



PHDP II
Technical assistance to MAIL
to strengthen the planting material and horticulture industry in Afghanistan
(Europe Aid/129-320/C/SER/AF/2)

Mission report on
Integrated Pest Management

Month of: December 2014

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AGRICONSULTING S.p.A.

In Consortium with



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA



Dipartimento di Scienze delle Produzioni Vegetali,
del Suolo e dell'Ambiente Agroforestale

DiPSA



List of Abbreviations

ANSA	Afghanistan National Standards Authority (ANSA)
AIMP	Agriculture Market Infrastructure Project
AKF	Aga Khan Foundation
ANHDO	Afghanistan National Horticulture Development Organization
ANDS	Afghanistan National Development Strategy
ANNGO	Afghanistan National Nursery Growers' Organization
ARD	Agriculture and Rural Development Cluster
ASAA	Aybak Samanagan Almonds Association
AAIDO	Afghanistan Almond Industry Development Organization
AWP	Annual Work Plan
BBF	BadamBagh farm
PBLT	Plant Biotechnology Laboratory of BadamBagh
CAV	Centro Attività Vivaistiche, Bologna, Italy
CHAMP	Commercial Horticulture and Agricultural Marketing Programme
CPG	Citrus Promotion Group
DAIL	Directorate of Agriculture, Irrigation & Livestock (Provincial and District level)
DANIDA	Danish Cooperation
DFID	British Cooperation
DIPSA-UNIFI	Dept. of Plant, Soil and Environmental Science of the University of Florence
DiSTA-UNIBO	Dept. of Agro environmental Sciences and Technologies of the University of Bologna
DM	Deputy Minister
DO	Demonstration Orchards
DUS-Test	Distinct (D) from any others, sufficiently uniform (U) and stable (S)- refers to new plant varieties -
EC	European Commission
ECD	European Commission Delegation
ELISA	Enzyme-linked Immune-absorbent Assays
EPAA	Export Promotion Agency of Afghanistan
EPPO	European Plant Protection Organization
ex situ	Refers to germplasm material that is removed from its original location and is maintained at a central location
EU	European Union
EU- Transition Project	Support to Capacitate MAIL in Transition for Sustainable Public Services Delivery- 2013-2016 (Europe Aid/133-537/C/SER/AF)
FAO	Food and Agriculture Organization of the United Nations
FFS	Farmer Field School

FOD	Farmers Organization Development
GDP	Gross Domestic Product
GHP	Good Hygiene Procedures
HACCP	Hazard Analysis and Critical Control Point
HCDP	Consultancy services for Facilitating the Management of and technical assistance delivery under the Horticulture Cooperative Development Project
HPS	ANHDO/RI Horticulture Private Sector Development Project (EU funded)
HVP	ANHDO Horticulture Value Chain Project (AFD funded)
HRD	Human Resources Development
ICARDA	International Center for Agricultural Research in the Dry Areas
IDEA NEW	Incentives Driving Economic Alternatives for the North, East, and West
in situ	Selected germplasm material kept in the original place where it was found
IPM	Integrated Pest Management
JICA	Japan Cooperation
LML	Landell Mills Limited
MCPD	Multi-Crops Passport Descriptors
MAIL	Ministry of Agriculture, Irrigation and Livestock
MOC	Ministry of Commerce
MPH	Ministry of Public Health
MRRD	Ministry of Rural Rehabilitation and Development
MSN	Mother Stock Nursery
NC	National Collection of fruit varieties of Afghanistan
NDF	National Development Framework
NGA	Nursery Growers' Association
NGO	Non-Governmental Organization
NHLP	National Horticulture and Livestock Project (World Bank)
NPP	National priority program
PHDPII	Perennial Horticulture Development Project, second phase [<i>Provision of Technical Assistance to the Afghan Ministry of Agriculture, Irrigation and Livestock to contribute to strengthen the planting material and horticulture industry</i> (Europe Aid/129-320/C/SER/AF)]
PHDCs	Perennial Horticulture Development Centers
PICU	Project Implementation and Coordination Unit
PRT	Provincial Reconstruction Team (international military personnel)
PSC	Project Steering Committee
QC	Quality Control
SME	Small and Medium Enterprises
SO	Specific Objective 1, 2, 3, etc. (or component) of ANHDO HPS and HVP projects
SOP	Standard Operating Procedures

TL	Team Leader
ToR	Terms of Reference
UPOV	Union for the Protection of New Varieties of Plants
USAID	United States Agency for International Development
USDA	United States Department of Agriculture

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Acknowledgements

- Thanks for cooperation of Haji Qudous Project Coordinator MoAIL-PHDCs.
- Thanks for Muheb Rahman Khademi and Raza Dehqan Herat PHDC Manager and His assistant to provide me information from National collections and Dos.
- Thanks from Baseer Ahmad Tabib Head of PPQD DAIL, Herat to provide me some information regarding major plant pest and diseases.
- Thanks for Belal Zadran Kandahar PHDC Manager to provide me some information from National collection and Dos.

1. Executive summary

This is the third mission of the IPM Expert covering the period of December 2014. Based on the TORs assigned. The consultant coordinated with Haji Qudos Project Coordinator of MoAIL-PHDCs and visited Herat PHDC. At the end of the visits some provisional recommendations were given concerning the pests and diseases observed during the reporting period.

List of places visited

<u>Location</u>	<u>District</u>	<u>Province</u>	<u>Remarks</u>
Herat PHDC	Enjil, Urdo Khan farm, PHD Centre	Herat	Visited NC, DO
Kandahar PHDC	Kokaran farm, PHDC	Kandahar	Data Information regarding NC & DOs got from FH

List of person met

<u>Name</u>	<u>Position</u>	<u>Location</u>	<u>Remarks</u>
Haji Qudos	Project Coordinator MoAIL-PHDCs,	BadamBagh, PHDP, Main office, Kabul	
Muheb Rahman Khademi	Field Horticulturist,	Herat PHDC, Urdo Khan Farm	Enjil district
Raza	Assistant of F.H	Herat, PHDC, Farm	Acting F.H
Mir wais	Pomology lab	Herat, PHDC, Farm	MAIL staff
Mohd Asef	Nurseryman	Herat, PHDC, Farm	MAIL staff
Said Bahram	Farm Data collector MAIL	Herat, PHDC, Farm	MAIL staff
Faqir Ahmad Bayangar	Agriculture General Director	Herat, DAIL	DAIL
Haji Bashir Ahmad Ahmadi	General Director of agriculture programme	Herat, DAIL	DAIL
Idress Zulal	Head of Horticulture Department	Herat, DAIL	DAIL
Baseer Ahmad Tabib	Director of PPQD	Herat	DAIL staff
Mohd Yousuf Ghoriani	Regional Orchard Management Officer	Herat	NHLP –sub office Herat
Belal Zadran	Field Horticulturist	Kandahar PHDC, Kokaran Farm	Kandahar

2. Observations and recommendations made during the reporting period

2.1. Herat PHDC

Observations

The major pest and diseases observed and related recommendations are listed at below:

The consultant performed field visits and collected some information, data and pictures from the PHDC managers, Plant protection and quarantine department, DAIR of Herat, HLP regional sub-Office located in Herat Province.

Autumn season best time for use of fertilizer DAP, Animal manure, pruning of stone fruit and application of dormant Oil, Bordeaux mixture, clean gums and use Bordeaux Paste.

Grapevine crown gall;

Crown gall is a disease resulting from infection by a bacterium that causes galls to form at the base of the stem or root crown or on other plant parts. The bacterium infects only through fresh wounds.

It is the first time that crown gall observed in National Collection and Demonstration of grapevine at very primary stage in PHDC Herat so during my mission and field visit as I observed only a few grapevine were infected with crown gall therefore IPM Expert given advice to acting field horticulturist to replace them immediately and sample has been taken and submitted to PBTL for more testing.

Grapevine fan leaf

Important and widespread virus disease of grapevine, occurring in all vine growing regions, probably spread by the main vector, the nematode *Xiphinema index* and by infected plant material.

Stone fruit bacterial canker disease

All species of stone fruit are susceptible to bacterial canker. Cherries and apricots are more susceptible than peaches, nectarines and plums.

The major pest and diseases found Herat PHDC are listed in the following table:

Species	Pests and diseases or disorders	Location	Remarks
Grapevine	Crown gall	NC & DO	Mild attack in few grapevines
	Grapevine fan leaf virus (GFLV)	NC	(Identified by PBTL) Have no clear symptoms in Afghanistan (for symptoms in other countries, please refer to page number 13 of booklet of common viral, bacterial and fungal diseases of fruit trees.)
	Frost	NC & DO	Moderate damaged fruits, Application of K ₂ O instead of nitrogen fertilizers is used to improve resistance of the vines to cold.
Apple	Bird Problem, Fruit damaged by magpie	DO	Moderate
Pear	Mites	DO	Moderate
	Gummosis	DO	Mild attack in few trees

Plum	Gummosis	DO	Minor problem in a few trees
	Green aphid	DO	Minor
	Mites	NC	Minor problem
Almond	Aphids	DO	Minor problem
	Mite	NC	Mild attack in few trees
Peach	Frost damage	DO	Seriously damaged fruits
	Gummosis	NC	Minor problem
	Aphids	DO	Minor problem
Almond, Plum, peach, Cherry	PNRSV Prunus Necrotic Ring Spot Virus	NC & MSN	(Identified by PBTL) Have no clear symptoms in Afghanistan (for symptoms in other countries, please refer to page number 5 of booklet of common viral, bacterial and fungal diseases of fruit trees.)
Almond, Plum, peach, Cherry	Bacterial canker	NC & MSN	Identified by PBTL
Apricot and plum	Shot hole (Wilsonomyces carpophilus)	NC & MSN	Identified by PBTL

2.2. Kandahar PHDC

The major pest and diseases already existed which was not very serious problem in NC and Dos. The consultant collected some information and data by help of Mr. Belal Zadran Kandahar Field Horticulturist and some data from BTPT that has been collected infected sample from field and identified

The major pest and disease existed in the PHD Centre Kokaran Farm Kandahar as follow:

Species	Pests and diseases or disorders	Location	Remarks
Vineyard	Powdery mildew	NC	Minor problem
	Grapevine fan leaf virus (GFLV)	NC	(Identified by PBTL) Have no clear symptoms in Afghanistan (for symptoms in other countries, please refer to page number 13 of booklet of common viral, bacterial and fungal diseases of fruit trees.)
Apricot	Gummosis	NC	Minor infected in a few trees
Pomegranate	Fruit fly	NC	Minor attack
	Aphid	NC	Minor attack
Plum, Peach	ACLSV: Apple chlorotic leaf spot virus	NC	(Identified by PBTL) Have no clear symptoms in Afghanistan (for symptoms in other countries, please refer to page number 7 of booklet of common viral, bacterial and fungal diseases of fruit trees.)

Peach	Phytophthora crown and root rot (Phytophthera spp.)	NC	Application of fosetyl Al (Aliette) and metalaxyl can reduce the severity to this disease (Phytophthora).
Plum, Peach	Gummosis	NC	minor
Peach	Scale	NC	minor
Plum	Mealy bug	NC	Minor
Fig	Mealy bug	NC	Minor

In Herat and Kandahar PHDCs some clones of grapevine are infected with grape fan Leaf Virus (GFLV) and identified by PBTL look at below

S/No	Sample Name	Lab Code	Date (Collection)	Station of Collection	Species	NC/MSN/ P.Orchard/Special	Analyzed for GFLV
9353	494-Awi,Plant 1,Herat	9351	Oct-13	Herat	Grape	NC	positive
9354	494-Awi,Plant 4,Herat	9352	Oct-13	Herat	Grape	NC	positive
9368	393-Ayta Tor,Plant 4,Herat	9366	Oct-13	Herat	Grape	NC	positive
9379	724-Fakhri Luka,Plant 2,Herat	9377	Oct-13	Herat	Grape	NC	positive
9380	724-Fakhri Luka,Plant 5,Herat	9378	Oct-13	Herat	Grape	NC	positive
9381	722-Fakhri Pustigul,Plant 1,Herat	9379	Oct-13	Herat	Grape	NC	positive
9382	722-Fakhri Pustigul,Plant 5,Herat	9380	Oct-13	Herat	Grape	NC	positive
9402	725 -Hussaini Qalamak ,Plant 4,Herat	9400	Oct-13	Herat	Grape	NC	positive
9412	493- Kasnadara ,Plant5,Herat	9410	Oct-13	Herat	Grape	NC	positive
9417	4068 Khalili ,Plant 1,Herat	9415	Oct-13	Herat	Grape	NC	positive
9444	856- Keshmeshi Sorkh, Plant 1,Herat	9442	Oct-13	Herat	Grape	NC	positive
9453	487 -Lal Katta Dana, Plant 4,Herat	9451	Oct-13	Herat	Grape	NC	positive
9461	490 -Lal Sia ,Plant 4,Herat	9459	Oct-13	Herat	Grape	NC	positive
9489	726 -Maska Kandahari ,Plant 2,Herat	9487	Oct-13	Herat	Grape	NC	positive
9490	726 -Maska Kandahari ,Plant 3,Herat	9488	Oct-13	Herat	Grape	NC	positive
9501	801- Munaqa ,plant	9499	Oct-13	Herat	Grape	NC	positive

	3,Herat						
9502	801- Munaqa ,plant 4,Herat	9500	Oct-13	Herat	Grape	NC	positive
9521	486- Raucha sorkh,plant 3,Herat	9519	Oct-13	Herat	Grape	NC	positive
9522	714- Raucha sorkh,plant 1,Herat	9520	Oct-13	Herat	Grape	NC	positive
9530	855- Sahibi,plant 5,Herat	9528	Oct-13	Herat	Grape	NC	positive
9540	488- Sahibi Sra,plant 3,Herat	9538	Oct-13	Herat	Grape	NC	suspected
9546	727- Sangenak,plant 5,Herat	9544	Oct-13	Herat	Grape	NC	positive
9583	723- Zerjome,plant 1,Herat	9581	Oct-13	Herat	Grape	NC	positive
9626	724- Fakhri Loka,plant 3,Kandahar	9624	Nov-13	Kandahar	Grape	NC	positive
9627	724- Fakhri Loka,plant 8,Kandahar	9625	Nov-13	Kandahar	Grape	NC	positive
9628	722- Fakhri pustigul,plant 3,Kandahar	9626	Nov-13	Kandahar	Grape	NC	positive
9651	737- Maska Srokh,plant 8,Kandahar	9649	Nov-13	Kandahar	Grape	NC	positive
9652	492- Mir Ahmadi,plant 3,Kandahar	9650	Nov-13	Kandahar	Grape	NC	positive
9683	497-Hussaini ,plant 8,Kandahar	9681	Nov-13	Kandahar	Grape	NC	positive
9693	494-Awi ,plant 3,Kandahar	9691	Nov-13	Kandahar	Grape	NC	positive
9828	707-Raucha Safid.plant 8,Kandahar	9826	Nov-13	Kandahar	Grape	NC	positive

Some clones of stone fruits in MSNs are infected with ACLSV which has been identified by PBTL in June 2013

S/N o	Sample Name	Lab Co de	Date (Collecti on)	Station of Collection	Speci es	NC/MSN/ P.Orchard/ Special	Analyzed for				
							PPV	PDV	PNRS V	ApMV	ACLS V
845 2	364plant No7,paghman	845 0	Jun-13	Paghman	plum	MSN	Negati ve	Suspe cted	Negati ve	Suspe cted	Positi ve
845 3	364plant No10,paghman	845 1	Jun-13	Paghman	plum	MSN	Suspe cted	Positiv e	Negati ve	Suspe cted	Positi ve
845 7	804plant No3,paghman	845 5	Jun-13	Paghman	peach	MSN	Negati ve	Negati ve	Negati ve	Suspe cted	Positi ve
845	804plant	845	Jun-13	Paghman	peach	MSN	Negati	Negati	Negati	Suspe	Positi

8	No6,paghman	6					ve	ve	ve	cted	ve
8459	804plant No9,paghman	8457	Jun-13	Paghman	peach	MSN	Negati ve	Negati ve	Negati ve	Suspe cted	Positi ve
8460	804plant No12,paghman	8458	Jun-13	Paghman	peach	MSN	Negati ve	Negati ve	Negati ve	Suspe cted	Positi ve
8461	804plant No13,paghman	8459	Jun-13	Paghman	peach	MSN	Negati ve	Suspe cted	Negati ve	Suspe cted	Positi ve
8469	812plant No3,paghman	8467	Jun-13	Paghman	peach	MSN	Negati ve	Negati ve	Negati ve	Negati ve	Positi ve
8470	812plant No7,paghman	8468	Jun-13	Paghman	peach	MSN	Negati ve	Negati ve	Negati ve	Negati ve	Positi ve
8471	812plant No10,paghman	8469	Jun-13	Paghman	peach	MSN	Negati ve	Negati ve	Negati ve	Negati ve	Positi ve
8472	812plant No13,paghman	8470	Jun-13	Paghman	peach	MSN	Negati ve	Negati ve	Negati ve	Negati ve	Positi ve
8476	812plant No3,paghman	8474	Jun-13	Paghman	peach	MSN	Negati ve	Suspe cted	Negati ve	Negati ve	Positi ve
8477	811plant No3,paghman	8475	Jun-13	Paghman	peach	MSN	Negati ve	Negati ve	Negati ve	Negati ve	Positi ve
8478	811plant No7,paghman	8476	Jun-13	Paghman	peach	MSN	Negati ve	Negati ve	Negati ve	Negati ve	Positi ve
8479	811plant No11,paghman	8477	Jun-13	Paghman	peach	MSN	Negati ve	Negati ve	Negati ve	Negati ve	Positi ve
8480	811plant No14,paghman	8478	Jun-13	Paghman	peach	MSN	Negati ve	Negati ve	Negati ve	Negati ve	Positi ve
8481	811plant No16,paghman	8479	Jun-13	Paghman	peach	MSN	Negati ve	Negati ve	Negati ve	Negati ve	Positi ve
8482	811plant No19,paghman	8480	Jun-13	Paghman	peach	MSN	Negati ve	Negati ve	Negati ve	Negati ve	Positi ve
8674	4031plant No2,Dehcochi	8672	Jun-13	Khandaha r	plum	MSN	Negati ve	Negati ve	Negati ve	Negati ve	Positi ve
9184	811 Plant No 3 khwaja M khyle	9182	Sep-13	Jabalsuraj	peach	MSN	Negati ve	Negati ve	Negati ve	Negati ve	Positi ve

The Common pest and disease outbreak in Orchard which are recorded by Director of Plant Protection and Quarantine Department of DAIL Herat in the following table:

S/No	Name of pest	Scientific name
1	Apple Codling moth	Cydia pomonella
2	Apple floury aphids	Lapidosaphes malicola
3	Quince worm	Euzophera biglla zeller
4	Grape fruit borer	Lopesia botrana
5	Grape leave borer	Sparganthis pillerjana
6	Mealy bug	Planococcus citri
7	Pomegranate aphids	Aphis punicaepass
8	Pomegranate fillies	Spectrobates ceratoniaer
9	Pomegranate larva	Euzophera puniciella

10	Plum larva	<i>Grapholitha funebrana</i>
11	Pistachio fruit borer	<i>Megastigmus pistaciae</i>
12	Vine two spotted spider mites	
13	Grape worm	<i>Theretra alecta</i>
14	Almond borer	<i>Eurytoma amygdali</i>
15	Green peach aphids	<i>Pseudococcus maritimus</i>
16	Apple leaf curl by worm	<i>Agryploce variegna</i> HP
17	Grape borer	<i>Lobesia botrana</i>
18	Apple pink aphids	<i>Dysaphis plantaginea</i>
19	Peach leave curl aphids	<i>Brachycaudus helichrysi</i> kalt
20	Walnut aphids	<i>Chromaphis juglandicola</i> kalt
21	Pistachio Psylla	<i>Agonosцена pistaciae</i>
22	Fig borer	
23	Fig mites	<i>Aceria fici</i>
24	Plum weevils	(<i>Curculio</i> (<i>Conotrachelus nenuphar</i>))
25	Pear Psylla	<i>Cacopsylla pyricola</i>
26	Green Peach aphids	<i>Myzus persicae</i>
27	Pear flowers mites	
28	Almond green aphids	
29	Almond soft scales	<i>Didesmococcus unifasciatus</i>
30	Peach Psylla	

Recommendations

The recommendations provided are just a summary of the measures that can be adopted based on the resources and products available in the market at the time of the observations.

The first general recommendation is that it is important to purchase all pesticides and fungicides from reliable sources and read accurately the labels; especially safety instructions.

The second general recommendation is crown gall bacterial disease management: crown gall is managed primarily with sanitation to protect vine from infection. The efficacy of the dormant treatment can be improved by pruning out and destroying infected wood. If the orchard is sprinkler irrigated, be sure to angle sprinkler heads low enough to keep from wetting the canopy

It is important to mention that a few grapevines of National collection and DO infected with Bacterial disease therefore the consultant has been given advice to Herat PHDC Acting Managers to replace them as soon as possible as well as the sample of infected include of galls with picture has been given to PBTL for more testing.

Grapevine crown gall Control

In general, bacterial diseases of plants are very difficult to control owing to the lack of effective chemicals. Antibiotics could be used, but they are expensive and, in any case, the compounds that are valuable for human therapy are not allowed to be used in agriculture. The most effective alternative is the use of copper, which is potentially phytotoxic (Harmful to plants).

The bacterium can live for many years in soil and can multiply in the root zone of susceptible plants. It infects the plant through a wound, usually at ground level or on the roots, and transfers a tumorigenic (cancerous) factor to some plant cells. These cells then start dividing uncontrollably, forming galls of undifferentiated tissue that restrict the normal functions of the plant.

Many nursery plants are infected through grafting and budding scars. The bacterium can also enter the plant through mechanical injury to crowns or roots. Such injuries may be caused by cultivation equipment, insects or animals.

Budding and grafting tools should be treated with a disinfectant to stop the bacteria spreading during budding and grafting.

Advice and recommendation of PBTL after test rest

1. Application of streptomycin sulphate 3 gr/liter (for specific rate please consult the supplier) will reduce the infection.
2. Cut of the infected parts of the plants

Note: It is better to spray in late fall and in the early spring.

Controlling of Powdery Mildew of Grape vine:

- **Application of Milk:** Spray milk as a preventative fungicide for powdery mildew in a ratio of one part milk to 9 parts water. This method has been tested by Mr. Shah Mahmood Sadeed Community Development Officer in IPM Project, FAO Sub-Office Mazar-e-Sharif.
- **Dormant spray** with Lime sulfur: Preventive spray against powdery mildew and anthracnose should be sprayed after pruning or before bud break.
- **Foliage spray:** Dusting with sulphur as preventive three times interval 14-21 days, first time of sulphur spray should be started when the shoot length 2-3 cm, Amount of sulphur for first spray 15kg/ha, Amount of sulphur for second spray 20kg/ha, Amount of sulphur for third spray 30kg/ha
- If sulphur powder not available use Wettable sulfur and wettable sulphur is the same as dusting sulphur but only mixed with water
- **Application:** wettable sulphur also used as preventive two times interval 14 days it should be sprayed when the berry size (pea size).
- Amount of wettable sulphur dosage 3gr. /liter of water, 1.250kg/ha. For two times enough

GFLV Treatment

- Through selection and production of virus free stocks by heat therapy and or meristem culture in order to use healthy scion and rootstock plant material.
- Avoid using contaminated soils to eliminate virus reservoirs and to diminish nematode population.
- GFLV is transmitted by nematode so it's important that this pathogen is not present in the field and that the basic material is virus free.

MAGPIES' bird control:

- It can be controlled with decoys, repellents, nets, scare equipment, cage traps ETC.

Almond Mite control

- Wash all infested trees with high pressure water then under the trees apply a little quantity Sulphur powder sprayed as a mist.
- Apply Ovicide in spring to control mite eggs before they hatch.
- At the early stage of attack before the Mites damage the leaves use selective acaricide (Miticide). Afghan orchard owners are already using Dicofol, Agrifol, Amitraz, Talstar.
- During hot weather especially summer season mites' outbreaks can be very serious on almond trees. Therefore it is a good prevention to apply winter oil during autumn

Apricot, Peach and Plum Gummosis:

- Clean infected area with sharp knife, wash with water then use Bordeaux Paste or spray copper oxy chloride.
- White wash the trunk of trees with lime with addition of a little quantity (two –three spoons) of Fungicide (Cupravit blue or copper oxy chloride)
- Avoid flood irrigation or water logging and ensure good drainage.
- Green pruning after harvesting fruits and cutting off infected branches.
- Use animal manure 4-5 tons/Jerib to improve the soil

Almond, Peach and Plum shot hole

Shot hole is managed primarily with fungicide treatments before bud burst to protect buds and twigs from infection. In orchards where twig infections are prevalent, the efficacy of the dormant treatment can be improved by pruning out and destroying infected wood. If the orchard is sprinkler irrigated, be sure to angle sprinkler heads low enough to keep from wetting the canopy

- Good sanitation is a key to treating shot hole disease naturally.
- All infected buds, blossoms, fruits and twigs need to be promptly removed and destroyed. Contaminated leaves around and beneath the tree should be removed as soon as possible.
- Apply a dormant spray of Bordeaux mixture or copper fungicide in late fall In areas where orchards have a history of this disease, spray at leaf fall or from November 15 to December first before winter rains to protect against twig infections. This spray also helps control leaf curl.

Peach Phytophthora

- The most effective ways to manage Phytophthora root and crown rot are to select a good planting site, select an appropriate rootstock, and properly manage irrigation water.

- Avoid over irrigating in spring and fall when soil temperatures are most conducive to disease development and water use by the tree is low.
- Plum rootstocks are less susceptible to Phytophthora infections than peach rootstocks, so plums grown on plum rootstock seldom have this disease.
- Fungicides are also available to treat soil around newly planted trees. If there is a history of Phytophthora root rot in the orchards and problems are anticipated, treatments may be warranted.
- Fungicide treatments currently, there are phosphorous acid-based fungicide use as a foliar spray onto healthy peach and apple trees for protection against infection in susceptible areas. Each year, a total of 2-3 sprays are applied, the first in early spring, the second 12 weeks later then followed by a third and final round after harvest in early autumn before the leaves senesce. This multiple spray program, using the spray dosages as recommended on the labels,

PNRSV Treatments

- Make proper Strategies for controlling of virus
- Use virus-free plant materials
- Heat-therapy, mainly root stocks. Isolation of new plantings from older ones to avoid infection
- Contact with PBTL

Stone fruit bacterial canker disease control

- Use certified, true to type and vigorous planting material from reliable sources.
- Prune during summer or dry periods.
- Avoid winter pruning. Prune during summer or Dry Periods provides, less opportunity for the bacteria to enter wounds.
- Disinfect secateurs in bleach solution between trees.
- Apply: Copper Oxy chloride for control of *Pseudomonas can be effective*

Almond, Apple and Pear aphid

- Remove root suckers and water sprout shoots
- Remove infested twigs mechanically
- Avoid excessive nitrogen which promotes new shoot growth that attracts aphids.
- Dormant oil sprays provides good control
- Natural enemies (Lacewing, lady beetle, Syrphid fly larvae, Religious mantis) can be effective
- Apply liquid soap
- The last resort spray Confidor can be effective
- Herat PHDC Manager has been used pesticide for control of Green Aphids and applied winter oil in NCs and Dos as well as for best control used: 200 gram Volk oil, Deltametrin 30 cc and water 20 liter.
- Green Peach Aphid, *myzus persicae*, is found in 90% flowering stage of peaches and plum trees in NCs. Spraying during flowering is not recommending preserving bees and other pollinating insect. So, spray after petal fall stage can be effective.

Pomegranate fruit flies:

- Collect all drop infested pomegranate from garden.
- Remove all damage infested fruit by flies and sooty mould fungus from the trees and carried out from garden.

- Use pheromone trap
- Remove secondary flowering of pomegranate from the trees.
- Remove secondary small pomegranate fruits from the trees.
- Perform green pruning to avoid fruit sunburn.
- The best ways of control fruit flies cover Pomegranate fruit with Bag
- The best time to cover the fruit is at 2 cherry sizes (which is usually 1 cm in diameter). Please note that unfertilized or already infested pomegranate smaller than this size will automatically fall down from the tree. It is better to collect and burn them. It will reduce the multiplication of the insect
- Use of plastic bags, paper bags or cloth bags
- All type of bags either paper, cloth and plastic bags can be used to cover the pomegranate fruit. While cloth bag is little expensive, it can last for 4-5 years, Plastic bag is very cheap and is available at every corner of the village. While using plastic bag, make 3-4 tiny holes in the bag so that when the air inside the bag gets hotter can escape easily without affecting the fruit. Similarly, you can use paper bag which is also cheaper and available in everywhere.
- Attractive size and color
- It needs to be mentioned that bagging does not affect the size, colour and taste of the bagged fruit. It rather increases the colour of the fruit, protecting from direct sun light, other insect attack and dust.
- Chemical pesticides are still useless
- According to research findings, no insecticides have yet been found effective to control this insect. Application of chemical insecticides rather poisons the pomegranate, which is harmful for health.

Mealy bugs control:

- Removing mealy bugs by rubbing or picking mealy bugs from affected plants. This is practicable when infestation is low
- Pruning and destroying affected parts. This is particularly useful at the initial stage of infestation.
- Removing and destroying heavily infested plants.
- Spraying a steady stream of water (reasonably high pressure) on the host plant to knock-off mealy bugs.
- Improvement of soil fertility
- Use selective pesticide

Weed control:

It is important to remove the weeds before they produce seed. There are various methods which could be used alternatively or in combination

i) use of Herbicide (i.e. Round up); ii) manual removal (traditional); mechanical removal disc attached with tractor, mulching, etc.). The PHDCs has recently received some agricultural machinery that with time may improve weed management.