



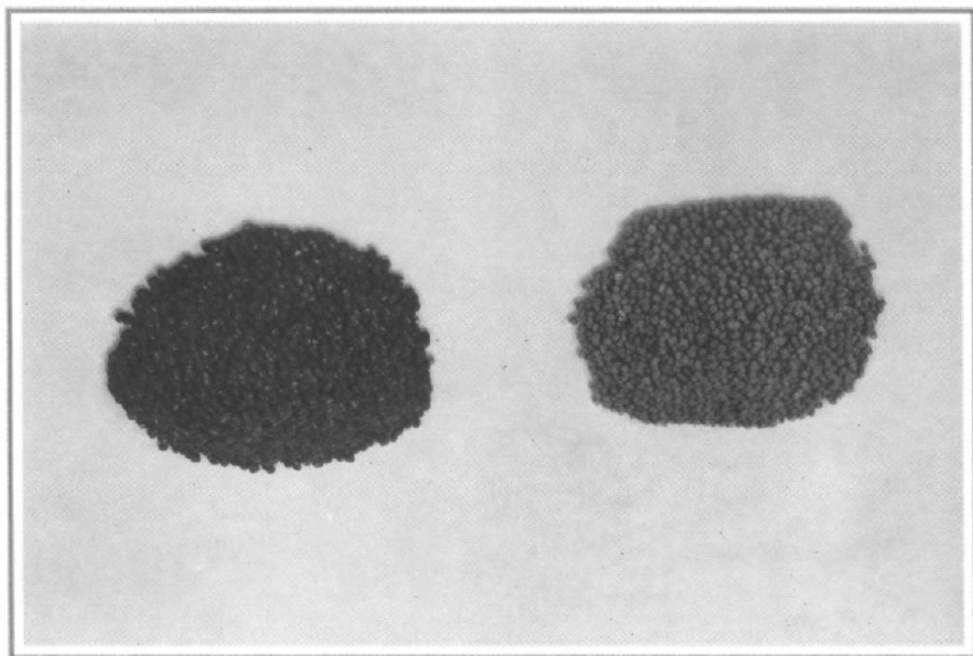
IPM PACKAGE NO. 7



INTEGRATED PEST MANAGEMENT PACKAGE

FOR

BLACK GRAM (URD)/ GREEN GRAM (MOONG)



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 BLACK GRAM (URD) & GREEN GRAM (MOONG)

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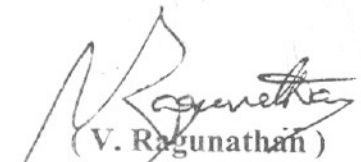
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FORWARD

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 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 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. Raguathan)

P R E F A C E

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, Cucurbitaceous vegetables), 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 (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 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 **Blackgram/Greengram** 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.

- I. Chairman, Technical Session : Dr. A.D. Pawar, Director (IPM), Dte of PPQS, Faridabad
- II. Coordinator, Technical Session : Dr. M.P. Misra, Dy. Director (Ent.), Dte. of PPQS, Faridabad
- III. Co-chairman, Technical Session : Dr. M. Ramiah, Professor Div. Of Pathology, TNAU, Coimbatore
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 3. Sh. S.K. Verma, Central IPM Centre, Patna
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 5. Sh. R.S. Sharma, PPO(E), Dte of PPQS, Faridabad
 6. Dr. D. Kanungo, Jt. Director, CIL, Dte of PPQS, Faridabad
 7. Dr. Jasvir Singh, AD(E), Dte of PPQS, Faridabad
- V. Technical input:
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 7. Sh. N.K. Mishra, LDC, IPM Div., Dte of PPQS, Faridabad.

IPM - PACKAGE FOR URD/MOONG**I MAJOR PESTS :****A. Pests of National Significance :****1. Insect pests :**

- 1.1 Whitefly – *Bemesia tabaci*
- 1.2 Hairy caterpillar – *Spilosoma obliqua & Amsacta moorie*)
- 1.3 Stemfly – *Ophiomya phaseoli*
- 1.4 Jassids – *Empoasca sp.*
- 1.5 Podborer – *Maruca testulalis*
- 1.6 Thrips – *Caliothrips indicus*

2. Diseases :

- 2.1 Yellow Mosaic Virus – (YMV)
- 2.2 Cercospora Leaf spot – *Cercospora sp.*
- 2.3 Powdery mildew – *Erysiphe polygoni*
- 2.4 Macrophomina blight – *Macrophomina phaseolina*

3. Weeds :

- 3.1 *Amaranthus viridis*
- 3.2 *Cyperus iria*
- 3.3 *Dactyloctenium aegyptium*
- 3.4 *Echinochloa spp.*
- 3.5 *Trianthema monogyna*
- 3.6 *Eleusine indica*
- 3.7 *Cleome viscosa*
- 3.8 *Phyllanthus niruri*

4. Nematodes :

- 4.1 Rootknot nematode – *Meloidogyne incognita*
M. javanica
- 4.2 Cyst nematode – *Heterodera cajani*

B. Pests of Regional significance :

1. Insect / mite

- 1.1 White grub, *Holotrichia* sp.
- 1.2 Blister beetle, *Mylabris* sp.
- 1.3 Red spider mite – *Tetranychus* sp.

2. Diseases

2.1 Leaf curl and Leaf crumple

3. Nematodes

- 3.1 Stunt nematode – *Telenchorhynchus* spp.
- 3.2 Lesion nematode – *Pratylenchus* spp.

II. PEST MONITORING

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, 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 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.

I. INTERGRATED PEST MANAGEMENT (IPM) STRATEGIES :

1. Cultural practices :

- 1.1 Deep ploughing, early sowing and timely irrigation is important for good crop stand.
- 1.2 Basal application of neem cake at 150 kg/ha reduces root rot disease besides being nematostatic.
- 1.3 Resistant / tolerant varieties are recommended for cultivation. Varieties for some of the diseases are as under :

(a) Yellow mosaic virus :

<u>Crop</u>	<u>Variety</u>	<u>Area / States</u>
i. Moong bean	Pant Mung 2, Pant Mung 3, PDM 54 (Moti), PDM 84-139(Samrat), PDM 84-143, PDM - 11.	Central and Eastern U.P., Bihar, West Bengal and Assam.
	ML - 337, Pant Moong 3, MUM 2, MH - 88 - 111 (spring), Asha (Haryana)	Punjab, Haryana, Delhi, Western U.P. & North Rajasthan.
	MUM - 2	Rajasthan.
ii. Urd bean	Pant U 19, Pant U - 30, UG 218, PDU 1, PDU 88 - 31	Central & Eastern U.P. Bihar, West Bengal and Assam

(b) Powdery mildew :

- (i) **Moongbean** TARM 1, Pusa 9072 Orissa, Karnatka, A.P. and T.N.
- (ii) **Urdbean** LBG 17 - do -

These varieties are specifically good for powdery mildew endemic areas (ri follows in coastal areas of South India).

2. Mechanical practices :

1. Hairy caterpillars have definite egg laying pattern (in masses) and first / second instar larvae remain restricted on one or two leaves. These can be easily spotted, collected and destroyed.

2. Light traps are very effective against hairy caterpillar.

3. Biological control:

1. Seed treatment with *Trichoderma viride* or *T. harzianum* @ 4g/kg of seed.

2. Conserve the natural enemies.

4. Chemical Control :

(1) Soil application of phorate or carbofuran* granules at 1.0 kg a. i. / ha may be followed before sowing of summer crop for protection against thrips and for kharif crop for protection against stem fly and jassid. It also reduces incidence of YMV disease.

(2) Seed treatment before sowing with Thiram 4 g/kg of seed.

5. Weed management practices :

1. Follow recommended agronomic practices i.e. land preparation, time of sowing, seed rate, proper irrigation and fertilizer management so as to have a desirable crop stand for reducing crop weed competition at early stage of crop growth.

2. The crop should be maintained weed-free initially for 4-6 weeks by following timely intercultural and hand weedings.

IV CROP STAGE – WISE IPM PRACTICES

Pre-sowing stage	Cultural practices	<ol style="list-style-type: none"> 1. Deep ploughing of the field. 2. Early sowing. 3. Growing resistant / tolerant varieties as recommended : <u>Yellow Mosaic Virus (YMV)</u> Mung bean – Pant Mung 2, Pant Mung 3, PDM 54, PDM 84-139, PDM 84-143, PDM – 11, ML 337, MUMZ, MH 88 – 111. Asha (Haryana) Urd bean - Pant U 19, Pant U 30, UC – 218, PDU – 1, PDU 88 – 31. Powdery Mildew : Mung bean - TARM– 1, Pusa 9072 Urd bean - LBG – 17 (In rice fallows in coastal area of South India)
	Chemical practices (for thrips, stemfly, jassids & Whitefly).	<ol style="list-style-type: none"> 4. Timely irrigation – to maintain good crop stand. 5. Soil application of Phorate or Carbofuran* granules @ 1.0 kg a.i. per ha. (It also reduces incidence of YMV).
Seed & Seedling stage	Cultural practices (for weeds).	<ol style="list-style-type: none"> 1. Timely sowing, proper seed rate, irrigation and fertilizer management to have a desirable crop stand. 2. Interculture and hand weeding to keep to crop weed free initially for 4- 6 weeks.
Vegetative stage	Mechanical practices (for Hairy Caterpillar)	<ol style="list-style-type: none"> 1. Look for the plants infested with 1st / 2nd instar larvae of hairy caterpillar, collect and destroy them. (Hairy caterpillar has definite egg laying pattern in masses. 1st / 2nd instar larvae remain restricted to leaves of plants where eggs have been laid). 2. Light traps are very effective against hairy caterpillar.

V. SAFETY PARAMETERS

Annexure - II deals with the safety parameters *inter alia* classification of toxicity as per Insecticides Rules, 1971, WHO classification by hazards, colour of toxicity triangle, symptoms of poisoning, First aid measures and treatment of poisoning. The extension functionaries of the State Department of Agriculture have to make use of this information as under :-

- i) Basic precautions which are required to be taken as per classification of toxicity as well as hazard criteria by WHO may be seen as per Annexure - III.
- ii) The extension functionaries are to educate the farmers on safety in use of pesticides with the help of colour toxicity triangle, as the farming community can follow the colour better and corresponding safety precautions.
- iii) The symptoms of poisoning must be known to the extension functionaries to enable them to extend first aid measures to affected persons to the extent possible.
- iv) Basically, the information on first aid measures and treatment of poisoning is required to be passed on by the extension functionaries to the doctors at Primary Health Centres as well as to the private Doctors in the vicinity of spraying of pesticides.
- v) Extension functionaries must ensure that trade names of common pesticides during plant protection measures along with a copy of the leaflet which is an integral part of a pesticide container must be made available to the doctors in the vicinity of plant protection operations.
- vi) Extension functionaries are to request the doctors to intervene in procurement of antidotes for different pesticides as cited under "Treatment of poisoning".

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								
ORGANOPHOSPHATE PESTICIDES								
1.	Phorate	Extremely toxic	Bright red	Class I a - Extremely hazardous	<p>Remove the person from the contaminated environment.</p> <p>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.</p> <p>Medical aid: Take the patient to the doocotr/Primary Health Centre immediately along with the original container, leaflet and label.</p>	<p>Mild - anorexia, headache, dizziness, weakness, anxiety, tremors of tongue and eyelids, miosis, impairment of visual acuity.</p> <p>Moderate- nausea, salivation, lacrimation, abdominal cramp, vomiting, sweating, slow pulse, muscular tremors, miosis.</p> <p>Severe - diarrhoea, pinpoint and non-reactive pupils, respiratory difficulty, pulmonary edema, cyanosis, loss of sphincter control, convulsions, coma and heart block.</p>	<p>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.</p> <p>Speed is imperative</p> <ul style="list-style-type: none"> - 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. 	

							<ul style="list-style-type: none"> - Oxygen - Morphine, if needed. <p>Avoid theophyllin and aminophyllin or barbiturates.</p> <p>2-PAM and other oximes are not harmful and in fact contra indicated for routine usatge.</p> <p>Do not give atropine to a cyanotic patient. Give artificial respiration first then administer atropine.</p>
FUNGICIDES							
3.	Thiram	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.

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 the 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 pest like *S. litura* 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.

3. 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 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 % defoliation up to 30 DAS or after 60 DAS in groundnut will not affect the yield. Such information may be useful to decide management practice for defoliators in groundnut and other crops.
- iii) Some of the defenders like lady beetles, groundnut beetles, rove beetle wasps play useful role in arriving at P:D ratio.

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 / pest population. They may also take the decision based on the AESA, 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 villages and motivate the farmers to adopt AESA in their fields.

AESA BY FARMERS

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

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 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 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 polythelene bags as hand gloves, handkerchiefs or piece of clean cloth as mask and a cap or towel to cover the head (Do not use polyethelene 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 pesticides.
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 polyethelene 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. Don 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 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 my purpose.
