



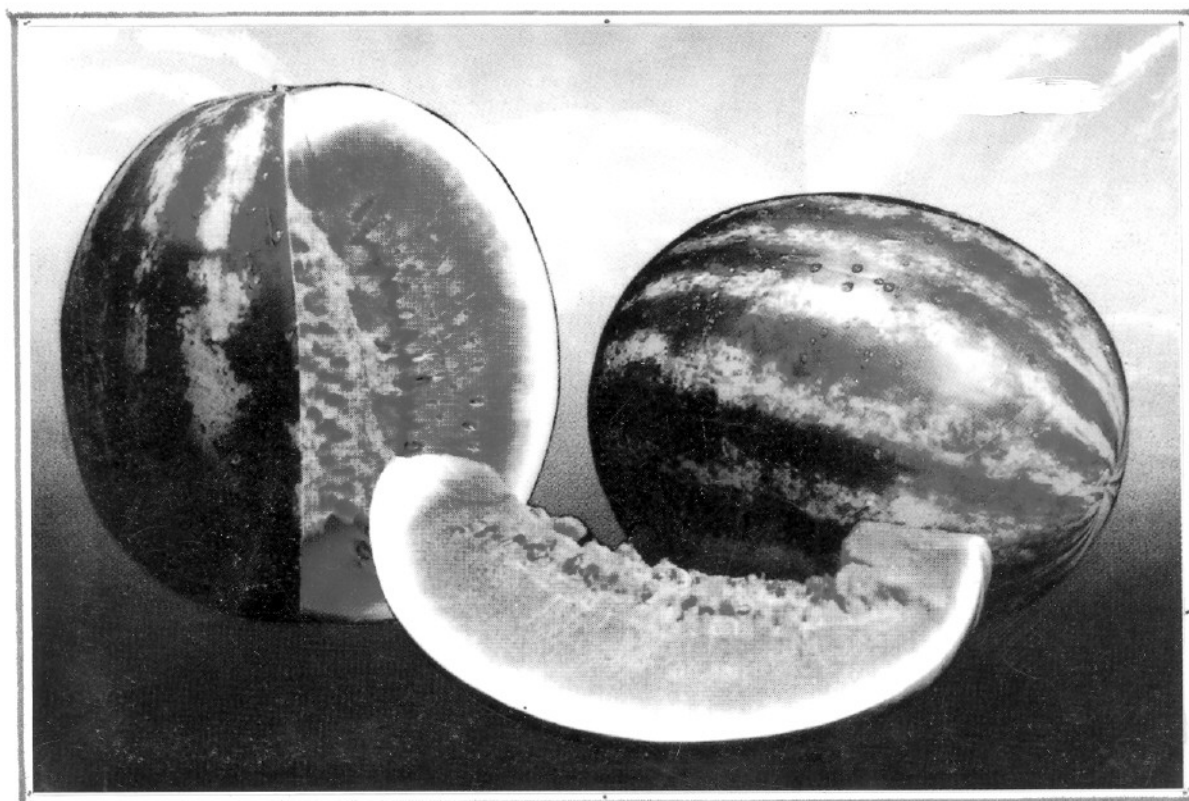
IPM PACKAGE NO. 66



**INTEGRATED
PEST MANAGEMENT
PACKAGE**

FOR

WATERMELON



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 WATERMELON

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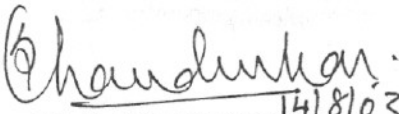
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FOREWARD

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 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 (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 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.

7th October, 2003



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- | | |
|-------------------------------------|--|
| (i) Chairman | Dr. A.D. Pawar, Director (IPM)
Dte. of P.P.Q. & S., Faridabad |
| (ii) Co-Chairman
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IPM PACKAGE FOR WATERMELON

I. MAJOR PESTS:-

(A) Insect pests:

- (a) Red pumpkin beetle
- (b) Serpentine leaf miner
- (c) Thrips
- (d) White fly
- (e) Aphids
- (f) Hairy caterpillar
- (g) Stink bug
- (h) Fruit fly
- (i) Red Spider Mite

(B) Diseases:

- i) Budnecrosis
- ii) Downy mildew
- iii) Powdery mildew
- iv) Anthracnose
- v) Blight (*Alternaria*)
- vi) Fusarium wilt

(C) Nematodes:

- (i) Root Knot nematodes (*Meloidogyne spp.*)

II. PEST MONITORING:

1. Agro Eco System Analysis (AESA)

The Red Pumpkin beetle and Serpentine Leaf Miner attack the crop at the seedling stage. Damage by Red Pumpkin beetle may results in re-sowing of the crop if not managed properly. Walk across the field and observe 10 to 20 plants randomly. The number of Red Pumpkin Beetle feeding on the tender leaves should be recovered. Observe the first fully opened leaf for any minute Serpentine Leaf Mines. Also in the early morning (8-9 AM) for adult leafminer on tender leaves and record their number.

Thrips, Whitefly, mites and leaf feeding caterpillars are usually noticed 15 to 20 days after germination. At this stage, on a black sheet of paper tap the growing tip of the plants three times from five plants and count the number of thrips. Similarly, observe the ventral side of leaf for aphids, powdery mildew and Red Spider Mites. Observe for black necrotic patches due to alternaria blight (Concentric rings) and record the observation to arrive at decision making for control measures on the basis of ETL.

Fruit flies are usually a problem as soon as female flower initiation takes place. Observe the rotten flower buds that are dropped for the number of fruit fly larvae by splitting/ opening the affected female fruits.

Watermelon bud necrosis symptoms can be identified by one or two scrotched leaves usually near the growing tip and dry tender buds. The distribution of the plants affected by Watermelon Bud Necrosis Virus (WBNV) will be at random and the growth will be distorted. Such plants have to be monitored and removed. On the fruits of affected plants splendid light & dark concentric rings develop usually near the petiole end. Such fruits are deformed which are to be removed.

Aphid can also transmit viral diseases such as mosaic, and Cucumber virus. They need to be monitored with the help of experts.

Plants have to be monitored for the incidence of diseases such as Downy mildew (Small yellow patches on the green leaf surface) , powdery mildew (powdery growth on the upper-surface of the leaf), Anthracnose and white cottony growth (Development of sunken, brownish lesions on leaves, stems and petioles).

III. ECONOMIC THRESHOLD LEVEL (ETL)

S.No.	Pest	Stage of the crop	Economic Threshold Level
1.	Red pumpkin beetle	Seedling/Vegetative	1 larvae per plant
2.	Fruitfly	Fruiting stage	1 larvae per 5 fruits
3.	Stink bug	Vegetative growth	1 bug per plant
4.	Aphids	Vegetative growth	2-3% affected plants
5.	Hairy caterpillars	Vegetative growth	One larva/mtr. sqr.
6.	Powdery mildew	Vegetative growth	5-10% leaf area damaged
7.	Downey mildew	Vegetative growth	5-10% leaf area damaged
8.	Anthracnose	Vegetative growth	10-15% leaf area damaged
9.	Blight	Vegetative growth	2-5% leaf area damaged
10.	Fusarium wilt	Root stage	5-10% plant infested

IV. INTEGRATED PEST MANAGEMENT STRATEGIES:

A. Insect Pest and disease management

- (i) Wherever possible hand picking of Red Pumpkin beetles will partially help if the incidence is less. Application of neem seed cake at the seedling stage will greatly help in minimizing both Red Pumpkin beetle and Serpentine Leaf miner. If necessary, spray NSKE (4%) 10-15 days after germination.
- (ii) Application of insecticides indiscriminately will eliminate the various indigenous natural enemies. Hence there is need to conserve them. Occurrence of Redspider mites or White fly or Aphids is an indication of indiscriminate pesticide application.
- (iii) Application of neem seed powder, or neem cake at the time of planting followed by NSKE (5%) spray 10-15 days after germination and one more application at the time of flowering can keep most of the pests below the economic threshold level.
- (iv) For the control of fruitflies, regular monitoring of fruit flies using fly traps is essential.
- (v) Destruction of fallen fruits and soil raking is also helpful for control of various pests.
- (vi) At the time of female flowering initiation, one or two sprays of a malathion (0.25%) and Jaggery @ 15 gms/litre can be given at 15 days interval for fruit flies effective management.
- (vii) To avoid Budnecrosis, ensure synchronize planting to avoid severe incidence of the virus.
- (viii) Avoid staggered planting.
- (ix) Remove and destroy affected plants in the field.
- (x) For thrips management, the weeds such as *Cassia tora* and other cucurbitaceous weeds need to be removed.
- (xi) Use sticky traps or water traps on blue background for monitoring thrips.
- (xii) Barrier crop such as Maize around the field may also help in minimizing the disease.
- (xiii) For disease management, treat seeds with *Trichoderma harzianum* and *T. Viride* @ 4-8 gms/kg of seeds.
- (xiv) Downy Mildew can be managed effectively by using selective fungicides but application has to be made only after scientific monitoring. Fungicides such as Radomil @ 1-2 g/litre can be used.
- (xv) Avoid using organochlorides and sulphur on watermelon and other Cucurbitaceous crops.
- (xvi) The activity of Pollinators is very much essential in crops such as watermelon. Spray should be given only during evening hours or early morning to avoid damage to Pollinators. Suitable stickers should be used for better efficacy of the spray.

- (xvii) Planting of highly susceptible varieties such as “Arka manik” “Sugar baby” etc. should be avoided in endemic pockets.
- (xviii) Alternaria blight can be managed using 0.2% dithan M-45 or 0.1% carbendazim at pre-flowering stage.
- (xix) Syndrome involving root-knot nematode and fungus fusarium can be managed by seed soak in 0.2% carbendazim followed by application of neem cake and drenching with *Trichoderma viride* (5 g/ lit of water).

B. Weed Management

- 1) Follow the recommended agronomic management practices of land preparation, planting distance, application of fertilizer and irrigation etc. to have healthy plants stand.
- 2) Smothering of weeds by using mulching with straw/hay etc.
- 3) Use hand operated implements for controlling weeds as and when needed

V. DO'S AND DONT'S

Do's	Don'ts
1. Weeding and hoeing in the plant periphery should be regularly carried out keeping in mind to expose the soil borne pathogens to unfavourable environment conditions.	Do not damage the root system, main or sub main roots.
2. Use fertilizers and manures as per recommendations.	Avoid imbalanced use of fertilizers.
3. Application of pesticides should be on the basis of ETL and pest defender ratio only.	Do not apply chemical pesticides on blind recommendation or calendar basis.
4. Use only recommended and comparatively safer chemical pesticides.	Do not mix two pesticides.
5. Be specific in dose and quantity of water.	Avoid indiscriminate use of pesticides and wrong sprayers.
6. Spray in morning or evening hours so that pollinators are not hit.	Do not spray crop during flowering and in noon hours as honey bees visit the crop.
7. Encourage the use bio-fertilizers along with compost.	Do not use FYM which has not been properly decomposed.

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 buried deep into soil away from water source.
3. Never re-use empty pesticide container for any purpose.