सत्यमेव जयते

IPM PACKAGE NO. 17

INTEGRATED PEST MANAGEMENT PACKAGE

FOR

ONION

Government of India
Ministry of Agriculture
Department of Agriculture & Cooperation
Directorate of Plant Protection, Quarantine & Storage
N.H. IV, Faridabad-121 001,
May, 2001

IPM PACKAGE FOR ONION

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Ministry of Agriculture
(Department of Agriculture & Cooperation)
DIRECTORATE OF PLANT PROTECTION, QUARANTINE & STORAGE
NH IV, FARIDABAD – 121 001 (Haryana)

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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)
Director (IPM)

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IPM PACKAGE FOR ONION

I. MAJOR PESTS

A. Pests of National Significance

1. Insect Pests

1.1 Thrips
1.2 Mites

2. Diseases

2.1 Leaf blight/purple blotch
2.2 Smudge
2.3 Downy mildew
2.4 Blast and neck rot

3. Major Weeds

3.1 Lamb square (*chenopodium album)*
3.2 Pimpernel (*Anagallis arvensis*)
3.3 Sweetclover (*Melilotus* spp.)
3.4 Funitory (*Fumaria indica*)
3.5 Corn spurry (*Spergula arvensis*)
3.6 Blue grass (*Poa annua*)
3.7 Canary grass (*Phalaris minor*)
3.8 Rabbit foot grass (*Dactyloctenium aegyptium*)

B. Pests of Regional Significance

1. Insect Pests

1.1 Onion caterpillar
1.2 Bean seed fly
1.3 American bollworm
1.4 Tobacco caterpillar
1.5 Onion maggot
1.6 Aphid

2. Diseases

2.1 Rust
2.2 Basal rot and wilt

2—459/PPQ&S/2002

II. PEST MONITORING

1. 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 on 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 past experience.

The details of the AESA are given in Annexure - I.

2. Field Scouting

AESA requires skill and so only the trained farmers can undertake their exercise. However, other farmers also can do field scouting in their own fields at regular intervals to monitor the major pest situation. Simple field scouting on pest situation by the farmers helps to minimize pesticide usage to a large extent.

3. Yellow pan/stick traps

Set up yellow pan/sticky traps for monitoring thrips @ 10 traps per ha. locally available empty yellow palmolive tins coated with grease/Vaseline/castor oil on outer surface may also be used as yellow pan trap.

4. Economic Threshold Levels (ETLs)

The Economic Threshold Level (ETL) is an attempt to improve decision making practices by using partial economic analysis on the impact of the control practice such as spraying a pesticide. At the ETL, the benefit of spraying is equal to the losses caused by the insects in the field. The farmers are advised to take appropriate measures when the incidence crosses ETL. The ETL for some of the pests are listed below:

Pest	Economic Threshold Levels
1. Onion maggot	1 maggot/hill
2. Onion caterpillar	1 caterpillar /hill

III. INTEGRATED PEST MANAGEMENT STRATEGIES

A. Cultural Practices

1. Crop rotation with coarse cereals, reduces the blotch incidence.

2. Application of neem cake @ 200 kg per ha., against nematodes and soil borne fungus.

3. Crop seedling should be timely planted in well prepared field at recommended spacing by using balanced dose of fertilizers for obtaining optimum plant population and healthy crop stands would be capable of competing with weeds at the initial stages of the crop growth.

B. Mechanical Control

1. Jet sprinkling of water through jet nozzles to prevent thrips multiplication.

2. Crop should be maintained weed free for 4-6 weeks after planting by resorting timely hand hoeing/hand weeding.

C. Biological Control

1. Conservation

General predators like Coccinellids, Syrphids, Spiders, Dragonfly, Damselfly, predatory bugs actively suppress the onion pests. Avoiding unnecessary broadspectrum chemical sprays is the best way to protect them.

2. Augmentation

a) Seed treatment with *Trichoderma viride* @ 2 g/1000 g of seed.

b) Conservation of predatory bugs.

c) Release *Chrysoperla carnea* @ 2 per plant against sucking pests and soft bodied insects.

D. Chemical Control

1. Chemical pesticide should be used on need basis as a last resort. Only when pest population intensity crossed economic threshold level, the safer pesticides should be applied judiciously.

2. Spray 5% NSKE during vegetative stage against thrips.

3. Seed treatment with Benomyl 50% W.P. @agm/litre water for controlling smut.

4. Spray *endosulfan 0.07% (2 ml/lit of water) to control thrips.

5. Spray Mancozeb 50% WP @ 1500-2000gm/ha for onion blotch/leaf blight.

6. Against weeds, spray fluchloralin @ 670 g-900 g a.i./ha. as pre-planting soil incorporation.

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*Not as per the approved usage under Insecticides Act, 1968.

IV. STAGEWISE IPM PRACTICE FOR ONION

Stage	Pest	Practice
1. Pre-sowing	Resting stages of pests Soil borne pathogens weeds	Deep summer ploughing. Soil incorporation of fluchloralin @ 670-9o0 g a.i/ha.
2. Seed Seedling	Smut	Red-skinned onions treatment with benomyl 50% W.P. @1gm/liter of water.
	Blotch	Seed treatment with carbendazim 0.01%. Spray mancozeb 50% WP @ 1500-2000gm/ha whenever disease symptoms noticed.
	Thrips	Yellow sticky traps @ 5 per ha. Spray *endosulfan @ 0.07% (2 ml/lit of water).
3. Vegetative	Onion maggots	Removal of alternate hosts. Optimum irrigation management.
	Weeds	Optimum Spacing; timely planting; balanced dose of fertilizers. Maintain weed free field for 4-6 weeks after planting by hand hoeing/hand weeding.
	Thrips & Aphids	Continue yellow sticky traps. Conservation of coccinellid predators. Spray *endosulfan @ 0.07% (2 ml/lit of water)
	Tobacco caterpillar	Hand collection of different stages of insects. Release of *T. remus* @ 50000 per ha. at weekly intervals for 4 times.
	Mites	Spray *dicofol @ 450 g a.i./ha
	Aphids	Spray *endosulfan @ 0.07% (2 ml/lit of water)
	Blotch	Spray mancozeb 50% @ 1500-2000gm/ha.

* Not as per the approved usage under Insecticides Act, 1968.

CROP: ONION

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.	
2.	Dicofol	Moderately toxic	Blue	Class III – Slightly hazardous				
FUNGICIDES								
3.	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.	

4.	Benlate (Benomyl)	Slightly toxic	Green	-do-				
5.	Bavistin (Carbendazim)	Slightly toxic	Green	-do-				
HERBICIDES								
6.	Fluchloralin	Moderately toxic	Blue	Class III – Slightly hazardous		Headache, palpitation, nausea, vomiting, flushed face, irritation of nose, throat eyes and skin etc.,	No specific antidote. Treatment is essentially symptomatic.	
7.	Pendimethalin	Moderately toxic	Blue	Class III – Slightly hazardous				

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 on management practices. The basic components of AESA are:-

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 from the bund. Select a site with a dimension of 1 sq. mt. randomly.

b) Record visual observations in following sequence:-
   - i) Flying insects (both pests & defenders)
   - ii) Close observation on pests and defenders which remain on the plants.
   - iii) Observe pests and defenders like ground beetle/ rove beetle earwigs by scrapping 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 plant 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. Give natural

colours to all the drawing, 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 pest 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 partiallly 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):**

Some of the defenders like lady bird beetles, spiders, lacewing bug, reduviid bug, *Campoletis* sp., wasps play useful role in arriving at P:D ratio i.e. 1:1.

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 excercise may be repeated by the extension functionaries during every visit to the village and motivate the farmers to adopt AESA in their fields.

AESA BY FARMERS:-

After a brief exposure during IPM demonstrations/ field training, 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.

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ANNEXURE - II

BASIC PRECAUTIONS 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/ approved LABELS.

B. Storage:

1. Avoid storage of pesticides in the house premises.
2. Keep only in original container with intact seal.
3. Do not transfer pesticides to other container.
4. Never keep them together with food or feed/ fodder.
5. Keep away from the 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 polyethylene bags as hand gloves, handkerchiefs or piece of clean cloth as mask and a cap or towel to cover the head (Do not use polyethylene bag contaminated with pesticides).
5. Read the label on the container before preparing spray solution.
6. Prepare spray solution as per requirement.
7. Do not mix granules with water.
8. Concentrated pesticides must not fall on hands etc. while opening sealed containers. Do not smell the sprayer tank.
9. Avoid spilling of pesticide 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 polyethylene bags.

E. **Equipment:**

1. Select right kind of equipment.
2. Do not use leaky, defective equipment.
3. Select right kind of 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 some 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 bucket etc with soap water after spraying.
7. Containers, buckets etc. used for mixing pesticides should not be used for domestic purposes.
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 burried deep into soil away from water source.
3. Never re-use empty pesticide container for any purpose.