

4.2 Types of Insects of Environmental Health Significance

The insects that need to be adequately studied include flies, fleas, lice, mites, mosquitoes, *Sandfly (leishmania)*, roaches and ticks. It is important to understand the biology characteristics, breeding habits and mechanics of spread of disease of each of these insects in order to institute adequate chemical, physical, biological and mechanical controls.

4.3 Destruction of Food and Material

Insects infest cattle, causing weight loss, annoyance and reduction of food supply. Disease is transmitted from human to human, from human through vector through animal through vector to human. It is important to understand the type of disease transmitted since the life cycle of the disease organism is known.

4.4 Intervention to Control Insects

The techniques used include removal of adult harborage, adulticiding, larvaciding and biological control. Prevention is the strongest potential intervention technique in the spread of particular insects.

4.5 INSPECTION AND SURVEYS

4.5.1 Fly Surveys

The major value of a fly survey is to determine those areas in which flies are in greatest concentration, to determine the kind of flies in order to use effective controls and to determine the potential spread of disease. There are several types of fly surveys. These include fly traps, fly grills and reconnaissance surveys.

Fly traps consist of baited traps, fly paper or fly cones. The fly traps have the advantage of capturing a cross section of flies in a given area. They also provide an approximate count of various species. The baited fly trap may be lined with animal feces, sugar, fish heads or some other decaying matter.

Fly grills are the most widely used means of surveying for flies. The grill depends upon the natural attractant, such as garbage, manure, or other decaying materials. The number of flies landing on the grill during a 30 second period is tabulated. It is possible to physically count the number of flies and make some judgement of the kind of flies on the grill.

4.5.2 Mosquito Surveys

Surveys are necessary for planning, operation and evaluation of mosquito control programs. The basic survey is used to determine the species of mosquitoes, sources, breeding places, locations, quantities, flight distance, larval habits and any other information for actual control.

4.5.3 Larval and Adult Mosquito Control

Mosquito larvae are controlled mechanically, biologically or chemically. Mechanical control involves emptying and removing all temporary containers, such as old tires and cans.

Depression in the ground should be smoothed up. High weeds, which traps water must be cut on a regular basis. Clean, straighten and drain all ditches so that water runs freely. Any growth in bodies of water particularly around the shoreline should be removed so that water flows readily rather than sits stagnant.

All seepage pits should be closed or sealed. Septic tanks and other areas where sewage may be trapped in a stagnant situation should be sealed. The major vegetation off the shoreline should be cleaned. Water in low places should be removed and such places should be filled. In irrigated areas, it is necessary to use only the amount of water necessary and to have all systems freely moving so that stagnation of water cannot occur.

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impounded areas with gold fish. Space spraying for adult mosquitoes is accomplished by use of aerosols, fogging, misting and dusting. It is important to note that mosquito-borne outbreaks of disease have not been eliminated from Kenya, hence more research mosquito control techniques should be done.

Before DDT was used for mosquito control, the principal techniques consisted of identifying the species of mosquito and its breeding habits, and then designing a method that would eliminate the larva, either by means of engineering techniques or by means of chemical larvacides.

Engineering techniques consist of improving drainage areas, adjusting the slope and depth of streams and methods and techniques for removal of any obstruction hampering the flow of water, which in turn increases the potential mosquito breeding. Biological control is the technique of utilizing parasites, predators and pathogens of insects to eliminate them. It also includes the use of sterilization techniques, management of the habitat and biologically produced compounds.

Biological control is basically the fostering and manipulation of natural enemies of insects e.g. fish is an excellent biological control for mosquito larvae. Insect growth or regulators are used as a means of control. Attractants will lure the insect trap or poison. Repellants are used on the skin and body as a means of control to prevent the insect from alighting and biting.

4.5.4 Fly Control

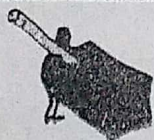
The four basic fly-control techniques include proper solid-waste disposal, chemical control, mechanical and physical control and biological control. Since house flies breed in garbage, decaying matter, feces, dead animals and any kind of organic material, it is essential that this solid waste be removed and stored properly. The storage should be plastic placed within metal cans with tight fitting lids.

Animal feed and feces become breeding areas for flies. Animal manure should be adequately stored, dog and cat feces should be picked up and removed in order to prevent fly breeding. Large fly populations can breed in high weeds. It is therefore necessary that weeds be controlled either chemically or physically. The type of chemical chosen for control of flies is determined by the effect that is desired. Residual sprays are put on surfaces on which flies will alight.

It is important to note that insects become quite resistant and tolerant to insecticides. As a result of this, the insecticides that are now recommended and probably the safest to use for humans at this time may not be those recommended for future use. The environmental health specialist should contact the center for disease control at the Ministry of Health if there are problems of fly control and safety. There are several techniques used in applying insecticides. They include space spraying through large blowers or insecticide bombs for adults, fog generators which produce the aerosol or smoke for adults and residual spraying with hand sprayers for adults and larvae.

Flies can also be controlled chemically by treating the animals by use of fly repellents or by use of fly attractants to draw flies into traps or in poison. Fly screens can also be used. The screens have to fit tightly to the windows or door frames. Flies can be electrocuted if they cross an electrically charged wire or alight on a screen that is electrically charged. Air shields can be installed so that air blows down and out from the door way thereby preventing flies from entering the building.

Activity



Give an illustration of how you can carry out a fly and mosquito survey with an ultimate aim of establishing an effective control of these insects

LESSON 6: PESTICIDES

6.0 Introduction

In this lesson you are going to learn about pests and how they can be controlled with minimal harmful effects on man. Pests cause a reduction in size, yield storage, and market quality of food and spread of diseases. Pesticides are used to control pests.

6.1 Objectives



By the end of this lesson, you should be able to:

- (i) discuss the major pesticides of environmental health importance
- (ii) examine the appropriate practices and techniques that can be used when using pesticides

6.2 Types of pesticides

- (i) acaricides - used against mites
- (ii) algaecides used against algae
- (iii) attractants used to attract insects, birds and animals
- (iv) defoliant used to remove leaves from plants prior to harvest or eliminate unwanted plants
- (v) fungicides used against fungi
- (vi) herbicides used against weeds
- (vii) insecticides used against insects
- (viii) molluscides used against slugs and snails
- (ix) ovicides used against insect eggs
- (x) repellents used to drive insects away
- (xi) rodenticides used against rats, mice and other rodents.

Pesticides are used as aerosols, sprays, dust or as baits

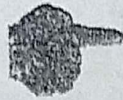
pesticides that degrade or deteriorate rapidly are also of great concern because of their

extreme toxicity and because they are non-selective in their action to humans, animals and pests.

A pesticide moves through an ecosystem in numerous ways. It is introduced by surface application and spraying. It may stay in the air or be washed down by the rain.

Concentrations of the pesticides continue to increase in the soil overtime and where leaching occurs, the pesticide can move into surface or underground water supplies. This will pollute the water.

Note



Pesticides may have long-range effect on fish and wildlife, depending on the type of accumulation that may occur. DDT for instance causes thinning of egg shells which in turn prevents the successful hatching of chick in a variety of birds.

Pesticides should be toxic to harmful insects harmless to humans, cheap and easily used, rapidly degradable to non-toxic substances, non-flammable, non-corrosive, non-explosive and non-staining.

6.3 Types of Pesticides of Environmental Health Importance

1. Inorganic insecticides and petroleum compounds, for example, arsenical (used against potato beetle) and compounds of copper, zinc and chromium were also used as pesticides. Chlorine and sulfur made extremely toxic compounds that were used along with salts of arsenic, lead and mercury. Many of these compounds were quite toxic to humans. Petroleum oils, such as kerosene, diesel

oil were used as mosquito larvicides. These oils which are still in use have certain toxic properties because they penetrate the tracheae of larvae and pupae of mosquitoes and anaesthetize them. A fraction of these oils mechanically interfere with the breathing process of water causing suffocation. Sulfur act as a repellent against chiggers.

2. Pyrethrum - a quick insect knock down.
3. Chlorinated hydrocarbons. These are combinations of chlorine, hydrogen and carbon. The first major chlorinated hydrocarbon was DDT. The technical name is dichlorodiphenyl trichloroethane. It controls mosquitoes, flies, lice, ticks and mites which reduces the level of malaria, plague, typhus fever, yellow fever. Although it has been banned, it is still effective chemical for control of mosquitoes.

4. Organophosphates

This term is derived from phosphoric acid to inhibit the enzyme cholinesterase. In many cases it has replaced chlorinated hydrocarbons because they are effective against insects that have become resistant to chlorinated hydrocarbons.

They are biodegradable, they do not contaminate the environment for long periods. They have less long-lasting effects on organisms that are meant to be treated with these chemicals.

6.4 Other Types of Pesticides

- (i) Fungicides and bactericides - prevent plant disease caused by fungi and bacteria.
- (ii) Nematicides are used to control nematodes which affect fishing areas or plants areas.
- (iii) Piscicides (fish killers) are used to treat public water. Their objective is to remove rough or trash fish from restricting lakes or game fish lakes.
- (iv) Avicides (bird killers) - control birds and pigeons in areas where they are

troublesome.

6.5 STANDARDS, PRACTICES AND TECHNIQUES

1. Application of Pesticides

They may be applied to standing water by the use of spray equipment. Oil solution can also be used. Aerosol bombs can also be used to control adult mosquitoes. Fogging and misting techniques are used to control adult insect. Fog and mist are produced through specialized equipment mounted on driven vehicles and blown out into the open air from the equipment

Dusting is used in agricultural areas. Residual spraying is carried out by applying the spray to surfaces upon which insects will alight and rest.

2. Pesticide labels and names

All pesticides must be registered for use. Pesticide names and names are very important. The label on the pesticide specifies the name of the manufacture, the name of the product, active chemical ingredients and percentages of concentration, the type of chemical whether it is a pesticide or rodenticide or otherwise. The label also contain recommendations for specific uses, directions of use, precautions in storage, precautions during use by personnel.

Since many chemicals can be sold under one brand name, it is essential to identify active chemical ingredients. The generic or brand name must appear on the label. The label must state specifically what pests are controlled and what rate of application of the insecticide is needed to control the pesticides affected by the particular pesticide. Instructions for correct and safe methods of application must be stated: clearly and carefully. The necessary precautions to be taken by the personnel should also be specified.

3. Pesticides Formulations

It is important to have some understanding of the form in which pesticides come and also dilution specifications to achieve the proper formulation effective for a given pesticide in a given situation. It is essential to have the correct dosage of pesticides for the proper type of pest control. Excess pesticides may cause ruination of edible crops, toxicity to crops and animals, excess costs and a specific hazard to animals and humans. Precautions to take when preparing pesticides for use:

- (i) determine the safe time intervals for application .
- (ii) the amount of residue acceptable by the food and drug administration
- (iii) whether a combination of pesticides are safe or compatible.
- (iv) Toxicity of the pesticide
- (v) Follow the instructions on pesticide containers to determine the dilution of the pesticide to the proper concentration.

4. Pesticide Application and Equipment

Pesticides may be applied as solids, liquids or gases. Solids are usually applied as dusts by means of hand dusting, shaker cans. Liquids may be applied by pouring, painting, spraying, ejecting or through aerosol bombs. The method of application is based on whether the pest will be killed, safety of the operation, the expense, durability of the pesticide and potential problems. For example the insecticide must not drift into residential areas and affect animals or humans. Weather conditions, time of the day must be taken into consideration when aerial dispersion of insecticides is used.

5. Storage of Pesticides

Pesticides must be stored with great care, since they may be highly flammable, explosive and toxic. Most insecticides, fungicides and rodenticides can be stored in one room. However, herbicides are quite volatile hence special precautions should be taken with their storage so that they do not contaminate the

storage area or escape outside, thereby damaging plants. All storage areas should maintain the following precautions:

- (i) storage areas should be locked and located away from food, animal feed, plant seed or water.
- (ii) They should be stored in a dry well-ventilated place as directed on the labels
- (iii) Storage areas should be clearly marked as a pesticide storage area.
- (iv) A sign should be posted listing the types of pesticides stored and the hazards therein.
- (v) They should be kept in the original containers
- (vi) Containers should be checked periodically in case of leaks, tears and spills.
- (vii) An inventory list should be kept in order that outdated materials are eliminated and shortages are accounted for.

In case of fire, fire fighters and general public should be protected from the fumes, residues due to fire. The hazards that exist are due to the presence of organophosphates and chlorinated hydrocarbons which are highly toxic. Also fumes from solvents, the presence of gases or the combination of substances may be highly toxic.

Care must be taken that runoff water from fire fighting which may contain highly toxic pesticides in quantity, does not enter environmental pathways. In case of fire, the fire fighters should be protected from poisoning by use of proper protective clothing and special self-contained breathing equipment .

6. **Transportation of Pesticides**

Transporting toxic chemicals can be very hazardous with the possibility of accidents or leakage. The vehicles that carry hazardous chemicals should have drivers who are fully aware of procedures to follow in the event of an accident or

an emergency. Volatile pesticides should not be within the drivers or passengers section.

The transporting vehicles should be properly built in order that powders within paper bags are protected from rain and will not be punctured or torn. Where pesticides are in liquid form, they must be in tightly closed original containers. Glass containers are not recommended as they can easily break.

Since pesticides are affected by high and low temperatures, they should be removed from trucks as soon as possible after delivery and stored in safe and locked facilities. In case of an accident involving these vehicles, drivers should immediately avail themselves of protective clothing and respirators and should inform fire, police and health departments. The public should be kept away from the accident.

7. Disposal of Pesticides

Unusual pesticides and empty containers should be disposed of in a safe manner because pesticides in concentrated form or in diluted form may constitute extremely serious hazardous. Disposal may take the form of ground disposal and incineration. Ground disposal may be very dangerous if the pesticide will contaminate either surface or ground water supplies. If you have to use ground disposal then pesticides will be buried deep in containers that will not deteriorate. Pesticides may also be destroyed using incineration

Incineration is only acceptable if the resultant fumes or waste escaping into the air is buried in containers that do not deteriorate. Pesticide containers should be handled separately and should be buried only in areas in which the water percolating through the ground will not carry the pesticide into the water supplies.