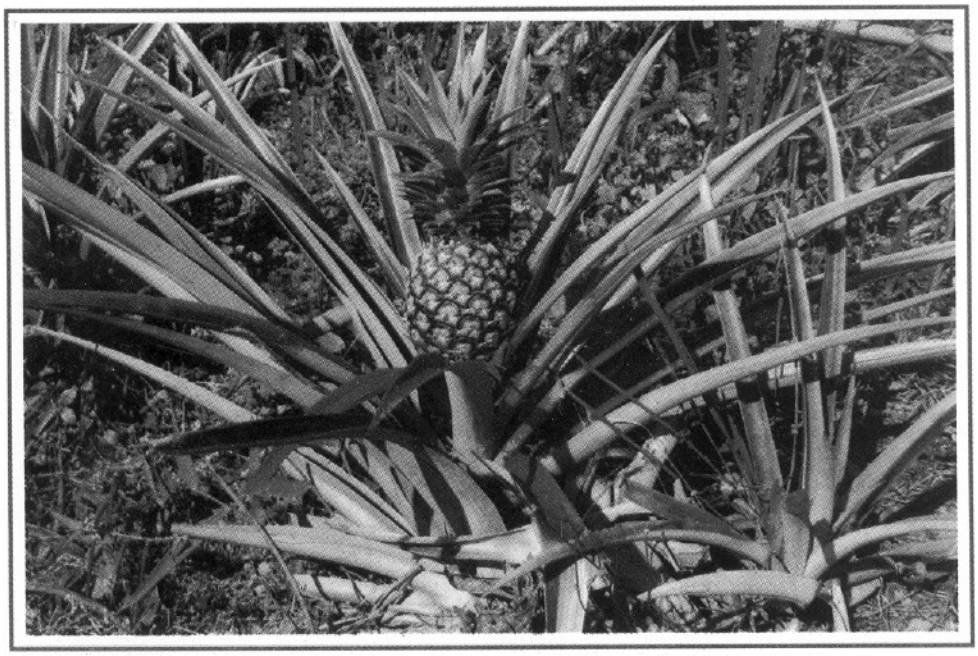
सत्यमेव जयते

IPM PACKAGE NO. 29

INTEGRATED PEST MANAGEMENT PACKAGE

FOR

PINEAPPLE



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 PINEAPPLE

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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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The IPM Package of Practices for **Pineapple** crop was discussed and finalised in the National Workshop on IPM held at National Plant Protection Training Institute (NPPTI), Hyderabad during May 14-17, 2001. The technical input received from the following experts is thankfully acknowledged.

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IPM PACKAGE FOR PINEAPPLE

I. MAJOR PESTS:

A. Pests of National Significance:

1. Insect Pests:

1.1 Mealy Bugs, *Pseudococcus brevipes* and *Planococcus citri*

1.2 Stem Borer, *Metamasius ritchiei*

1.3 Scale Insect, *Diaspis bromeliae*

2. Diseases:

2.1 Fruit Rot, *Ceratostomella paracoxa*

2.2 Root Rot, *Phytophthora cinnamoni, Phytophthora parasitica*

2.3 Pine apple Wilt, Virus transmitted by mealy bug *Dysmicoccus brevipes*

3. Nematodes:

3.1 Root knot Nematode, *Meloidogyne incognita*

3.2 Root lesions, *Pratylenchus*

3.3 Root Nematodes, *Rotylenchus* reniforms

4. Weeds:

4.1 Cyperus rotundus

4.2 Cynodon dactylon

4.3 Nut Grass

5. Rodents:

5.1 Porecupine, *Hystrix indica*

5.2 Roof Rat, *Rattus rattus*

5.3 Smaller Bandicoot, *Bandicota bengalensis*

B. Pests of Regional Significance:

1. Insect Pests:

1.1 Fruits & stem borer, *Thecla ecohion*

1.2 Termites, *Tetranychus* spp.

1.3 Pine apple Bug, *Carpohilus hemipterus*

1.4 Pine apple mite or Red mite, *Stigmacus horidanas*

1.5 Slug caterpillar, *Latoia tepida*

1.6 Black Palm Beetle, *Oryctes rhinoceros*

2. Diseases:

2.1 Black Rot/Soft Rot, *Ceratostomella paradoxa*

2.2 Leaf spot, *Phytophthora* sp.

2.3 Stem Rot/Core Rot, *Ceretoeystis paradoxa, Thielaviopsis paradoxa*

3. Weeds:

3.1 Imperata cylindrica

3.2 Eupatorium odoratum

3.3 Galinsoga perviflora

3.4 Bidens pilosa

3.5 Ageratum conyzoides

3.6 Lantana camara

3.7 Cyperus diformis

3.8 Ambrossia artimissifolia

II. PEST MONITORING:

The objective of surveys is to monitor the initial development of pests and diseases in endemic areas. In the beginning of crop season survey routes based upon the endemic areas are required to be identified to undertake roving surveys. Based upon the results of the roving surveys the state extension functionaries have to concentrate for greater efforts at Block and Village level 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 as per results of fields scouting.

A. Agro-Eco System Analysis (AESA):

AESA is an approach, which can be gainfully employed by extension functionaries and farmers to analyse the 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.

B. Rapid Roving Survey (RRS):

Undertaking rapid roving survey at every 10 km distance initially at weekly and thereafter at 10 days intervals (depending upon pest population). Record incidence of mealy bug (*Pseudococucus bromilae*), observe at each spot 5 plants at random and 12 spots per ha. and also record population potential of different biocontrol fauna, major diseases and their intensity.

C. Field Scouting:

Based on the observations of RRS the farmers at village level are to be mobilised to undertake fields scouting. During field scouting farmers may record pest, disease, defenders populations once in 7-10 days in their own fields as per Agro Eco System Analysis (AESA) approach. The State Department of Agriculture should make all

possible efforts by using different media mode and publicity to inform the farmers in the specific areas having indication of pest or disease build up.

III. IPM STRATEGIES:

A. Cultural Practices:

1. Deep ploughing or dug to a depth of 30-40 cm. till a fine tilth is obtained in summer before planting to expose soil pathogens, hidden stages of insect pests and under ground bulbs or rhizomes of perennial weeds.

2. In hills, the land is terraced either or cut into strips of suitable width by forming contour trenches. Planting is done on hillock slopes upto a gradient of 60 ° across the slop without forming terraces.

3. Select healthy planting materials i.e., suckers, slips, and crowns.

4. High density planting (HDP) gives more profit besides less weed infestation, protection from sunburn, increased production of suckers and slips per unit area and non-lodging of plants.

5. Adopt proper irrigation and fertilizer management. Avoid application of high nitrogenous fertilizers to boost the crop.

6. The crop should be maintained free from weeds. Hand weeding with Punjab sickle is effective with Glyphosate as recommended in chemical control (Glyphosate @ 1.5 kg a.i + 1 hand weeding was found very effective under Meghalaya condition).

7. Remove and destroy crop residues to restrict populations build up of rodents.

8. Do not extend the normal crop period and avoid ratooning.

9. Adopt synchronization in cultivation as much as possible according to locality.

B. Mechanical Practices:

1. Collection and destruction of plant parts infested with insect pests and diseases.
2. Use of traps to reduce the rodents population by using locally available attractive baits.
3. Install 10-12 bird perchers per ha for the benefit of predatory birds like black drango, king crow, orange myna and blue joy which play significant role to bring down pest population.

C. Biological Control Practices:

1. Applications of *Trichoderma* sp. for soil borne pathogens.
2. Conservation of predators (lace wings, lady bird beetle, staphylinids, predatory wasps, surface bugs like Assassin bugs, Pentatomid bugs, Praying mantis, Dragon flies, Geocoris, Anthocorid, Nabids, Reduviid, spidors), parasitoids like *Apanteles* sp., *Bracon* sp., *Campoletis* sp,. *Eriborus* sp., *Trichogramma* sp. and *Telenomus sp.*.
3. Growing two rows of maize/sorghum or cowpea along with the border helps in conserving bio-agents such as lady bird beetle, Staphylinids, *Chrysoperla* sp., Anthocorids, Geocoris, Nabis, Reduviids etc. The pollens of maize helps in retaining *Chrysoperla* in main pineapple field.
4. Monitor the incidence of sucking pests and release eggs or first instar larvae of *Chrysoperla* sp. @ 2-3 grubs/plant.

D. Chemical control:

1. Spraying with *fenitrothion @ 0.03% solution or *endosulfan @ 0.05% solution for the effective control of mealy bug at vegetative stage.
2. Insecticide applications should be avoided 20 days before harvesting.

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

3. Application of Glyphosate @ 1.5 kg a.i/ha by using hood so as to protect the tender fruits.

4. For root rot and heart rot control, prophylactic treatment with Bordeaux mixture or any other copper oxychloride fungicidal drench may help to check to disease incidence.

5. Use 0.005% Bromodiolon in ready to use form or wax blocks for rodent control.

E. Weed control:

1. The manual weeding accounts for nearly 40% of the total cost of cultivation.

2. For suppressing the weed population and restoring the soil fertility in pineapple inter-cropping with rice was found suitable.

3. Mulching of pineapple orchard with black polythene followed by thatch grass gives better yield and suppresses the weed growth.

F. Rodent Management:

1. The pineapple field should be kept weed free to restrict the population build up of rodents.

2. To control the left out population chemical control may be adopted in the following schedule:

Day 1: Survey and plugging of burrows.

Day 2 : Identification of live burrows and pre-baiting for zinc phosphide.

Day 4: Zinc-phosphide (2%) poison baiting.

Day 5: Collection of left over poison bait and dead rats.

Day 7: Plugging of burrows.

Day 8: ALP (Aluminimum phosphide) fumigation of burrows.

Or

3. Treat burrows with bromadiolone baits. In case of anticoagulants baiting, after 15 days, all the treated burrows should be plugged to assess the control success.

Or

Day 1: Plugging of burrows

Day 2: Identification of live burrows and treatment of burrows with anticoagulants.

Day 17: Plugging of burrows

Day 18: Treatment of reopened burrows again with anticoagulants or fumigation by ALP to control residual population.

IV. 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.	Fenitrothion	Highly toxic	Yellow	Class II – Moderately		Mild – anorexia, headache, dizziness,	For extreme symptoms of O.P poisoning, injection of	

				Hazardous		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.	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 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.	
HERBICIDES								
3.	Glyphosate	Slightly toxic	Blue	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.	Bromacil		Blue	-do-				
5.	Diuron		Blue	-do-				
RODENTICIDES								
6.	Bromodiolone	Extremely toxic	Bright red	Class I a – Extremely hazardous		Bleeding from nose, gums and into conjunctiva, urine and stool & coma Possible polar and petechial rash, late-massive echymoses or hematoma of skin, joints, brain hemorrhage	- Give Vitamin K1 15-25 mg for adults; 5-10 mg. for children orally; - Transfuse with fresh blood if bleeding is severe or until anemia is corrected. - Iron (Ferros sulfate) by mouth for correction of secondary anemia, 0.3 gm t.i.d.	
7.	Aluminium phosphide	Extremely toxic	Bright red	Class I b – Highly hazardous		Headache, palpitation, nausea, vomiting, flushed face, irritation of nose, throat eyes and Skin etc.	No specific antidote. Treatment is essentially symptomatic.	

ANNEXURE -I

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 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 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.

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