IPM PACKAGE NO. 12

INTEGRATED PEST MANAGEMENT PACKAGE

FOR

SESAME

Government of India
Ministry of Agriculture
Department of Agriculture & Cooperation
Directorate of Plant Protection, Quarantine & Storage
N. H. IV, Faridabad - 121 001.

IPM PACKAGE FOR SESAME

Contents

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FOREWARD

Integrated Pest management (IPM) approach has been globally accepted for achieving sustainability in agriculture. It has become more relevant due to a number of advantages like safety to environment, pesticide-free food commodities, low input based Crop Production Progamme etc. Though IPM approach has been taken up since 1981, its impact has not been felt until 1994. Human Resource Development has helped to sensitise extension functionaries and farmers about the usefulness of IPM.

For successful implementation of IPM, the scattered information on various components of this eco-friendly approach forms basic necessity. In this direction, initial attempts were made in 1992 to harmonise the IPM Package of Practices of various crops. Subsequently concerted efforts were made in 1998, 2001 and 2002 to update and develop IPM package of practices for agricultural and horticultural crops. Presently, IPM package of practices for 51 crops have been finalised to help the extension workers and farmers to manage the pests/ diseases and to minimise the over use/ misuse of chemical pesticides. Efforts have been made to incorporate the relevant available technical input provided by the scientists of ICAR Institutes/ SAUs and State Departments of Agriculture. However, suggestions for further improvement in future publication/ revision will be of immense help. Hopefully, these IPM Package of Practices will be useful for the Researchers, Plant Protection Workers and Farmers alike.

April 1, 2002

(V. Ragunathan)

PREFACE

In order to minimise the indiscriminate and injudicious use of chemical pesticides, INTEGRATED PEST MANAGEMENT (IPM) has been enshrined as cardinal principle of Plant Protection in the overall Crop Protection Programme under the National Agricultural Policy of the Govt. of India. IPM is an eco-friendly approach for managing pest and disease problems encompassing available methods and techniques of pest control such as cultural, mechanical, biological and chemical in a compatible and scientific manner. The greater emphasis has been given on biological control including use of biopesticides.

With a view to provide technical knowledge to the extension functionaries and farmers in the States, first National Workshop on IPM for harmonisation of Package of Practices was organized at National Plant Protection Training Institute (NPPTI), Hyderabad during June 29-30, 1992. Subsequently workshops were organized from April 15-17, 1998 and Nov. 5-6, 1998 at Directorate of Plant Protection, Quarantine & Storage, Faridabad and IPM package of practices for 20 crops were evolved on rice, cotton, vegetables, pulses, and oilseeds. In this series, two National Workshops on IPM have been conducted at NPPTI, Hyderabad and Dte. of PPQ&S, Faridabad during May 14-17, 2001 and Feb. 20-22, 2002 respectively to update 20 available IPM Packages and develop 31 new IPM Packages specially for Horticultural crops. In these workshops, 51 IPM Package of Practices for cereal crops (Rice, Wheat, Maize, Sorghum, Millets), commercial crops (Cotton, Sugarcane, Tobacco, Tea), pulse crops (Pigeonpea, Gram, Black gram/Green gram, Pea, Rajma), oilseeds (Groundnut, Soybean, Rapeseed/Mustard, Sesame, Safflower, Castor, Sunflower, Oilpalm), vegetables (Potato, Onion, Tomato, Brinjal, Okra, Chillies, Cruciferous vegetables, Leguminous vegetables, Cucurbitacious vegatables), fruit crops (Citrus, Banana, Apple, Mango, Guava, Grapes, Pineapple, Sapota, Pomegranate, Litchi), spice and plantation crops (Small Cardamom, Large Cardamom, Black Pepper, Ginger, Coriander, Cumin, Fennel, Coconut, Cashew and Arecanut) have been finalised.

IPM technology manages the pest population in such a manner that economic loss is avoided and adverse side effects of chemical pesticides are minimized. The IPM packages encompasses various management strategies for containing the pest and disease problems. Pest monitoring is also one of the important component of IPM to take proper decision to manage any pest problem. It can be done through Agro-Ecosystem Analysis (AESA), field scouting, light, pheromone, sticky/yellow pan traps. The economic threshold levels (ETL) of important pests and diseases are also given in the packages to take appropriate control measures when pest population crosses ETL.

These IPM packages developed with the technical inputs from experts from Indian Council of Agriculture Research, State Agricultural Universities, Central Directorate of Plant Protection, Pesticide Industries and State Departments of Agriculture/Horticulture will provide technical backup in the management of pests, diseases, weeds, nematodes and rodents in the Indian Agriculture and Horticulture. These will also be useful in reducing the pesticide residues in exportable agricultural commodities and would also help in the management of pests/diseases/weeds/nematodes which may get inadvertently introduced in the country.

IPM Package of Practices for Agricultural and Horticultural crops will be helpful to minimize the ill effects of chemical pesticides to promote the IPM for sustainable production. These packages will be useful for the researchers, extension workers and farmers alike who are engaged in the agricultural practices.

April 1, 2002

(A.D. Pawar)
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IPM PACKAGE FOR SESAME

1. MAJOR PESTS

A. Pests of National Significance

1. Insect Pests

i. Leaf webber or leaf roller and pod borer (*Antigastra catalaunalis*)
ii. Gall fly (*Asphaudylia sesami)*
iii. Leaf hopper

2. Diseases

i. Phyllody
ii. Dry root rot
iii. Phytophthora blight
iv. Alternaria blight

3. Weeds

i. Cock's comb (*Celosia argentia)*
ii. Crowfood grass (*Dactyloctenium aegyptium)*
iii. Horse purspane (*Eragiron bonariensis)*
iv. Barnyard grass (*Echinochloa* spp.)
v. Bermuda grass (*Cynodon dactylon)*
vi. Spurge (*Euphorbia* spp.)

B. Pest of Regional Significance

1. Insect pests/mite

i. Hawk Moth
ii. Bihar Hairy caterpillar
iii. Red Hairy Caterpillar
iv. White mite
v. Pod bug
vi. Pentatomid bug
vii. Cotton aphid

2. Diseases

i. Leaf spot
ii. Wilt
iii. Bacterial blight
iv. Bacterial leaf spot
v. Powdery mildew

3. **Nematodes**

i. Pigeon Pea Cyst Nematode (Rajasthan)

II. PEST MONITORING

The objective of surveys is to monitor the initial development of pest and diseases in endemic areas. In the beginning of crop season survey routs bases upon the endemic areas are required to be identified to undertake roving survey. Based upon the results of the roving survey, the State extension functionaries have to concentrate for greater efforts at Block and Village levels as well as through farmers to initiate field scouting. Farmers should be mobilised to observe the pest and disease occurrence by field scouting at the intervals as stipulated here under. The plant protection measures are required to be taken only when pests and diseases cross ETL as per results of field scouting.

1. **Rapid Roving Survey :**

Undertake roving survey at every 10 km distance initially at fortnightly and thereafter (depending upon pest population) at 10 days intervals. Record incidence of capsule borer, other pests and biocontrol fauna on 20 plants at random. Record the major diseases and their intensity.

2. **Field Scouting :**

Field scouting for pests and biocontrol fauna by extension agencies and farmers once in 7 days should be undertaken to workout ETL.

The State Department of Agriculture should make all possible efforts by using different media, mode of publicity to inform the farmers for field scouting in the specific crop areas having indication of serious pest and diseases build up.

3. **Agro eco-system analysis (AESA) :**

AESA is an approach, which can be gainfully employed by extension functionaries and farmers to analyse field situations with regard to pests, defenders, soil conditions, plant health, the influence of climatic factors and their interrelationship for growing healthy crop. Such a critical analysis of the field situations will help in taking appropriate decision or management practices. The basic components of AESA are :

1. Plant health at different stages
2. Built – in compensation abilities of the plants
3. Pest and defender population dynamics

4. Soil conditions
5. Climatic factors
6. Farmers's past experience

Details of AESA are given in Annexure – I

4. **Light trap :**

Light traps may be installed and operated after sunset for 2 hours for monitoring the moth and jassid population.

5. **Crop stage-wise pest/disease monitoring schedule:**

Sr. No.	Crop Stage	Observations	Sample	Frequency	Action
I	Seedling stage	a) Charcoal rot or dry root rot b) Seedling blight or Phytophthora blight (Visual observation)	3 sq. m. or 2 m. row (Count No. of plants at 5 locations in the field).	Fortnightly	If the incidence is above 20% the field may be considered as sick and growing sesame may be discouraged in the affected field for 1-2 years. In case the diseases incidence is less than 10% care should be taken in the following season to treat seed with recommended measures. Use resistant varieties.
II.	Vegetative stage	a) Leaf roller and pod borer b) Hairy-caterpillar	-do -	Every 10 days	If the incidence is more than 1-2 larva per plant, follow the recommended plant protection measures.
		c) Cercospora leaf spot d) Bacterial blight e) Alternaria leaf spot f) Bacterial leaf spot g) Powdery Mildew (Visual observation)	- do -	- do -	On appearance of disease, follow the recommended control measures.

Sr. No.	Crop Stage	Observations	Sample	Frequency	Action
III.	Flowering Stage	a) Gallfly	-do-	Weekly	Action to be initiated at 2.5 galls per plant OR 10% damage.
		b) Phyllody	- do -	- do -	Rogue out the diseased plant and destroy.
IV.	Pod formation and maturity	a) Capsule borer	- do -	-do -	Action to be initialed at 1-2 larva per plant.
		b) Phyllody	- do -	- do -	Rogue out the diseased plant and destroy.

III. ECONOMIC THRESHOLD LEVEL (ETL)

i.	Leaf roller & pod borer and Hairy Caterpillar	-	1 to 2 larva per plant.
ii.	Gallfly	-	2 to 5 Galls per plant or 10 per cent damage.

IV. IPM STRATEGIES

1. Cultural Practices

i. Deep ploughing to reduce the population of soil harbouring insect pests and nematodes.
ii. Synchronised sowing.
iii. Grow resistant/tolerant varieties as under :

Name of the variety		Tolerant against
a) TKG – 21	-	Tolerant to bacterial and cercosopra leaf spot.
b) TKG – 22	-	Tolerant to phytophora blight.
c) B – 67	-	Tolerant to Macrophomina and Phyllody.
d) Krishna	-	Tolerant to Alternaria leaf spot and Capsule borer.
e) Vinayak	-	Tolerant to leaf spots.
f) Gujarat Til. 2	-	Tolerant to bacterial blight. Wilt and phyllody.
g) Haryana Til. 1	-	Field resistant to Phyllody.
h) TSS – 6 (SVPR – 1)	-	Tolerant to Phyllody, Alternaria leaf spots.
i) IMP Sel. 5 (Rama)	-	Resistant to Macrophomina rot

- Timely sowing, proper seed rate (5 kg of seed per ha.)
- Thinning operation should be done to maintain 30 x 15 cm spacing so as to give optimum plant population.
- Keep the crop weed free upto 45 days after sowing by two hand hoeing/weedings at 20 and 35 days.
- Intercropping is beneficial with green gram, red gram and pearlmillet.

2. Mechanical Practices

i. Collection and destruction of larvae of hawk moth, leaf webber/capsule borer and hairy caterpillar.
ii. Use light traps against Lepidopteran pests.
iii. Uproot the phyllody affected plants.
iv. Mechanically remove the roots of previously harvested crops as they harbour cyst nematode.

3. Biological Control

i. Seed treatment with *Trichoderma viride* @ 4 gms. per kg. seed for the control of root rot.

4. Chemical Control

i. Insect Pests

a. For control of defoliators, leaf webber/ capsule borer or gall midge, spray 2 rounds of neem oil 2 per cent.

b. For control of insect pests, spray or dust any one of the chemicals :

*Endosulfan	-	0.07 %
Carbaryl	-	0.15%
Quinalphos	-	0.05 %
*Dimethoate	-	0.03%
*Malathion	-	5% D } (@ 25 kg/ha)
*Endosulfan	-	4% D }

ii. Diseases

i. Seedling blight, Cercospora leaf spot, Dryroot rot and Alternaria leaf spot- Seed treatment with *Captan or *Thiram 2-2.25 gm/kg followed by *Mancozeb spray 1.25-1.5 kg a.i../ha in 750 1 water 10 days interval.

ii. Bacterial blight and bacterial leaf spot – Seed treatment with Agrimycin – 100 (250 ppm) or Streptocycline suspension 0.05% (for 30 minutes). Foliar spray with Streptocycline (500 ppm) when symptoms noticed. repeat after 15 days interval it necessay.

iii. Powdery Mildew – Foliar spray of *Sulphur 2.5 kg a.i./ha in 750-1000 1 water at flowering to capsule formation stage.

iv. Phyllody – 2-3 foliar sprays of Dimethoate 30 EC @ 1 ml/lit of water for vector control.

5. Weed management practices:

1. Crop should be sown timely at proper moisture by using recommended seed rate, balance doses of fertilizers for achieving optimum plant protection and healthy cropstand which would be capable of competing with weeds at initial stages of growth.

2. Crop should be maintained weed free upto 45 days after sowing by resorting two hands hoeings/weedings at 20 and 35 days after sowing.

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* Not as per approved usage under Insecticides Act, 1968

V. CROP STAGE-WISE IPM PRACTICES:

Sl.No.	Crop Stage / Pests	IPM Package	Particulars
1.	PRE-SOWING	Cultural practices	Deep ploughing to reduce the population of insect pests and nematodes
			Synchronised sowing
			Timely sowing and proper seed rate (5 kg of seed per ha.)
			Grow resistant/tolerant varieties
	Seedling blight,Dry root rot		Timely irrigation to maintain good crop stand
	Alternaria leaf spot	Bio-controls	Treat the seed with *Trichoderma viride* @ 4 gm/kg of seeds
	Bacterial blight		Use bio-fertilizers Azospirallum and Phospho-bacteria as recommended
	Bacterial leaf spot	Chemical Practices	Seed treatment with Agrimycin – 100 (250 ppm) or Streptocycline suspension 0.05% for 30 minutes
2.	SEEDLING	Mechanical and Chemical Practices	Crop sanitation/weeding
	Dry root rot		Folliar spray with *Mancozeb 1.125-1.5 kg a.i./ha in 750 1 water
	Phytophthora blight		Rogue out diseased infected plants
3.	VEGETATIVE		
	Leaf roller/pod borer		Collection and destruction of larvae
			Use light traps for monitoring of lepidopteran pests
	Hairy Caterpillar		Spray Endosulfan 0.07%

Sl.No	Crop Stage / Pests	IPM Package	Particulars
	Leafroller/pod borer		Carbaryl 0.15% , Qunialphos 0.05%, *Dimethoate 0.03% or Dust *Malathion 5% D or *Endosulfan 4% D @ 25 kg/ha.
	Cercospora leaf spot, Bacterial blight,		For bacterial blight and leaf spot, apply foliar spray of streptocycline (500 ppm)
	Alternaria leaf spot, Bacterial leaf spot		For seedling blight and Alternaria leaf spot, spray 0.2% *mancozeb or *Carbendazim 0.05%.
	Powdery mildew		For powdery mildew, spray 0.2% sulphur.
4.	FLOWERING		
	Gallfly Phyllody	Mechanical and Chemical Practices	Clip the galls, pick and burn the shed buds.
			Rogue out the phyllody affected plants.
			Spray crop at the bud initiation stage with *Dimethoate 0.03% or *Endosulfan 0.07%.
5.	POD FORMATION AND MATURITY		
		Mechanical and Chemical practices	Uproot and destroyed phyllody affected plants.
			Spray *Endosulfan 0.07%, Quinalphos 0.05% or *Dimethoate 0.03%.

*Not as per approved usage under Insecticide Act, 1968.

VI . DO's AND DON'Ts IN SESAME IPM

S. No.	DO's	DONT's
1.	Grow only resistant/tolerant varieties	Discourage susceptible varieties
2.	Adopt Synchronised sowing	Avoid Staggered sowing.
3.	Adopt crop rotation.	Avoid Monocropping.
4.	Use organic manure, FYM & neem cake and bio-fertillizers as per recommended dose.	Discourage more of chemicals fertillizers.
5.	-	Restrict Insecticide spray period to protect pollination.

CROP: Seasame

VII. SAFETY PARAMETERS IN PESTICIDES USAGE

S. No	Name of pesticide	Classification as per Insecticides Rules, 1971	Colour of Toxicity Triangle	WHO classification by hazard	First aid measures	Symptoms of poisoning	Treatment of poisoning	Waiting period (No. of days)
INSECTICIDES ORGANOCHLORINE PESTICIDES								
1.	Endosulfan	Highly toxic	Yellow	Class II – Moderately Hazardous	Remove the person from the contaminated environment. In case of (a) Skin contact – Remove all contaminated clothings and immediately wash with lot of water and soap; (b) Eye contamination – Wash the eyes with plenty of cool and clean water; (c) Inhalation – Carry the person to the open fresh air, loosen the clothings around neck and chest, and (d) Ingestion – If the victim is fully conscious, induce vomiting by tickling back of the throat. Do not administer milk, alcohol and fatty substances. In case the person is unconscious make sure the breathing passage is kept clear without any obstruction. Victim's head should be little lowered and face should be turned to one side in the lying down position. In case of breathing difficulty, give mouth to mouth or mouth to nose breathing. Medical aid: Take the patient to the docotr/Primary Health Centre immediately along with the original container, leaflet and label.	Nausea, vomiting, restlessness, tremor, apprehension, convulsions, coma, respiratory failure and death	- Gastric lavage with 2-4 L. tap water – Catharsis with 30 gm. (10 oz) sodium sulphate in one cup of water - Barbiturates in appropriate dosages repeated as necessary for restlessness or convulsions - Watch breathing closely, aspirate, oxygen and/or artificial respiration, if needed. - Avoid oils, oil laxatives and epinephrine (Adrenalin) – do not give stimulants. - Give calcium gluconate (10% in 10 ml. Ampules) intra-venously every four hours.	

ORGANOPHOSPHATE PESTICIDES								
2.	Quinalphos	Highly toxic	Yellow	Class II – Moderately Hazardous		Mild – anorexia, headache, dizziness, weakness, anxiety, tremors of tongue and eyelids, miosis, impairment of visual acuity. Moderate- nausea, salivation, lacrimation, abdominal cramp, vomiting, sweating, slow pulse, muscular tremors, miosis. Severe – diarrhoea, pinpoint and non-reactive pupils, respiratory difficulty, pulmonary edema, cyanosis, loss of sphincter control, convulsions, coma and heart block.	For extreme symptoms of O.P poisoning, injection of atropine (2-4 mg., for adults, 0.5-1.0 mg for children) is recommended, repeated at 5-10 minute intervals until signs of atropinization occur. Speed is imperative - Atropine injection – 1 to 4 mg. Repeat 2 mg. when toxic symptoms begin to recur (15-16 minute intervals), Excessive salivation – good sign, more atropine needed; - Keep airways open, Aspirate, use oxygen, insert endotracheal tube. Do tracheotomy and give artificial respiration as needed. - For ingestion lavage stomach with 5% sodium bicarbonate, if not vomiting. For skin contact, wash with soap and water (eyes- wash with isotonic saline). Wear rubber gloves while washing contact areas. In addition to atropine give 2-PAM (2-pyridine aldoxime methiodide). 1 g and 0.25 g for infants	
3.	Monocrotophos	Extremely toxic	Bright red	Class I b – Highly hazardous				
4.	Dimethoate	Highly toxic	Yellow	Class II – Moderately hazardous				
5.	Malathion	Moderately toxic	Blue	Class III – Slightly Hazardous				

							intravenously at a slow rate over a period of 5 minutes and administer again periodically as indicated. More than one injection may be required. Avoid morphine, theophyllin, aminophyllin, barbiturates ofr phenothiazines. Do not give atropine to a cyanotic patient. Give artificial respiration first then administer atropine.	
CARBAMATES								
6. 7.	Carbaryl Streptocycl ine suspension	Highly toxic Slightly toxic	Yellow Green	Class II – Moderately hazardous		Constriction of pupils, salivation, profuse sweating, lassitude, muscle incoordination, nausea, vomiting, diarrhoea, epigastric pain, tightness in chest.	- Atropine injection 1 to 4 mg. Repeat 2 mg when toxic symptoms begin to recur (15-60 minute intervals). Excessive salivation – good sign, more atropine needed. - Keep airway open. Aspirate, use oxygen, insert endotracheal tube. Do tracheotomy and give artificial respiration as needed. - For ingestion, lavage stomach with 5% sodium bicarbonate, if not vomiting. For skin contact was with soap and water (eyes – wash with isotonic saline). Wear rubber gloves while washing contact	

							area. - Oxygen - Morphine, if needed. Avoid theophyllin and aminophyllin or barbiturates. 2-PAM and other oximes are not harmful and in fact contra indicated for routine usatge. Do not give atropine to a cyanotic patient. Give artificial respiration first then administer atropine.	
FUNGICIDES								
8.	Mancozeb	Slightly toxic	Green	Table 5 – Unlikely to present acute hazard in normal use.		Headache, palpitation, nausea, vomiting, flushed face, irritation of nose, throat eyes and skin etc.,	No specific antidote. Treatment is essentially symptomatic.	
9.	Carbendazim	Slightly toxic	Green	-do-				
10.	Thiram	Moderately toxic	Blue	Class III – Slightly hazardous				
11.	Zineb	Slightly toxic	Green	Table 5 – Unlikely to present acute hazard in normal use				
12.	Captan	-do-	Green	-do-				
13.	Sulphur	-do-	-do-	-do-				

Annexure-I

AGRO ECO SYSTEM ANALYSIS (AESA)

AESA is an approach, which can be gainfully employed by extension functionaries and farmers to analyse field situations with regard to pests, defenders, soil conditions, plant health, the influence of climatic factors and their inter-relationship for growing healthy crop. Such a critical analysis of the field situations will help in taking appropriate decision on management practices. The basic components of AESA.

1. Plants health at different stages.
2. Built-in-compensation abilities of the plants.
3. Pest and defender population dynamics.
4. Soil conditions.
5. Climatic factors.
6. Farmers past experience.

The methodology of AESA is as under :

A. Field Observations

a) Enter the field at least 5 ft. away the bund. Select a site with a dimension of 2 sq. mt. Randomly.

b) Record the visual observations in following sequence :

   i. Flying insects (both pests & defenders)

   ii. Close observation on pests and defenders which remain one the plants.

   iii. Observe pest like *S. litura* and defenders like ground beetle/rove beetle/earwigs by scraping the soil surface around the plants.

   iv. Record disease and its intensity.

   v. Record insect damage in percentage.

c) Record parameters like number of leaves, branches, plant height and reproductive parts of the selected plants which should be flagged for making observation in the following weeks.

d) Record the types of weeds, their size and population density in relation to crop plant.

e) Record soil conditions viz. Flooded, wet or dry.

f) Observe rodent live burrows.

g) Repeat the step (a) to (f) in four sites randomly selected.

h) Record the climatic factors viz. Sunny, partially sunny, cloudy, rainy etc. for the preceding week.

B. Drawing

First draw the plan with actual number of branches/leaves etc, at the centre on a chart. Then draw pests on left side and defender on the right side. Indicate the soil condition, weed population, rodent damage etc. Given natural colours to all the drawings, for instance, draw healthy plant with green colour, diseased plant/ leaves with yellow colour. While drawing the pests and the defenders on the chart, care should be taken to draw them at appropriate part of the plant, where they are seen at the time of observation. The common name of pests and defenders and their population count should also be given alongwith diagram. The weather factor should be reflected in the chart by drawing the diagram of sun just above the plant if the attribute is sunny. If cloudy, the clouds may be drawn in place of sun. In the case of partially sunny, the diagram of sun may be half masked with clouds.

C. Group Discussion and decision making

The observations recorded in the previous and current charts should be discussed among the farmers by raising questions relating to change in pest and defender population in relation to crop stages, soil condition, weather factors such as rainy, cloudy or sunny, etc., the group may evolve a strategy based upon weekly AESA, ETL and corresponding change in P:D ratio and take judicious decision for specific pest management practices.

D. Strategy for decision making (Examples)

i. When large number of egg masses and early instar larvae of Spodoptera/Helicoverpa are observed, the group may conclude application of NPV.

ii. 25 per cent defoliation up to 30 DAS or after 60 DAS in ground will not affect the yield. Such information may be useful to decide management practice for defoliators in groudnut and other crops.

iii. Some of the defenders like lady beetles, groundnut beetles, rove beetles, wasps play useful role in arriving at P:D ratio.

E. AESA by Extension Functionaries

The Extension functionaries during their regular visit to the village mobilise the farmers, conduct AESA and critically analyse the various factors such as the pest population viz-a-viz defender population and their role in natural suppression of the pest, the influence of prevailing weather condition/soil conditions on the likely build up of defender/pest population. They may also take the decision based on the AESA, which IPM components like release of defenders, application of neem formulations/safe pesticides are to be used for specific pest situation. Such an exercise may be repeated by the extension functionaries during every visit to the village and motivate the farmers to adopt AESA in their fields.

F. AESA by Farmers

After a brief exposure during IPM demonstrations/field trainings, farmers can practice AESA in their own fields. Wherever trained farmers are available their experiences could be utilised in training their fellow farmers in their own villages. Thus a large group of farmers could be made proficiently competent in undertaking weekly AESA thereby empowering themselves in decision making on any specific pest situations. Farmers-to-farmers training approach will go a long way in practicing IPM on a large area on sustainable basis.

Annexure-II

BASIC PRACEAUTIONS IN PESTICIDE USAGE

A. Purchase

1. Purchase only JUST required quantity e.g. 100, 250 500, or 1000 g/ml for single application in specified area.
2. Do not purchase leaking containers, loose, unsealed or torn bags.
3. Do not purchase pesticides without proper/approval LABELS

B. Storage

1. Avoid storage of pesticides in house premises.
2. Keep only in original container with intact seal.
3. Do not transfer pesticides to other containers
4. Never keep them together with food or feed/fodder
5. Keep away from reach of children and livestock
6. Do not expose to sun-light or rain water
7. Do not store weedicides along with other pesticides

C. Handling

1. Never carry/transport pesticides along with food materials.
2. Avoid carrying bulk-pesticides (dusts/granules) on head, shoulders or on the back.

D. Precautions for preparing Spray Solution

1. Use clean water
2. Always protect your NOSE, EYES, MOUTH, EARS and HANDS.
3. Use hand gloves, face mask and cover your head with cap.
4. Use polythin bags as hand gloves, handkerchiefs or piece of clean cloth as mask and a cap or towel to cover the head (Do not use polythin bag contaminated with pesticides.).
5. Read the label on the container before preparing spray solution
6. Prepare spray solution as per requirement on
7. Do not mix granules with water
8. Concentrated pesticides must not fall on hands etc. while opening sealed containers. Do not smell the pesticides.
9. Avoid spilling of pesticides solution while filling the sprayer tank.
10. Do not eat, drink, smoke or chew while preparing solution
11. The operator should protect his bare feet and hands with polythin bags.

E. Equipment

1. Select right kind of equipment
2. Do not use leaky, defective equipment
3. Select right kind or nozzle.
4. Don't blow/clean clogged-nozzle with mouth. Use old tooth-brush tied with the sprayer and clean with water
5. Do not use same sprayer for weedicide and insecticide.

F. Precautions for applying pesticides

1. Apply only at recommended dose and dilution
2. Do not apply on hot sunny day or strong windy condition
3. Do not apply just before the rains and also after the rains
4. Do not apply against the wind direction
5. Emulsifiable concentrate formulations should not be used for spraying with battery operated ULV sprayer.
6. Wash the sprayer and buckets etc. with soap water after spraying
7. Containers, buckets etc. used for mixing pesticides should not be used for domestic purpose.
8. Avoid entry of animals and workers in the fields immediately after the spraying.

G. Disposal

1. Left over spray solution should not be drained in ponds or water lines etc. Throw it in barren isolated area, if possible.
2. The used/empty containers should be crushed with a stone/stick and buried deep into soil away from water source
3. Never re-use empty pesticide container for any purpose.

WARNINGS

1. Consult expert of the field of Plant Protection before use of any pesticide, regarding doses and time of application

2. Don't use pesticides in wrong way.

3. *Select pesticides wise fully.*

4. *Use pesticides wise fully.*

5. *Use pesticides judiciously on need based manner.*

6. *Don't use green leaves as food after spray of pesticides.*

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