



IPM PACKAGE NO. 76



**INTEGRATED
PEST MANAGEMENT
PACKAGE**

FOR

PASSION FRUIT



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

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DIRECTORATE OF PLANT PROTECTION, QUARANTINE & STORAGE
N. H. IV, FARIDABAD - 121 001 (HARYANA)

DR. P. S. CHANDURKAR
Plant Protection Adviser
to the Government of India

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 cost based Crop Production Programme 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, 2002 and 2003 to update and develop IPM Package of Practices for agricultural and horticultural crops. Presently, IPM Package of Practices for 77 crops have been finalized to help the extension workers and farmers to manage the pests and diseases and to minimize 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/Horticulture. 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.


(P. S. CHANDURKAR)
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P R E F A C E

In order to minimize 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 harmonization of Package of Practices was organized at National Plant Protection Training Institute (NPPTI), Hyderabad during June 29-30, 1992. Subsequently workshops were organized on April 15-17, 1998 and Nov. 5-6, 1998 at the Directorate of Plant Protection, Quarantine & Storage, Faridabad and IPM Package of Practices for 20 crops were finalized 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 14-17, 2001 and Feb. 20-22, 2002 respectively to update 20 available IPM Packages and develop 31 new IPM Packages especially for horticultural crops. Sixth and Seventh National Workshop held at Central Insecticides Laboratory, Faridabad on 4th-5th July, 2002 and 9th-10th January, 2003 respectively for 18 IPM Packages and Eighth National Workshop was held at NPPTI, Hyderabad on 28th-29th May, 2003 for 8 IPM Packages. In these Workshops, 77 IPM Package of Practices for cereal crops (Rice, Wheat, Maize, Sorghum, Millets), commercial crops (Cotton, Sugarcane, Tobacco, Tea, Betelvine, Saffron), pulse crops (Pigeonpea, Gram, Black gram/Green gram, Pea, Rajma), oilseeds (Groundnut, Soybean, Rapeseed/Mustard, Sesame, Olive, Safflower, Castor, Sunflower, Oilpalm), vegetables (Potato, Onion, Tomato, Brinjal, Okra, Chillies, Cruciferous vegetables, Leguminous vegetables, Cucurbitaceous vegetables, Broccoli, Spinach, Lablab bean, Garlic), fruits (Citrus, Banana, Apple, Mango, Guava, Grapes, Jackfruit, Pineapple, Sapota, Pomegranate, Litchi, Papaya, Apricot, Peach, Pear, Cherry, Walnut, Ber, Amla, Loquat, Strawberry, Watermelon, Fig, Phalsa, Persimmon, Custard apple, Raspberry, Kiwi, Passion fruit), spice and plantation crops (Small Cardamom, Large Cardamom, Black Pepper, Ginger, Coriander, Cumin, Fennel, Coconut, Cashew and Arecanut) have been finalized.

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 encompass various management strategies for containing the pest and disease problems. Pest monitoring is one of the important components of IPM to take proper decision to manage any pest problem. It can be done through Agro-Ecosystem Analysis (AESAs), 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 Agricultural 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 agriculture and horticulture. These will also be useful in reducing the pesticide residues in 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 IPM packages will be useful for the researchers, extension workers and farmers alike who are engaged in the agricultural practices.

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(A. D. Pawar)
Addl. PPA-cum-Director(IPM)

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- I. Coordinator : Dr. A. D. Pawar, Addl. PPA-cum-Director (IPM)
Dte. Of PPQ&S, Faridabad.
- II. Co-coordinator : Dr. B. G. Naik, Addl. PPA-cum-Director
NPPTI, Hyderabad.
- Sh. V.K. Yadav, Joint Director (IPM),
Sh. D.D.K. Sharma, DD(PP)
Dte. of PPQ&S, Faridabad.
- III. Chairman : Dr. N. Benjong Aier, DD (Rec.), D/o Horticulture,
Technical Session Govt. of Nagaland, Kohima
- IV. Co-Chairman : Dr. J.N. Thakur, AD(E)
Technical Session CIPMC, Solan.
- V. Expert input :
1. Dr. S.P. Sharma, PPO (E), CIPMC, Guwahati
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IPM PACKAGE FOR PASSION FRUIT

(*Passiflora edulis*)

I. MAJOR PESTS

1. INSECT PESTS

- | | |
|-----------------|-------------------------|
| 1.1 Fruit flies | <i>Bactrocera spp.</i> |
| 1.2 Mealy bugs | <i>Planococcus spp.</i> |
| 1.3 Aphids | |

2 DISEASES

- | | |
|-------------------------|--------------------------------|
| 2.1 Brown spot | <i>Alternaria passiflorae</i> |
| 2.2 Septoria spot | <i>Septoria passiflorae</i> |
| 2.3 Root rot | |
| 2.4 Phytophthora blight | <i>Phytophthora nicotianae</i> |
| 2.5 Wilt | <i>Fusarium oxysporium</i> |
| 2.6 Base rot | <i>Pythium spp</i> |
| 2.7 Woodiness virus | (PWV) |

- | | |
|----------|-------------------------|
| 3. MITES | <i>Brevipalpus spp.</i> |
|----------|-------------------------|

4. RODENTS

- | | |
|---------------------------|------------------------------|
| 4.1 Soft furred field rat | <i>Rattus meltdada</i> |
| 4.2 Indian male rat | <i>Bandicota bengalensis</i> |
| 4.3 Common house rat | <i>Rattus rattus</i> |

II. PEST MONITORING

The objective of pest monitoring is to detect the initial development of pests and diseases and also bio-control potential in the field situations.

1. Rapid roving survey (RRS)

Survey team should undertake regular insect pest and disease monitoring at 7 days interval and assess biocontrol potential in addition to insects pest and disease situation to give early forewarning. Records should be kept about insect pests and disease incidence and biocontrol fauna. The field should be selected randomly after every 10 km distance.

2. Field scouting

Field scouting should be undertaken by the farmers and extension functionaries to keep a close watch on the appearance of insect pests/diseases and biocontrol fauna once in 7 days to work out the economic threshold level for various pests.

3. Agro-Eco-System Analysis (AESA)

Based upon weekly AESA economic threshold level and corresponding change in pest defenders ratio should be worked out. The extension functionaries have to take judicious decision in advising farmers for specific pest management practices. Detailed methodology for undertaking AESA exercise is given in Annexure- I.

4. Pest monitoring through traps.

I. Traps

The traps may be placed in the field @ 10 traps per ha. to monitor and population suppression of fruit flies. Hanging of bottle traps containing 100 ml of water emulsion of methyl eugenol (0.1%) + malathion (0.1%) during fruiting season is very effective for control of fruit fly. Traps can be fixed during morning hours.

II. Sticky traps

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

III. INTEGRATED PEST MANAGEMENT PRACTICES

(A) CULTURAL PRACTICES

1. **Propagation and planting**: Seeds, cutting and grafting on resistant root stock; selection of mature vines for cutting in nursery bed/polythene bags in suitable potting media; rooted cuttings can be transplanted after 3 months spacing as below:

Row to Row - 3-5 meters

Plant to Plant - 3-4 meters

Pit size - 50 cm X 50 cm X 50 cm

2. Summer deep ploughing to expose soil inhabiting/resting stages of various insects/pathogens and nematodes populations.
3. Trimming of all field bunds to destroy the existing rodent burrows.
4. Apply recommended doses of NPK
5. Proper drainage system to remove excess water be ensured to keep root rot diseases under control.
6. Plants should be trained with the help of supporting wires to form a roof like structure to protect fruits from sun burn and bird damage.
7. Remove and destroy all infested leaves, twigs and fruits to prevent further spread of pests.
8. In summer, keep the vines open, avoid crowding and excessive shading of vines.
9. For rodent control adopt community approach and orchard sanitation.

(B) MECHANICAL PRACTICES

1. Collect and destroy the different developmental stages of insect pests.
2. The trellies should always run across the slope or in North-South direction, for proper exposure to sun light.
3. Tips should be pinched to facilitate branching when the vines reach the trellies.
4. Pruning should be restricted to the lower parts of the vines hanging on the ground, during winter when vines are dormant.

(C) BIO-CONTROL PRACTICES

1. Conserve predators like lady bird beetles, syrphids, crysopids, wasps, surface bugs, spiders, different species of parasitic wasps and predatory mites.
2. Before raising nursery, make use of *Trichoderma* spp. for control of different fungal diseases.
3. Make the release of different laboratory reared bioagents where necessary.

(D) CHEMICAL PRACTICES

1. Spray malathion 50 EC(2ml/litre of water) to check fruit flies.
2. Spray mancozeb/copper oxychloride(2g/litre of water) to control major fungal diseases like brown spot, root rot, base rot, wilt etc.
3. To control root rot, spray Bordeaux mixture or 0.03% copper oxychloride.
4. To control mites, spray dicofol (0.05%) or wettable sulphur(0.25%)when mite population exceeds 20 per leaf.
5. For control of brown spot, spray solution of copper oxychloride or captan or mancozeb(2.5-3 g/litre of water) at 15 days interval if necessary.
6. For rodents control, prebaiting with plain food material is necessary before zinc phosphide or bromadiolone baits in rodent burrows.
7. Fumigate live burrows with aluminium phosphide tablets (one tablet per burrow) and close the burrows.

DO'S

1. Grow only recommended variety kaveri (hybrid between purple and yellow) tolerant to collar rot, wilt, brown leaf spot and nematodes.
2. Agronomic practices:
 - a) Timely sowing
 - b) Always use recommended fertilizers in balanced proportion based on soil testing reports.
3. Pest management:
 - (a) Ensure regular surveillance for timely detection of economic threshold levels (ETL), required for need based application of control measure.
 - (b) Selection of safe and effective pesticides and its recommended doses at right stage.

DONT'S

- Do not grow the under script material which vary greatly in fruiting pattern and pest susceptibility.
- Do not use imbalanced fertilizers which result in poor plant health and reduce resistance to various insect pests and diseases.
- Do not keep the infected plant materials in field to check the further spread of the diseases.
- Do not go for blanket spray without field roving.
- Do not use mixture of various insecticides which are not recommended in any case.
- Do not use the insecticides at lesser/over doses.
- Do not use sub standard nozzles which

AGRO-ECO SYSTEM ANALYSIS(AESA)

Agro-eco system analysis(AESA) is a process which involves periodical observation of plant health, plant compensation abilities, ETL, climatic factors, change of pests and defenders population and their inter-relationship. AESA can be practiced by more than one group of trained farmers in a village. AESA helps in decision making on management practices required to be adopted at each crop growth stage. AESA technique may be useful in farmer to farmer IPM training programme.

Method:

A. Field Observations:

- a) Enter the field at least 5 ft away from the bund. Select a vine site with a dimension of one sq.m randomly.
- b) Record the observations in following sequence:
 - a. Flying insects(both pests and defenders)
 - b. Close observation on pests and defenders which remain on the plants.
 - c. Record disease and its intensity.
 - d. Record insect damage in percentage.
- c) Record in one of the selected sites parameters like number of leaves, branches, height and reproductive parts(plants should be flagged for making observations in the following weeks).
- d) Records the types of weeds, their size and population density in relation to crop selected.
- e) Observe the live burrows of rodents and their intensity.
- f) Repeat the step (a) to (e) for other randomly selected four sites.
- g) Record the climatic factors viz. sunny,cloudy,partly cloudy, rainy etc. for the preceding week.

B. Drawing

Draw the entire observations in a chart paper with the plant at the centre, pests on the left side and defenders on the right side. Use natural colors for the drawing. Indicate common names and population of pests and defenders per plant.

C. Group Discussion and Decision Making:

The observations using the previous and current charts should be discussed among the group members by raising questions relating to changes in pests and defenders population, crop stage, etc. The group may also evolve a strategy based up on weekly AESA, ETL and corresponding change in Pest and defender (PD) ratio and take judicious decision for specific pest management practices.

D. Strategy for decision making: (Example)

- 1) If the weather is hot and dry without any rain, group may suggest for no spray otherwise recommended for fungal diseases.
- 2) In case of aphid if 2-3 larvae of *Chrysopa* spp. or of *Syrphid* flies are present on the infected vine or 50% aphids are mummified (parasitised), then there is no need of chemical spray.
- 3) When more than 20% foliage of vines are affected by any fungal disease and weather is humid, group may advocate for fungicides spray.
- 4) If the population of defenders like lady bird beetles, syrphids, chrysopids, spiders, predatory mites and wasps is equal or more than insect pests, then group may advocate for no chemical spray.

AESA BY EXTENSION FUNCTIONARIES

The extension functionaries during their regular visits to the villages should mobilize the farmers, conduct AESA and critically analyze the various factors such as the pest population vis-à-vis defender population and their role in natural suppression of the pests, the influence of prevailing weather conditions/soil conditions on the likely build up of defender/pest population. They may also take the decision based on the AESA, IPM components like release of defenders, application of safe pesticides to be used for specific pests 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.

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 utilized 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 situation. Farmer to farmer training approach will go a long way in practicing IPM on a large area on sustainable basis.

BASIC PRECAUTIONS IN PESTICIDE USAGE

A. Purchase:

1. Purchase only JUST required quantity e.g 100,250,500 or 1000g/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 levels/leaflets.

B. Storage

1. Avoid storage of pesticides in the house premises.
2. Keep pesticides only in original containers 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 the reach of children and livestock.
6. Do not expose to sunlight 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, shoulder or on the back.

D. Precaution for preparing spray solution

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

E. Equipments

1. Select right kind of equipments.
2. Do not use leaky, defective equipments.
3. Select right kind of nozzles.
4. Do not blow/clean clogged-nozzles 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. Precaution for spraying pesticides:

1. Apply only 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 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 but should be dumped in barren isolated area.
 2. The used/empty containers should be crushed with a stone/stick and buried deep into soil away from water sources.
 3. Never re-use empty pesticide container for any other purpose.
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