



IPM PACKAGE NO. 53



INTEGRATED PEST MANAGEMENT PACKAGE

FOR
APRICOT



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 APRICOT

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Government of India
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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)^{14/8/03}

August, 2003

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.

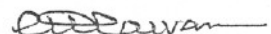
With a view to provide technical knowledge to the extension functionaries and farmers in the States, first National Workshop on IPM for harmonization of Package of Practices was organized at National Plant Protection Training Institute (NPPTI), Hyderabad during June 29-30, 1992. Subsequently workshops 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



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

ACKNOWLEDGEMENTS

The IPM Package of Practices for Apricot crop was discussed and finalized in the National Workshop on IPM held at CIL, Faridabad during 4-5th July, 2002. The inputs received from the following experts is thankfully acknowledged :

- | | | |
|-------|-------------------------------|---|
| (i) | Chairman | Dr. A.D. Pawar, Director (IPM)
Dte. of P.P.Q. & S., Faridabad |
| (ii) | Co-Chairman
Tech. Session | Sh. N.M. Dev, A.D. (E)
Dte. of P.P.Q. & S., Faridabad |
| (iii) | Coordinator-
Tech. Session | Dr. M.P. Misra, Joint Director (Ent)
Dte. of P.P.Q. & S., Faridabad |
| (iv) | Expert Inputs | <ol style="list-style-type: none">1. Dr. Brijendra Singh, Entomologist,
Dte. of P.P.Q. & S., Faridabad2. Dr. D. Kanungo, Joint Director(Tox), CIL
Dte. of P.P.Q. & S., Faridabad3. Dr. Raj Singh, Joint Director (Bio), CIL
Dte. of P.P.Q. & S., Faridabad4. Dr. B.S. Phogat, Agronomist (H),
Dte. of P.P.Q. & S., Faridabad5. Dr. J.N. Thakur, A. D.(E), CIPMC, Solan(HP)6. Dr. Jasvir Singh, AD(E), CIPMC, Jalandhar7. Dr. R.P. Misra, PPO(E), CIPMC, Lucknow8. Dr. R.N. Singh, AD(E), CIPMC, Faridabad9. Sh. O.P. Verma, PPO(PP), CIPMC, Jammu10. Sh. M. Parrey, SSA-III, CIPMC, Srinagar |
| (v) | Technical Input | <ol style="list-style-type: none">1. Sh.S.P.Singh,APPO,IPM Div.,Dte. of PPQ&S,Fbd.2. Sh. K. S. Sharma,SSA, IPM Div.,Dte. of PPQ&S,Fbd3. Sh. Yogesh Kumar,SSA, IPM Div.,Dte. of PPQ&S,Fbd4.Sh.M.C.Sharma, SSA-III, IPM Div.,Dte, of PPQ&S,Fbd5. Sh. R.S. Tomer,SSA, IPM Div.,Dte. of PPQ&S,Fbd6. Sh. Laxmi Chand,SSA, IPM Div.,Dte. of PPQ&S,Fbd7.Mohd. Abrar Alam,Steno, IPM Div.,Dte. of PPQ&S,Fbd8. Sh. N.K. Mishra,LDC, IPM Div.,Dte. of PPQ&S,Fbd |

IPM PACKAGE FOR APRICOT

I. MAJOR PESTS

A. PESTS OF NATIONAL SIGNIFICANCE

1. Insect pests:

- | | | |
|-----|---------------------|--|
| 1.1 | Flat headed borers | (<i>Chrysobothris mali</i> & <i>Capnodis</i> sp.) |
| 1.2 | Hairy caterpillar | (<i>Lymantria obfuscata</i>) |
| 1.3 | Defoliating beetles | (<i>Adoretos</i> sp. & <i>Brahmina</i> sp.) |
| 1.4 | Leaf curling aphid | (<i>Anuraphid helichyrysi</i>) |
| 1.5 | Brown apricot scale | (<i>Lecanium corni</i>) |
| 1.6 | San-jose-scale | (<i>Quadraspidiotus perniciosus</i>) |

(2) Diseases:

- | | | |
|-----|----------------------------|--|
| 2.1 | Brown rot & Blossom blight | (<i>Monilinia laxa</i>) |
| 2.2 | Frosty mildew | (<i>Cercospora persici</i>) |
| 2.3 | Powdery mildew | (<i>Sphaerotheca parmosa</i>) |
| 2.4 | Coryneum blight/shot hole | (<i>Stigmia corpophylla</i>) |
| 2.5 | Silver leaf and canker | (<i>Chondrostereum purpureum</i>) |
| 2.6 | White root rot | (<i>Dematophora necatrix</i>) |
| 2.7 | Whisker rot | (<i>Rhizopus stolonifer</i>) |
| 2.8 | Collar rot | (<i>Phytophthora</i> sp. & <i>Phythium</i> sp.) |
| 2.9 | Bacterial gummosis | (<i>Pseudomonas</i> sp.) |

B. PESTS OF REGIONAL SIGNIFICANCE

I. Insect pests:

- | | | |
|------|--------------------------------------|---|
| 1.1 | Tent caterpillar | (<i>Malecosoma kashmirensis</i>) |
| 1.2 | Leaf rollers | (<i>Archips argyrospilus</i> & <i>subsidiaria</i> sp.) |
| 1.3 | Blue beetle | (<i>Heltica semipicens</i>) |
| 1.4 | Ear wig | (<i>Forficula auricularia</i>) |
| 1.5 | Codling moth | (<i>Cydia pomonella</i>) |
| 1.6 | Green capsid | (<i>Lygus pabulinus</i>) |
| 1.7 | Peach twig borer/Apricot fruit borer | (<i>Anarsia lineatella</i>) |
| 1.8 | Conspere sting bug | (<i>Euschistis conspersus</i>) |
| 1.9 | Dung beetle | (<i>Oryctes rehinoceros</i>) |
| 1.10 | Blossom thrips | (<i>Taeniothrips</i> spp.) |

2. Weeds

Monocot weeds

- | | | |
|-----|---------------|--------------------------------|
| 2.1 | Burmuda grass | (<i>Cynodon doctylon</i>) |
| 2.2 | Congo grass | (<i>Imperata cylindrica</i>) |
| 2.3 | Carpet grass | (<i>Axonopus compressus</i>) |
| 2.4 | Crab grass | (<i>Digitaria spp.</i>) |
| 2.5 | Knot grass | (<i>Paspalum conjugatum</i>) |
| 2.6 | Nut grass | (<i>Cyperus rotundus</i>) |

Dicot weeds

- | | | |
|------|-----------------|--------------------------------|
| 2.7 | Day flower | (<i>Commelina spp.</i>) |
| 2.8 | Sorrel | (<i>Oxallis spp.</i>) |
| 2.9 | Bill goat weeds | (<i>Ageratum conyzoides</i>) |
| 2.10 | Sowthistle | (<i>Sonchus spp.</i>) |

II. SEASONAL VARIETIES/CULTIVARS RECOMMENDED FOR CULTIVATION

A. Temperate Areas:

	Early Season	Local Name	Maturity period
i)	Charmagz	Metha Cher	2 nd week of June
ii)	Kaisha	Kaisha	2 nd week of June
iii)	Nugget		

B. Mid Season:

i)	Frog more early	Kher Cher	2 nd week of June to last week of July.
ii)	Galgati Sweet	Bota Cher	2 nd week of June to last week of July
iii)	Suffaida	Bota Cher	3 rd week of June to last week of July
iv)	Charmagz		

C. Late Season:

i)	Amba		1 st week of August
ii)	Quettar		1 st week of August

D. Mid hill/Sub tropical:

i)	New Castle		
ii)	Early Shipley		
iii)	Shakarpara		

IMPROVEMENT OF FRUIT SET, YIELD & QUALITY (STRUCTURE):

In locations where the productivity is low, Biozyme and Protozyme @ 3 ml./lt. water) can be sprayed at bud swell and petal fall stage to improve fruit set and yield.

III. PEST MONITORING:

A. Agro Eco System Analysis (AESAs)

AESA is an approach, which can be gainfully employed by extension functionaries and farmers to analyse field situations for pests, defenders, soil conditions, plant health, the influence of climatic factors and their relationship for growing healthy crop. A critical analysis of the field situations will help or enhance in decision making skill for implementation of 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 -1.

B. Survey/Field scouting:

The objective of surveys through roving surveys is to monitor the initial development of pest and disease in the endemic areas. Therefore, in the beginning of crop season, i.e. from March 1st week survey routes based upon the endemic areas are required to be identified to undertake roving surveys from mid of March i.e. green tip stage/bud swell. Based upon the results of the roving surveys, the state extension functionaries have to concentrate for greater efforts at block and village levels as well as through farmers to initiate field scouting especially to know the proper bud stage for applying the delayed dormant oil spray. Therefore, for field scouting farmers should be mobilized to observe the pest and disease occurrence at the intervals as stipulated under different fruit developmental stages. The plant protection measures are required to be taken only when pest and diseases cross ETL as per result of field scouting.

Roving Survey:

Undertake roving survey at every 5 km. distance or after every 5 orchards depending, on the plantation stretch both in linear and deep horizontal magnitudes, initially at 10 days intervals and thereafter at weekly intervals depending again on pest population intensity/observe/identify the proper bud/growth stage for applying the dormant oil Spray after taking the prevailing temperature into consideration which should not be less than 4⁰C for at least 48 hours. Observe 10 plants randomly in zig zag fashion in each orchard for recording the intensity/population of sucking pests and defoliators at the later growth stages i.e. from bud burst/petal fall to harvesting. Record population of potential different

biocontrol fauna also to arrive at the decision making stage. Record the occurrence and extent of diseases along with deficiency related disorders exhibited by the plant during the course of survey.

C. Pest Monitoring Through Traps:

1 Through yellow sticky traps: Set up yellow fast coloured sticky traps, for monitoring the aphid, one trap/5 trees. Locally available empty yellow Palmolive-tin coated with grease/Vaseline/caster oil an outer surface may also be used.

2 Through pheromone traps: Certain pests like gypsy moth and codling moth require installation of pheromone traps to monitor initial pest build up and suppression of its increasing population. Sticky pheromone traps may also be used 5-7 traps per ha. for effective monitoring.

3 Through light traps: Most of the moths of leaf roller caterpillars and a few beetles of root/stem borers get attracted towards light during night. Therefore, installation of light traps in the orchards help in monitoring of initial build-up of pest population.

D. Economic Threshold Levels (ETLs):

Based upon the results of survey/field scouting etc. the extension functionaries are to determine the ETLs for different pests to advise farmers to initiate pest management practices accordingly. For some fruit pests adequate sampling techniques are not available. This is particularly true for pests with non-uniform distribution such as San-jose-scale, trunk borers, green fruit worms. Economic threshold for sp. which attack foliage are difficult to establish because of the large number of variables involved, such as fruit to leaf ration, weather, variety, time of year and tree vigor. However, it seems certain that there is a considerable tolerance for loss of leaves or leaf function in tree fruits trees.

The determination of economic injury levels and the development of effective survey techniques made possible the treating of portions of the orchard where predator prey rations are unfavourable for biological control.

ETL: Economic threshold is the population density of pest at which control measures should be determined to prevent an incurring pest population from reaching the economic injury level (EIL).

EIL: It is the lowest population density of pest that will cause economic damage (ED).

ED: It is the amount of injury which will justifying the cost of artificial control measures. These costs should be measured in the broadest sense possible.

S.No.	Name of Pest	Range	Incidence /Extent	Remarks
1.	San-Jose-scale	a) 1-5 scales/sample b) 6-12 scale/sample c) 13 & above/sample	Low Medium High	
2.	Tortrix moth	Appearance of infestation on the apical shoots exhibiting scorching.	-	Depending on survey observations.
3.	Hairy caterpillar	Appearance of caterpillar on foliage	-	Depending on survey observations.
4.	Foliar diseases	a) Just appearance of diseases, upto 5%. b) 6-15% foliage/twigs/limbs affected c) >15% of foliage/twigs/limbs affected	Traces/low Medium High	The level may be influenced by prevailing weather conditions and also vary from disease to disease.

IV. INTEGRATED PEST MANAGEMENT STRATEGIES

A. Cultural practices:

- Proper soil section be made for raising orchards of respective crops.
- Proper climatic factors/topography be considered for planting of the respective fruit trees.
- Plant material for laying quality fruit orchard should be obtained from registered nursery.
- Avoid planting of saplings infested with scales, borers and diseases.
- Make use of recommended quantum of FYM in the soil for laying of nursery and laying of orchard.
- Make use of balanced dose of chemical fertilizers and avoid excessive use of nitrogen which should be used in split doses only.
- Removal of weeds from the orchards. Mulching of dry grass or hay 10-15 cms in thickness in the tree basins should be done.
- Apply white wash impregnated with glue regularly on the tree trunks to avoid sun burn and winter injury.
- If plants/trees exhibit the deficiency of micro nutrients go for the application of the same on the basis of soil and leaf analysis.
- Growing of flowering plants especially marigold and maize on the peripheries will helping conservation of both predators and parasites.
- 2-3 Bee colonies/ha should be provided in each orchard at the time of bloom.
- Proper irrigation schedule should be adopted.
- Trees should neither be forced to drought nor water lodging conditions.
- Rouge out infected plants.
- Avoid water lodging in the tree basin and improve the drainage of the orchard.
- Maintain vigour of the tree to keep away shot hole/pin hole borers, bark beetles and other pest infestation.
- Grow marigold, berseem and mustard's in between lines of plantation to check the nematode population.

- Make use of disease free bud wood for raising healthy nursery plants. Take proper care in handling the fruits to avoid bruises.
- Don't grow the nursery at the same site every year.
- Use nematode free planting stocks.
- Don't delay harvesting of fruits.
- Keep the trees as free as possible from mechanical wounds, winter injury, crotch separation and cankers.
- Proper pruning of trees be made for obtaining quality fruit and good yield.
- Pruning cuts should be made close to the branches leaving no stubs.
- Cut wounds should be covered with superior white lead paint.
- Solarization of nursery beds be undertaken to destroy soil pests.

B. Mechanical practices:

- Remove and destroy dead and dying fruit trees to ward off borer infestation.
- Prune destroy the scale and borer infested twigs/branches.
- Collection and destruction of egg masses of hairy caterpillar especially from the barks of shade trees grown in the vicinity of the orchards.
- Stapling burlap skirts around tree trunks infested with hairy caterpillar and collection of larvae and pupae from May to end of June and ensure their destruction.
- Clean the stem borer hole with flexible wire & apply the recommended chemical..
- Cover the exposed part of the stem to sun with dry grass or gunny bags soaked with methyl parathion (0.1%) once a month in March till October.
- Install a light trap near the orchard to collect and kill the beetles in kerosenized water.
- Shaking of non bearing trees over a cloth sheet at dusk and collect and destroy the beetles (defoliating and fruit eating).
- Clip off terminal shoots/with unshed cluster of dry leaves in winter for the destruction of shoot borers.

- Collect and destroy the fallen fruits.
- Remove the dead bark and frass and apply water proof paint on hard wood to avoid borer attack.
- Add well rotten manure in case of termite infestation.
- Destroy termitaria in the vicinity of the orchards.
- Apply Mashobra paste after cleaning the weeping wounds at the time of dormancy break for the control of bacterial gummosis.
- Cover fresh wounds with chaubatia paste or copper oxychloride paint.
- Remove the infected roots and apply chaubatia paste on the cut ends.
- Collect and destroy the grubs of root borers while preparing basins.
- Destroy the affected seedlings.
- Complete collection and destruction of foliage and pruned wood in the orchards itself after leaf fall.
- Clip off mildew twigs and destroy them.
- Remove all the mummified fruits, dead fruits and prunings from the orchards.
- Pruning of suckers and water sprouts.

C. Biological Practices:

1. Soil borne diseases:

Root rot and collar rot control.

1.1 Before laying or raising of plant nursery make use of *Trichoderma viride* and *T. harzianum* to control root rot disease and at later stages for control of collar rot also.

1.2 Make use of neem cakes while raising plant nurseries to ward off any soil pest.

2. Conservation:

2.1 Conserve the predators like Lace wings, Lady bird beetles, Carabids, Syrphids, Anthocorid bugs, Mirids bugs, Nabid bugs, Capsid bugs, Spiders, Predatroy Ants, Phytoseiid mites, Parasitoids like *Encarsia*, *Aphytis*, *Trichogramma*, *Telenomus* etc. in orchard.

2.2 Growing of flowering plants, especially Marigold and Maize on the peripheries and legumes as inter cropping help in nematode management and conservation of both predators and parasitoids, especially *Chrysoperlla* and Anthocorids.

2.3 Collection of egg masses of Hairy caterpillars and putting them in a fine meshed cage for emergence of egg parasites (*Anastatus sp.*) protect the parasites from orchard sprays. The larvae hatched may be destroyed.

2.4 Collect the different larval instars of hairy caterpillar (suspected parasitized) from orchards and place them in wire meshed cages for emergence of larval parasites like various species of *Exorista*, *Drino*, *Apanteles*, *Sarcophage*, *Pollenia*, *Helina*, *Anilastus*, *Anthomyia*, *Euplectrus*, etc. to protect them from scheduled spray effects.

2.5 Collection of pupae of hairy caterpillar from the orchards and placing them in wire mesh cages for emergence of pupal parasites like various species of *Brachymeria*, *Monodontomerus*, *Hyposoter*, *Exorista* and *Pimpla* etc. to protect the parasitoids from scheduled spray effects.

3. Augmentation:

3.1 Monitor the incidence of sucking pests like Sanj-jose-scale, Mite, Aphis and release of:.

B. Parasitoids: *Encarsia perniciosi* and *Aphytis diaspidis* @ 2000/infested tree at least 15 days of insecticidal sprays and 10 days after fungicidal sprays against scale insects. The dosage may vary depending upon the intensity and extent of damage.

D. Chemical control Measures:

1. Need based, judicious and safe application of pesticides are the most vital tripartite segments of chemical control measures. Under the ambit of IPM. It involves developing IPM skills to play safe with environment by proper crop health monitoring. Observing ETL and conserving natural biocontrol potential before deciding in favour of use of chemical pesticides as a last resort. Therefore, it is necessary to rely upon pesticides.
2. Following suggestions have important bearing for success of control measures in the context of IPM strategy:
 - 2.1 The number of fungicidal and insecticidal sprays recommended in Annexure-1/A & 1/B can be minimized as per need after proper surveillance and pest intensity considering both biotic and abiotic factors.
 - 2.2 Avoid mixing of two or more insecticides/tank mixing.
 - 2.3 Repeated application of same pesticides should be avoided.
 - 2.4 Avoid use of synthetic pyrethroids which may cause resurgence of sucking pests.
 - 2.5 Use selective insecticides (Endosulfan)_ during early fruiting phase of crop growth.
 - 2.6 Encourage use of neem based formulations.
 - 2.7 Proper spray equipments should be used:
 - a) Tractor mounted sprayers/power sprayers for effective spray coverage.
 - b) Discourage using undescriptive inefficient sprayers.
 - 2.8 Use proper spray volume per unit area.

3. Cautions during spraying:

- 3.1 If operator feels giddiness, uneasy, he must discontinue spraying/dusting at once.
- 3.2 Operator should not spray/dust more than 4 hours at a stretch in a day.
- 3.3 Operator should not take up spray/dusting work with empty stomach.

3. Rodent Management:

- 4.1 Adopt orchard sanitation.
- 4.2 Do not cultivate fodder crops especially oats in orchards.
- 4.3 Make use of Bromodiolon bait (0.005% a.i.) in two application at an interval of one week.
- 4.4 Adoption of community approach may be taken.

V. STAGewise IPM PRACTICES TO BE ADOPTED

S.No.	Crop stage	Pest	Stage-wise IPM Practices	
1.	Bud Burst	Scales, Aphids, Thrips	Monitoring	Regular monitoring be conducted
			Biocontrol	Conduct surveys and surveillance for conservation of natural enemies and observe P:D ration.
			Chemical	Conduct sprays as per the recommendations (Ref. annexure 1-A). only after determining ETL.
		Bark eating & Chaffer beetles	Cultural	Maintain plant vigour by providing sufficient and balanced nutrients and avoid water stressing of the trees.
			Mechanical	Swab the infested branches and trunk with 10.0% carboxyl dust and soil in the ration of 1:6 mixed with wheat or rice straw.
		Borers	Cultural	Maintain plant vigour by providing balanced dose of nutrients and avoid water stress. Avoid trunk injury to the plant and white wash on the tree trunks.
			Mechanical/ Chemical	Clean the holes and remove saw dust with flexible wire insert para dichloro benzene flakes and plug the holes and for more details (ref. Annexure-II).
		Canker, Stigmina, blight, Shot hole, Leaf curl	Monitoring	Conduct regular monitoring for the build up of diseases to determine the incidence extent (ETL).
			Chemical	Apply recommended chemicals (ref. Annexure-1B)
2.	Petal Fall	Aphids, Scales, Thrips	Monitoring	Regular monitoring be conducted.
			Biocontrol	Conserve the natural enemies. Release <i>Encarsia sp.</i> <i>Aphytis sp.</i> @ 2000 adults/infested tree or LBB 30-50 adults/injected tree or <i>Chrysopa</i> 10-20/1st instar larvae/tree.
			Chemical	Apply the recommended chemicals (Ref. Annexure.I-A).
		Peach rust, Leaf spot, Leaf curl	Monitoring	Conduct regular monitoring for the build up of diseases for determining incidence/extent (ETL).

		Canker, P. mildew	Chemical	Apply the recommended chemicals (ref. Annex. I-B)
		P.Mildew	Mechanical	Clip off the mildew twigs and destroy them.
3.	Fruit Set	Scales, thrips, Leaf Rollers, Hairy Caterpillar	Monitoring	Regular monitoring for the build up of pest and conservation of natural enemies.
			Biocontrol	Repeat the practice as mentioned under S.No. 2 above.
			Chemical	Apply the recommended chemicals (if needed) (ref. AnnexureI-A).
		Leaf spot, blight/shot hole, leaf curl, P. Mildew	Monitoring	Conduct monitoring and surveillance for the build up of the disease for determining incidence/extent (ETL).
			Chemical	Apply the recommended chemicals. If needed (Ref. Annexure 1-B).
4.	Fruit Development	Scales, Aphids, Leaf Rollers, Fruit and Bark eating Beetles Chaffer Beetles and Chalcid	Monitoring	Regular monitoring be conducted for determining ETL.
			Biocontrol	Repeat the practice as mentioned at S.No. 2 above.
			Chemical	Apply the recommended chemicals if needed (Ref. Annexure1-A).
		Hairy caterpillar	Mechanical	Burlapping of tree trunks may be done for the management of the pest.
		Leaf spot, blight, Bacterial Gumosis, Brown rot	Monitoring	Conduct regular monitoring for determining the incidence/extent (ETL).
			Chemical	Apply the recommended chemicals if need 9Ref. Annexure 1-B)
		Chalcids	Mechanical	Collect and destroy all fallen fruits from the orchards.
5.	Preharvest	Scales, Aphids, Chalcids, Fruit & Bark eating Beetles, Chaffer Beetles	Monitoring	Regular monitoring and surveillance for determining the ETL.s
			Biocontrol	Conservation of natural enemies be done. Repeat the practices as mentioned under S.No. 2 above.

			Chemical	Apply the recommended chemicals (Need based) only (Ref. Annexure I-A).
		Chalcids	Mechanical	Collect and destroy all the fallen fruits from the orchards.
		Hairy caterpillar	Mechanical	Burlap skirts around the infested tree trunks for mass trapping of larvae and pupae and ensure their destruction.
6.	Post Harvest	Hairy Caterpillar	Mechanical	Scrap, collect and destroy the egg masses of the pest.
		Scales, Aphids, Chaffer, Beetles, Leaf Rollers, Bark eating Beetles and Borers	Monitoring	Regular monitoring and surveillance be conducted for determining ETL.
			Biocontrol	Repeat the practices as mentioned at S.No. 2 above.
7.	Leaf Fall	Scales, Aphids, Chaffer, Beetles/Bark eating beetles	Monitoring	Regular monitoring be conducted for determining ETL.
			Biocontrol	Repeat the practices as mentioned as S.No. 2 above.
		Hairy caterpillar	Mechanical	Scrap, remove and destroy the egg masses of caterpillars.
		Borers	Mechanical	Uprooting of severely infested plants and their destruction. Pruning of borer infested twigs and their destruction. Repeat the practice as mentioned under S.No. 1 Treatment of Basin soil with PDB.
		Blight, Shot hole/leaf spot, Leaf curl, bacterial gummosis, Canker Forsty Mildew	Mechanical	Remove diseased branches twigs and destroy them.
			Chemical	Apply the recommended Chemical (Ref. Annexure-B)
8.	Dormant stage	Scales	Mechanical	Pruning and destruction of scale infested branches/twigs. Removal and destruction of heavily infested young trees from the orchard. Removal and destruction of left over/culled infested fruit from the orchards. Removal of mummified fruits

				from the orchards.
			Chemical	In case of severe infestation go for the application of dormant oil (diesel spray) spray.
		Hairy Caterpillar	Mechanical	To check the infestation during ensuring season collect and destroy the egg masses of the pest from in and around of the orchards.
		Borers	Cultural	Maintain vigour of the trees through proper fertilization. Avoid mechanical injury to the trees and cover the wounds with chaubatia paste.
			Cultural	Heavily infested trees/dead/dying wood should be pruned and destroyed to check the infestation for ensuing season. Clip off terminal shoots with unshed cluster of dry leaves in winter for the destruction of shoot borers.
		Water lodging	Cultural	Provide proper drainage in orchards to drain off the surface water.
		Canker, Coryneum blight, shot hole, Root rot leaf curl	Mechanical	Apply wound dressers (Bordeaux paste) on cut areas.
			Mechanical	Remove the infected roots and apply chaubatia paste.
			Cultural	Avoid mechanical injury of the trees.
			Cultural	Diseases can be effectively controlled by adoption of judicious pruning of all dead wood and proper orchard management. Maintain vigour of the plants through proper fertilization. Improve the drainage of the orchard.
			Chemical	Apply the recommended fungicides. (Ref. Annexure I-B).

VI. MANAGEMENT PRACTICES FOR PERENNIAL PESTS**A. Borers (Stem, Shothole and Bark Eating Borers):**

1. Clear the holes with flexible wire and then insert 0.5 gm. of para-dichlorobenzene (PDCB) in the hole and plug it with puddling material or insert cotton wick soaked with petrol or methyl parathion (1ml/lt. water) or dichlorovos (0.15 ml/lt/water) and plug the hole.
2. Place small quantity of crystals of Para-dichloro-benzene (PDCB) on the surface of the soil around the trucks of the tree during the leaf fall (September-October). The quantity of PDCB to be applied will vary with size of the tree. Apply the crystals in a ring completely encircling the trunk, within 1.0-3.0 inch distance from the trunk. Cover the crystals with the earth to confine the PDCB gas. Don't apply treatment during summer and late fall.
3. In case of localized infestation, swab the infested part with methyl parathion (0.2%) or spray with fenitrothion (0.05%).
4. Remove webbing and treat the main limbs and trunk of the attached tree in March and September/October with 0.1% methyl parathion 50 EC and inject into the holes excavated by the caterpillars.
5. Swabbing infested branches and trunk with 10% carbaryl dust and soil in the raion of 1:6 mixed with Rice or Wheat straw.

B. Chaffer Beetles:

Applying phorate 10 G @ 1.5 kg.ai/ha. in the soil against the grabs of chaffer beetles.

C. Termites:

1. Drench the soil with chlorpyriphos (0.1%).
2. Treat the trunk and main roots of the affected plant with chlorpyriphos (0.1%).

D. Nematodes:

Use carbofuran granules 3 G @ 60 kg./ha in nursery beds and 100-300 gms./tree in orchards depending on the size of tree after fruit harvest.

E. Collar rot:

1. Clean the infected collar area with a sharp knife and apply Bordeaux paint.
2. Remove the soil around the collar region and expose the affected protion to sun.
3. Apply *trichoderma harzianum* and *T. viride*. Irrigate 30 cm. radius around tree trunk with copper oxychloride or mancozeb 400-600 gms/100ltrs. of water.