautions before, during and after application of the chemical. Because pesticides are highly toxic the user must follow the general guidelines and safety instructions.

I. Before applying a pesticide:

1. Examine the pest and the type of damage done.

2. Contact appropriate personnel to seek advice on control measures.

3. Purchase only the recommended pesticides.

4. Read the label carefully and follow the instructions.

5. Make available appropriate protective clothing and equipment.

6. Check the application equipment and make sure it is in proper working condition.

7. Store the pesticides in a safe and secure place that cannot be reached by children and domestic animals.

8. Make sure plenty of water is available.
9. Make available soap and a towel for cleaning.

10. If a highly toxic chemical is used then warn the neighbours of your spray programme.

11. Mix only sufficient pesticide for the day's work.

12. Store the pesticide in the original container and NEVER in small containers like beer bottles, soft drink bottles and water cans etc.

II. While mixing and during applying pesticides:

1. Mix only the correct quantity of the pesticide.

2. Wear correct protective clothing, goggles, respirator, boots etc.

3. Keep children and domestic animals away from the site of mixing and application.

4. Avoid the pesticide coming in contact with the skin, mouth and eyes.

5. Never eat, drink or smoke when mixing or applying pesticides.

6. Do not inhale the dust, spray drift or fumes of the pesticide.

7. Never blow the nozzles or suck the nose with your mouth.

8. Do not spray near children, people, animals and prepared food.

9. Never leave the pesticide unattended in the field.

10. Finish the prepared pesticide on the same day, do not retain or store it for the next day's application.

III. After application:

1. Take the unused pesticide back to the store.

2. Dispose of all the empty pesticide containers.

3. Properly clean the application equipment with plenty of water.

4. Remove protective clothing, wash yourself well with plenty of water and put on clean clothing.

5. Strictly observe the waiting period between last application and harvest.

6. If you feel sick at any time during or after application seek medical help immediately.

PESTICIDE LEGISLATION

All pesticides used in PNG are now governed by the pesticide regulation. The Environmental Contaminants (Pesticides) Regulation 1988 controls the importation, manufacture, distribution and sale of pesticides within PNG. Under the regulation the term pesticide includes those products intended to control the following:

- plant pests and diseases

- weeds

- rodents

-stored product pests

- human and animal disease vectors (eg. mosquitoes)

- household, public health, industrial and commercial pests

- certain animal pests (i.e. ectoparasites on ruminants, horse and pigs)

Also included under the definition of a pesticide are:

- plant growth regulators

- defoliants

- dessicants

- fruit thinning agents

FURTHER INFORMATION

For further information and advice you should contact

Chief Plant Protection Officer
Agricultural Protection Division
Department of Agriculture and Livestock
P O Box 2151
BOROKO
Tel: 21 1618 (Direct), 21 799 Ext. 219
or contact your nearest D.A.L. Plant Pathologist or Entomologist based at

Laloki Research Station
P O Box 417, KONEDOBU
Tel: 28 1068

Agricultural Research Centre Bubia
P O Box 1639, LAE
Tel: 45 1033

Lowlands Agricultural Experiment Station
P O Kerevat, RABAUL

Tel: 92 3161 or 92 3184 or 92 3188

Agricultural Weed Control Unit
Saramandi Research Station
P O Box 433, WEWAK
Tel: 88 3083

For information on pesticide regulation you should contact

Environmental Protection Officer
Department of Environment and Conservation
P O Box 6601, BOROKO
Tel: 27 1788

The following publications are recommended for further reading

1. A manual for the safe and efficient use of pesticide. Rural Development Series Handbook No. 18 (Revised Edition). Department of Primary Industry, Port Moresby.

2. Recommendations for the control of pests 1987. Technical Report 87/1, January 1987. Department of Primary Industry, Port Moresby.