TRAINING MANUAL

INTEGRATED PEST MANAGEMENT

FOR APRICOT FARMERS

The Agribusiness Project – Agribusiness Support Fund

Integrated Pest Management Training Manual for Apricot Farmers – The Agribusiness Project

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This manual is a live document which can be changed as the project progresses. Any suggestions for further improvement are most welcome. Project staff is particularly encouraged to identify areas for further improvement.

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BACKGROUND/INTRODUCTION

Vegetable and fruit crops are highly prone and vulnerable to attack by pests. Pest damage can range from leaf damage that has no effect on the value of the fruit to severe damage that kills plants, significantly reduces crop yield or reduces the crop's market value. Pests may also cause contamination of fruit at harvest, reducing its marketability. Fruit pests include insects and mites, pathogens, nematodes, weeds and vertebrates.

Apricots have long been an important crop in different valleys of Northern Pakistan including Gilgit-Baltistan and Chitral and an essential source of income. Growing between 1,800-3,200 metres above sea level, below peaks that reach 8,000 meters high, the orchards of apricots, intercropped with alfalfa and forest trees, are irrigated by spring water or glacial melt waters brought in by complex systems of canals over great distances to the carefully terraced slopes. Rich in minerals and vitamins, for many centuries the sun-dried fruit has been renowned regionally for its taste. The long-living Hunza people attribute their longevity and many health-giving properties to their apricots.

Production of apricot is around 6-10,000 tones in the northern area. It's a huge amount." Unfortunately, due to seasonal gluts in production, most of the apricots - along with other tree crops such as apples, cherries, mulberries - is wasted. A significant proportion rots before it is consumed or marketed. However, the rising international popularity of dried fruits in the 1990's offered a new, and very lucrative, market to the tree croppers of Pakistan provided, that is, they could compete with much larger-scale apricot orchards of Turkey and the USA. (Mountain dry fruits)

OBJECTIVE OF IPM

- Strengthening and Building the capacity of Farmers and crop growers and field staff of Department of Agriculture and other stakeholders in effective management of fruit and vegetable crops
- Application of effective crop management tools and approaches
- Promote best pest management practices
- Improve crop yield by implementing different components of IPM

- Foster linkages between farmers and other stakeholders for joint ventures in better managing the crop diseases and pests
- Enhance the understanding of farmers and stakeholders in the areas of pest management and safe use of pesticides on their farms

DISEASES AND PESTS OF APRICOT CROP

- **CROP TYPE-** **APRICOT**

- **TYPES of PESTs/Pathogens**
  1. Pseudomonas syringae
  2. Monilinia laxa and monilinia fructicola
  3. Agrobacterium tumefaciens
  4. Monilinia laxa and monilinia fructicola
  5. Wilsonomyces carpophilus
  6. Verticillium dahlia

- **TYPES OF DISEASES**
  1. Bacterial Canker
  2. Brown Rot Blossom and Twig Blight
  3. Crown Gall
  4. Ripe Fruit Rod
  5. Shot Hole Diseases
  6. Verticillium Wilt

DESCRIPTION OF THE DISEASES:

A detail about the different diseases of specific crops are elaborated in detail in the manual.

CATERPILLAR WORM: Scientific name: *Ecphanteria spp*

Adults are white moths ranging in size from 4 to 6 cm. Females lay eggs in groups on the leaves and pseudo-stem. Larvae are reddish brown and eventually migrate to fruit bunches, where they feed and then move to the soil to form the chrysalis.

Smaller larvae affect the fruit most eating outer part of the skin and leaving streamer-shaped scars. Generally the damage is not of economic importance.

Management recommendations:

Since larvae prefer eating suckers and sprouts, they should be managed appropriately to prevent pest population increases.

FRUIT FLY *Bactocera Spp*

Cultural Control and Sanitary Methods

One of the most effective control techniques against fruit flies in general is to wrap fruit, either in newspaper, a paper bag, or in the case of long/thin fruits, a polythene sleeve. This is a simple physical barrier to oviposition but it has to be applied well before the fruit is attacked. Little information is available on the attack time for most fruits but few Bactrocera spp. attack prior to ripening.

Chemical Control

Although cover sprays of entire crops are sometimes used, the use of bait sprays is both more economical and more environmentally acceptable. A bait spray consists of a suitable insecticide (e.g. malathion) mixed with a protein bait. Both males and females of

fruit flies are attracted to protein sources emanating ammonia, and so insecticides can be applied to just a few spots in an orchard and the flies will be attracted to these spots. The protein most widely used is hydrolysed protein, but some supplies of this are acid hydrolysed and so highly phytotoxic. Smith and Nannan (1988) have developed a system using autolysed protein. In Malaysia this has been developed into a very effective commercial product derived from brewery waste.

SCALE INSECT: *Aspidiotus destructor, Parlatoria crypta*

DAMAGE: Scale insects obtain food by sucking vital fluids from the host plant, causing yellowing and possibly stunted growth of the affected leaves or needles. A heavily infested plant will have extensive leaf yellowing, premature leaf drop, and possibly branch dieback. A plant weakened by a scale population is often more susceptible to damage by a secondary pest that may ultimately kill the plant.

Although sooty mold growth does not damage the plant, it looks unsightly and in large amounts can interfere with photosynthesis, slowing plant growth.

Management/Control

The best defense against severe scale infestations is to monitor landscape plants weekly throughout the year, paying close attention to the undersides of leaves and stems for scale, and avoid over-fertilization. Insects often lay more eggs and survive better on plants that are lush from heavy doses of nitrogen.

CHEMICAL CONTROL

Smothering scale insects by applications of horticultural oil is the easiest and often the most effective means of control. There are numerous types of oils, each with different temperature capabilities. There are some ultra light oils that can be used during the growing season, but it is critical to read the label carefully for guidelines on plant sensitivity and temperature restrictions. Most contact insecticides cannot penetrate the protective covering of the immobile scale nymphs and adults. Only the crawler stage is susceptible to contact insecticides. Systemic insecticides may provide control of soft scales, but is generally not effective for armored scales.

IMPORTANCE OF INSECT PEST IN AGRICULTURE

It is world-recognized fact, that without insects, our lives would be vastly different. Insects pollinate many of our fruits, flowers, and vegetables. We would not have much of the produce that we enjoy and rely on without the pollinating services of insects, not to mention honey, beeswax, silk, and other useful products that insects provide.

Insects feed on a seemingly endless array of foods. Many insects are omnivorous, meaning that they can eat a variety of foods including plants, fungi, dead animals, decaying organic matter, and nearly anything they encounter in their environment. Still others are specialists in their diet, which means they may rely only on one particular plant or even one specific part of one particular plant to survive.

Many insects are predatory or parasitic, either on plants or on other insects or animals, including people. Such insects are important in nature to help keep pest populations (insects or weeds) at a tolerable level. We call this the balance of nature. Predatory and parasitic insects are very valuable when they attack other animals or plants that we consider to be pests.

INTRODUCTION TO INTEGRATED PEST MANAGEMENT

Integrated pest management (**IPM**), also known as **Integrated Pest Control** (**IPC**) is a broad-based approach that integrates practices for economic control of pests. IPM aims to suppress pest populations below the economic injury level (EIL). The UN's Food and Agriculture Organization defines IPM as "the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment.

IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms. Entomologists and ecologists have urged the adoption of IPM pest control since the 1970s. IPM allows for safer pest control. This includes managing insects, plant pathogens and weeds

PRINCIPLES OF IPM

Following are the key principles of Integrated Pest Management (IPM) to promote best crop management practices among progressive famers of Banana.

- **Grow a healthy crop**.

  The focus is on cultural practices aimed at keeping the crop healthy. Selection of varieties that are resistant or tolerant to pests is an important aspect. Attention to soil, nutrient and water management is part of growing a healthy crop. Many IPM programs therefore adopt a holistic approach and consider a wider range of agro-ecological parameters related to crop production.

- **Manage the agro-ecosystem** in such a way that pests remain below economic damaging levels, rather than attempt to eradicate the pest. Prevention of pest build up and encouragement of natural mortality of the pest is the first line of defense to protect the crop. Non-chemical practices are used to make the field and the crop inhospitable to the

insect pest species and hospitable to their natural enemies, and to prevent conditions favorable to the buildup of weeds and diseases.

- Decisions to apply external inputs as supplementary controls are made locally, are based on monitoring of pest incidence and are site-specific. External inputs may include predators or parasites (bio-control), labor to remove the pest manually, pest attracting lures, pest traps, or pesticides. The choice of external input varies for each situation. Pesticides are generally used if economically viable non-chemical pest control inputs are not available or failed to control the pest. They are applied only when field monitoring shows that a pest population has reached a level that is likely to cause significant economic damage and the use of pesticides is cost-effective in terms of having a positive effect on net farm profits. Selection of products and application techniques should aim to minimize adverse effects on non-target species, people and the environment.

PEST MONITORING & SCOUTING

Following steps are involved for effective and comprehensive monitoring and scouting of Pests:

- **Scouting procedure**
  - The document title
  - Date and Name Field
  - A Map Key
  - More Fields
  - The document title
  - Date and Name Field
  - A Map Key
  - More Fields

- **Monitoring**

  - ✓ Monitoring Traps for banana aphids by using Yellow and Blue Sticky Traps.
  - ✓ Magnifiers & Scopes
  - ✓ Magnifying Glasses/Loupes

- ✓ Stereoscopes
- ✓ Weekly scouting and disease records
- ✓ Scouting and record keeping

METHODS/TOOLS OF IPM (BIOLOGICAL, CULTURAL, CHEMICAL MECHANICAL CONTROL)

There is a wide variety of techniques that can be applied under IPM approaches. Applicability of individual techniques depends on various factors, including the crop, the cropping system, the pest problems, the climate, the agro-ecological conditions, etc. Generally, IPM involves a combination of techniques. Some examples of such techniques:

Cultural practices that can help prevent build up of pests

- Crop rotation
- Inter-cropping,
- Field sanitation and seed bed sanitation,
- Use of pest-resistant crop varieties,
- Managing sowing, planting or harvesting dates
- Water/irrigation management,
- Soil and nutrient management (including mulching, zero/low tillage, fertilizer management)
- Practices to enhance the buildup of naturally existing predator populations
- Hand-picking of pests or hand-weeding
- Use of traps or trap crops
- Post harvest loss prevention

Biological inputs

- Biological control through release of predators, parasites or pathogens
- Biological control through fish, ducks, geese, goats, etc.
- Release of sterile male insects
- Bio-pesticides
- Biological preparations (e.g. name extract)

Chemical inputs

- Chemicals that disrupt insect behavior (e.g.: pheromones)
- Growth-regulators
- Conventional pesticides

S #	METHODS-IPM	PRACTICES
1	**MECHANICAL**	Trapping and collecting; mowing, chopping, crushing, and grinding plant residues, pests, and other forms; hand pulling and picking
2	**CULTURAL**	Use resistant varieties; rotate crops; chop stalks and dispose of refuse after harvest; tillage approaches; times for planting and harvesting; pruning and thinning with some crops; fertilizing based on crop needs; sanitation; water and runoff control; using trap crops
3	**BIOLOGICAL**	Using natural predators, such as beneficial insects; using parasites, such as bacteria; using genetically engineered crops; releasing sterile or incompatible pests
4	**PHYSICAL**	Using high and low temperatures; irradiation, particularly with seed and food grains; light traps
5	**CHEMICAL**	Poisons; growth regulators; attractants and repellants; sterilants
6	**REGULATION**	Quarantines; government-sponsored eradication and supression programs

PROPOSED PEST SPECIFIC PESTICIDES FOR INTEGRTAED PEST MANAGEMENT (IPM)

Pesticides can be classified or grouped in many different ways. Following are the key pesticides used for IPM.

S #	PESTICIDES	PEST CONTROLLED
1	**Insecticide**	INSECTS
2	**Miticide**	MITES
3	**Acaricide**	TICKS and SPIDERS
4	**Molluscicides**	SNAILS and SLUGS
5	**Fungicide**	FUNGI
6	**Avicide**	BIRDS
7	**RODENTICIDE**	Rodents
8	**Nematicide**	Nematodes
9	**Bactericide**	Bacteria
10	**Herbicide**	Weeds
11	**Piscicide**	Fishes
12	**Predicide**	Predatory Animals

USE OF BIOPESTICIDES

ORGANIC PESTICIDES-PLANTS PARTS

Bio pesticide are certain types of pesticides derived from such natural materials as animals, plants, bacteria, and certain minerals.

For example, canola oil and baking soda have pesticidal applications and are considered biopesticides.

At the end of 2001, there were approximately 195 registered biopesticide active ingredients and 780 products.

Biopesticides fall into three major classes

- ✓ Microbial pesticides
- ✓ Plant-incorporated-protectants (PIPS)
- ✓ Biochemical pesticides

There are two level's of benefit for pesticide use

- Primary
- Secondary

- **Primary Benefits are direct gains from the use of pesticides**

➢ **Controlling pests and plant disease vectors**

- Improved crop/livestock yields
- Improved crop/livestock quality
- Invasive species controlled

➢ **Controlling human/livestock disease vectors and nuisance organisms**

- Human lives saved and suffering reduced
- Animal lives saved and suffering reduced
- Diseases contained geographically

CHEMICAL CONTROL

Smothering scale insects by applications of horticultural oil is the easiest and often the most effective means of control. There are numerous types of oils, each with different temperature capabilities. There are some ultra light oils that can be used during the growing season, but it is critical to read the label carefully for guidelines on plant sensitivity and temperature restrictions. Most contact insecticides cannot penetrate the protective covering of the immobile scale nymphs and adults. Only the crawler stage is susceptible to contact insecticides. Systemic insecticides may provide control of soft scales, but is generally not effective for armored scales.

ROLE OF BIOLOGICAL CONTROL OF INSECT PEST, IMPORTANT BENEFICIAL INSECTS (PARASITOIDS AND PREDATORS) AUGMENTATION AND CONSERVATION IN THE FIELD.

AUGMENTATION

In order to promote biological control practices it is imperative to enhance and augment the desired population of benenficial insects (Predator and Parasitoides) through the purchase and release of commercially available beneficial species. However, there has been relatively little research on releasing natural enemies in gardens and landscapes. Releases are unlikely to provide satisfactory pest control in most situations. Some marketed natural enemies are not effective. Praying mantids, often sold as egg cases, make fascinating pets. But mantids are cannibalistic and feed indiscriminately on pest and beneficial species. Releasing mantids does not control pests.

Only a few natural enemies can be effectively augmented in gardens and landscapes. These include entomophagous nematodes, predatory mites, and perhaps a few other species. For example, convergent lady beetles (*Hippodamia convergens*) purchased in bulk through mail order and released in very large numbers at intervals can temporarily control aphids; however, lady beetles purchased through retail outlets are unlikely to be sufficient in numbers and quality to provide control.

Successful augmentation generally requires advanced planning, biological expertise, careful monitoring, optimal release timing, patience, and situations where certain levels of pests and damage can be tolerated. Desperate problems where pests or damage are already abundant are not good opportunities for augmentation.

CONSERVATION

Conservation of beneficial predators and parasitoids is key toll to promote biologically control practices. Most pests are attacked by several different types and species of natural enemies, and their conservation is the primary way to successfully use biological control. Ant control, habitat manipulation, and selective pesticide use are key conservation strategies.

PESTICIDES MANAGEMENT

Broad-spectrum pesticides often kill a higher proportion of predators and parasites than of the pest species they are applied to control. In addition to immediately killing natural enemies that are present (contact toxicity), many pesticides are persistent materials that leave residues that kill natural enemies that migrate in after spraying (residual toxicity). Residues often are toxic to natural enemies long after pests are no longer affected. Even if beneficial survive an application, low levels of pesticide residues can interfere with natural enemies' reproduction and their ability to locate and kill pests.

Biological control's importance often becomes apparent when broad-spectrum, persistent pesticides cause secondary pest outbreaks or pest resurgence. A secondary outbreak of a different species occurs when pesticides applied against a target pest kill natural enemies of other species, causing the formerly innocuous species to become pests. An example is the dramatic increase in spider mite populations that sometimes results after applying a carbamate (e.g., carbaryl or Sevin) or organophosphate (malathion) to control caterpillars or other pests.

Eliminate or reduce the use of broad-spectrum, persistent pesticides whenever possible. Carbamates, organophosphates, and pyrethroids are especially toxic to natural enemies. When pesticides are used, apply them in a selective manner. Treat only heavily infested spots instead of entire plants. Choose insecticides that are more specific in the types of invertebrates they kill, such as *Bacillus thuringiensis* (Bt) that kills only caterpillars that eat treated foliage. Rely on insecticides with little or no persistence, including insecticidal soap, horticultural or narrow-range oil, and pyrethrins.

A less-persistent pesticide can result in longer control of the pest in situations where biological control is important because the softer pesticide will not keep killing natural enemies. One soft pesticide spray plus natural enemies can be effective for longer than the application of one hard spray.

EXAMPLES OF BENEFICIAL INSECTS

S #	COMMON NAME	BENEFITS
1	Bees	Bees play key role in pollination of different plans
2	Butterflies	Butterflies are significant agent of pollination
3	Moths	These insects are highly beneficial in pollination
4	Flies	Flies are important agents of pollination and also play key role in the eco-system
5	Honey bees	Honey bees highly beneficial and produces honey and beeswax
6	Ants	Ants aerates soil
7	Lady bug beetles	It is important predator and prey on harmful insects
8	Mantids	It is important predator and prey on harmful insects
9	lacewings	It is important predator and prey on harmful insects
10	Silkworm moth	These insects cocoons provide silk fiber
11	Honey ants	human food
12	Flying ants	human food
13	Grasshopper	human food
14	Scarab beetles	These beetles are highly helpful in decomposing carrion (dead flesh), dung, and vegetation

HAZARDS, SAFE AND EFFECTIVE USE OF PESTICIDES

1. {PESTICIDE – An Economic Poison} Any substance used for controlling, preventing, destroying, repelling or mitigating any pest. They include fungicides, herbicides, insecticides, namaticides, rodenticides, desicants, defoliants or plant growth regulators.

2. Poison: A chemical substance which exerts an injurious effect in many cases in which it comes in contact with living organisms during normal use. Fatality from pesticides poisoning results only from accidents, ignorance, suicide or homicide.

3. FORMS: Emulsifiable Concentrates, Wettable Powders, Oil Solutions, Fogging Concentrates, Dusts, Aerosols, Granular, Fumigants, Impregnated materials, Baits.

4. Identify Pest Problem and justify need for Pesticide. Decide on what Pesticide is necessary, type, where available, dose, dilution, timing, frequency, method of application, precautionary measures, cost, confirm it is not in a banned list.

5. PURCHASE: Ensure correct product based on recommendation is purchased. Buy from reputable source, avoid fake products. Buy pack commensurate with usage rate. Watch out for expiry date. Avoid damaged, leaking packs or those without original labels or tampered seals. Keep pesticides away from passengers, livestock or foodstuff during transportation

6. STORAGE: Check label for recommended optimum storage conditions. Avoid overstocking, keep stock for just a season. Secure store to avoid unauthorized access and theft. Store pesticides according to different classes. Inspect store regularly to identify and remove damaged or expired products. Never store pesticides in living quarters or offices. Always keep pesticides in original containers.

7. CLASSIFICATION OF PESTICIDES: Products are classified according to their hazard levels. Toxicity values provide a guide to product toxic effect expressed as LD50, expressed as milligram (mg) of toxicants per

kilogram body weight, the dose which kills 50% of the test animals to which it is administered under experimental conditions.

8. POISON ROUTES: Pesticides in both wet and dry state can enter our body via the skin, the respiratory organ and the mouth.

9. Entry via the Skin: 90% of cases worldwide. Concentrate penetrates skin more rapidly than water mixtures. Hands, arms and feet – the most likely contact zones. Wettable powders, granules or dusts less readily absorbed but sweat enhances skin penetration. Handling, decanting, mixing concentrates exposes operators to higher risk than actual application. Degree of hazard depends on dermal toxicity, extent of exposure, amount of body surface exposed, and part of the body exposed (eye versus palm), time lag between exposure and decontamination

10. Exposure through Inhalation: Through spray droplets or dust. Can cause damage to nose, throat and lung tissues. Vapours and aerosols with droplet sizes below 10 microns would reach lungs, 50-100 microns impact on the nasal lining. Higher risk when working in enclosed spaces, aerosol sprays in green houses, living and bed rooms, or when transferring volatile compound from one container to another. Product with fumigant action

11. Exposure through the Mouth: Less common in practice but serious consequences. Smoking, eating or drinking when mixing pesticides. Attempt to wipe off sweat from face with contaminated hand. Clearing spray nozzle by blowing them. Accidental touching the skin around the mouth when removing respirator or nose mask. Accidental contamination of foodstuff during transportation.

12. Measuring & Mixing: From label, select dose & rate & mixing instruction appropriate for area to be treated and application equipment to be used. Always adhere to recommended dose rates and dilutions. Higher doses would not produce better effects. Lower doses would be less effective. Concentrates which mix easily with water can be measured out and poured directly into sprayer tanks partly filled with water. Wettable powders are best pre-mixed (creamed) with a little water before pouring with spraying tank. Do not fill sprayer to the brim - may leak during use. Prepare only what would be used same day

13. Avoid skin contamination when mixing. Wear protective clothing as recommended. If contamination of skin occurs, wash off immediately using plenty of water. Splashes in the eye must be washed out roller plenty of water for about 10 minutes. Do not measure out or mix pesticides in or near houses or where livestock are kept. Take care not to contaminate water supplies or puddles from which animals may drink. Use suitable equipment. Never scoop or stir pesticide with bare hands.

14. Use cleanest available water, filter out debris. Pour liquids carefully to avoid spillage and splashes – use a funnel if necessary. Never suck up any liquid pesticide with a tube. Handle dust and wettable powders carefully to avoid fluffing up. Stand up-wind so that dust or splashes blow away. Wash all equipments after use. Throw washing water into a hole in the ground away from dwellings, wells, waterways and crops. Mixing vessels and measures for pesticides must never be used for any other purpose. Always keep pesticide in their original containers. Do not transfer into drink bottles or food container. Leftovers and unwanted concentrates should be tipped into a hole in the ground away from dwellings, wells, waterways & crops.

15. Disposal of Containers: All empty containers must be safely dealt with. Metal cans & drums – wash out, puncture & bury (Note: do not puncture aerosol cans). Plastic – Wash out, puncture, burn or bury. Cardboard packaging – burn. Burning must take place away from dwelling & crops. Do not stand in the smoke of such fires. Pesticide containers must not be reused or washed in streams, rivers or ponds. Do not use pesticide containers for food or drinking water for humans or animals because adequate cleansing is very difficult to achieve.

16. Pesticide use in the Field: Do not apply herbicide without adequate training. Never allow children to apply or be exposed to pesticides. Read and follow label instructions strictly. Do not allow workers into the field during application. Take heed of weather conditions particularly wind, avoid drift. Drift can render application ineffective as product is blown into non target area when it could also cause damage. Some products are easily washed by rain avoid application when rain is threatening.

17. Protective Clothing: A secondary line of defense, protective clothing as good as the way it is used – When an how to wear. The material it is made of the quality of maintenance it gets.

18. Types: The most essential items of protective clothing are : Boots – unlined made of rubber. Gloves, unlined made of nitrile or neoprene. Head cover, wide brimmed hat. When using UL formulations or when mixing. Respirator with filters – filters must be exchanged after about 8 hours of wear during operation (check with manufacturer's recommendation). Overall: when wearing overall, the trouser legs should be put over the rubber boots to avoid drainage of pesticide into the boots.

19. Other protective clothing: Apron, PVC-Coated, nitrile or neoprene material Optimum Protection requirement for protective clothing

20. Symptoms of Pesticide Poisoning: Weakness and fatigue, Headache, Excessive sweat, Blurred vision, Vomiting, Muscle twitching, Dizziness, confusion, Extreme salivation, Difficulty with breathing, Itching and burning of the eyes, Skin irritation, Narrow pin point pupils, Abdominal pain, diarrhea, Unconsciousness.

21. First Aid Management at Scene of Incident: Speed is essential do not wait for external help. Calmly and methodically avoid self contamination during treatment. According to the priorities of the patient: the highest priority is adequate breathing it must be maintained continuously, decontamination, terminate the exposure, remove person from scene avoid further skin contact and or inhalation, remove contaminated clothing quickly and completely.

22. Remove pesticide from skin, hair or eyes, wash with copious quantity of water for at least 10 to 15 minutes, do not look for special washing solution if no water is available dab or gently wipe skin with cloth or paper avoid harsh rubbing or scrubbing, keep patient calm and strictly at rest, place patient on his side with his head lower than the rest of the body and turn to one side, if patient is unconscious keep the chin pulled forward and the head back to ensure breathing take place, if patient is extremely hot and sweating excessively cool by using cold water sponging. If he feels cold cover with a blanket to maintain normal temperature

23. Induce vomiting ONLY if chemical swallow is highly toxic, likely to prove fatal and medical assistance not readily available. Induction of vomiting can only be carried out on conscious patient if considered necessary. Never give anything by mouth to an unconscious patient. If breathing stops (patients face or tongue may turn blue) pull chin forward to avoid tongue dropping into back of throat. If fits occur place padded material between teeth and avoid patient injuring himself. Do not forcibly restrain. Do not give milk.

PLANT QUARANTINE

The Pakistan Plant Quarantine Act 1976 and Rules 1967 tare enforced through which the country is protected from the entry and spread of exotic insect pests and disease and trade of plants and plant products is facilitated.

PESTICIDE REGISTRATION

Pesticides are regulated through the agricultural Pesticides Ordinance 1971, The responsibility of registration / permission for import and quality control is executed through the Department of Plant Protection. Due to the efforts of the Department, the prices are not only contained but declined by 30-40% despite devaluation of Pak Rupee.

PERSONAL SAFETY MEASURES FOR HANDLING AND APPLICATION OF PESTICIDES

Personal protection equipment such as respirators, chemical resistant (CR) gloves, CR footwear, coveralls with long sleeves, protective eyewear, CR headgear, CR aprons and a first-aid kit should be available immediately outside the storage area. The first-aid kit should include the following items: adhesive strips, tape, eye pads, gauze bandages and tweezers. The phone number 800-222-1222 for the Poison Control Center should be posted in a prominent location.

It is essential that protective eyewear be worn during mixing/loading. The protective eyewear should consist of safety glasses that provide front, brow and temple protection, goggles or a face shield. Workers should be instructed in the correct procedure for the removal of contaminated clothing. Eye wash stations or portable eye wash bottles should be easily accessed by each person engaged in the operation and should be capable of flushing eyes for a minimum of fifteen minutes. At a minimum, a hose and nozzle should be on hand. Routine wash up facilities, equipped with soap, hand cleanser and single use paper towels should be available near the storage area.

PESTICIDES SPILLS AND OTHER ACCIDENTS

An absorbent material such as re-usable gelling agents, vermiculite, clay, pet litter or activated charcoal should be on hand along with a garbage can and shovel to quickly contain and clean up any spills. All discharges to the environment or spills should be recorded. The records should include the date and time of the incident and the cleanup. The Massachusetts Department of Agricultural Resources must be notified within 48 hours if a pesticide spill leads to pollution.

SITE SECURITY

The storage cabinets should be kept locked and the door to the storage area should contain a weather proof sign warning of the existence and danger of pesticides inside. The door should be kept locked. The sign should be visible at a distance of twenty five feet and can contain a notice such as:

DANGER PESTICIDE STORAGE AREA, ALL UNAUTHORIZED PERSONS KEEP OUT, KEEP DOORS LOCKED WHEN NOT IN USE

The sign should be posted in both English and the language or languages understood by workers if this is not English.

PESTICIDES DISPOSAL

Proper disposal of pesticides and their containers is an important phase of pesticide management. An improperly disposed product can be hazardous to people and the environment. Rinse liquid pesticide containers three times when emptied: fill the containers about one-third full and swish it around. Allow the containers to drain well between each rinse (30 or more seconds). The rinse material should be poured into a spray tank and applied to a registered site. Triple-rinsed containers are considered non-hazardous and should be disposed of according to state recommendations. Never reuse an empty pesticide container. If an empty triple-rinsed container cannot be disposed of immediately, store it in a safe, locked area. Before throwing out powders or granular pesticide containers, be sure to remove all contents from the containers.

PESTICIDES TRANSPORTATION

Depending on the hazard and the quantities of pesticides and hazardous materials (fertilizers, fuel, etc.) at a minimum the following checklist can be helpful for transporting pesticides

- Driver is a licensed or certified pesticide applicator
- Inspect vehicle for leaks or other problems
- Pesticide containers secured in place
- Pesticide containers stored in a dry and lockable portion of the vehicle but not in the same compartment of driver
- Binder of pesticide labels and MSDS
- Emergency phone numbers
- First aid kit
- Fire Extinguishers
- Cleaning up supplies for spills (kitty litter, shovel, plastic bags, etc)
- PPE (gloves, goggles, coveralls, etc)
- At least 5 gallons of potable water for emergency eye or skin decontamination
- Obey all traffic laws and use signals