MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END THEORY EXAMINATION
B.Sc. (Hort.)
MODEL ANSWERS

Semester: V (New) **Academic Session:** 2019-2020
Course No.:- HPATH- 352 **Title:** Diseases of Fruit, Plantations,
Credit : 2+1 = 3 Medicinal and Aromatic Crops.
Day & Date: **Total Marks:** 80(Eighty) **Time:**

Note :- 1. Solve any eight questions from "SECTION "A.
2. All questions from "SECTION "B" are compulsory.
3. All questions carry equal marks.
4. Draw neat diagrams wherever necessary.

SECTION "A"

Q.1. Describe symptoms of following diseases.

1. Anthracnose of mango

Answer: The fungus attack tender shoots and foliage. Brown or dark circular or irregular spots are formed on the leaves and such leaves are crinckled. On the lesions and dead portions minute, pink, cushion shaped, fructifications of the pathogen are seen during moist weather. The flowers wither and shed. Black, round or irregular sunken spots are formed on fruit skin.

2. Soft rot of papaya

Answer: Water soaked patches appear on the stem at the ground level. These patches enlarge and girdle the base of the stem. The diseased tissues turn dark brown or black and rot .The terminal leaves turn yellow, droop and wilt. Fruits shriveled and drop off. Due to disintegration of parenchymatous tissues at the base of the stem the entire plant topples over and dies. If the bark is opened the internal tissues appear dry and give a honey comb appearance. Rotting may spread above and below on the stem and down to the roots. The roots deteriorate and may be destroyed.

3. Powdery mildew of ber.

Answer: The developing young leaves show a white powdery mass causing them to shrink and defoliate. Small, white powdery growth appear on the young fruits which later enlarge and coalesce and finally turn brown to dark brown. In severe cases, the whole fruit surface gets covered with the powdery mass. Affected young fruits drop off prematurely or become corky, cracked, mis-shapen and underdeveloped,. Matured fruits turn rusty. Sometimes the whole crop is rendered unmarketable.

4. Tea rust

Answer: On the leaves the alga produces cankers and kill the tissues. The alga occurs as orange yellow, roughly circular patches on the upper surface of the leaf. The patches may be few or numerous, crowded or scattered and may occupy and part of the leaf. They are rare on the petiole. The host cells in contact get killed and their contents turn brown and dry up. Ultimately the alga itself ceases to grow, cells die and a crater like depression is left surrounded by an elevated ring. On the stem the pathogen occurs as red hairy patches. The infection ultimately cause the death of the shoot.

Q.2. Describe disease cycle of following diseases with a suitable diagram.

1. **Citrus canker (4 marks)**

Answer: The bacterium spreads mainly through wind splashed rains. Long distance dissemination takes place through diseased planting material. It survives in cankerous leaves, twigs and branches. It survives in the infected leaves for five months and infected twigs up to 76 months. Injury caused by leaf miner (*Phytocnistis citrella*) paves the way for the entry of pathogenic bacterium.

Well labeled diagram.

2. **Powdery mildew of grape. (4 marks)**

Answer: It survives as dormant mycelium and as cleistothecia on the shoots and buds from season to season. The disease spreads by the air-borne conidia.

Well labeled diagram.

Q.3. Enlist the important diseases of grape with their causal organisms and describe in detail the symptoms, disease cycle and integrated disease management of Downy mildew of grape.

Answer: Diseases of grapes (2 marks)

Name of the disease	Causal organism
Downy mildew	*Plasmopara viticola*
Powdery Mildew	*Uncinula necator*
Anthracnose	*Gloeosporium ampelophagum/ Elsinoe ampelina*
Bacterial Blight	*Xanthomonas campestris pv. viticola*
Grape fan-leaf	virus

Symptoms of downy mildew: (2 marks)

Small translucent, pale yellow spots with indefinite borders on the upper surface of leaves. On the under surface of leaves a downy growth of the fungus appears. Infected areas are killed and turn brown. Lower surface becomes dirty grey. The necrotic lesions enlarge and coalesce to form larger necrotic areas on the leaves, frequently resulting in defoliation. Shoots and tendrils are covered with whitish growth of the fungus. Flowers may blight or rot. Entire clusters or part of them may be attacked and become quickly covered with the downy growth and die. The berries become leathery and wrinkle. The fruits shed if the attack is very severe.

Disease cycle: (2 marks)

The pathogen survives on the infected leaves and vines as oospores and dormant mycelium. The secondary spread is through wind-borne sporangia and zoospores which are found on the new flush.

IDM: (2 marks)

Sanitation.

Removing and burning of all diseased leaves, shoots, flowers.

After pruning, the vines should be sprayed with Bordeaux mixture 1.0 per cent or Difolatan 0.2 per cent or Chlorothalonil 0.2 per cent.

When the flushes are formed, spraying with Difolatan 0.2 per cent or Chlorothalonil 0.2 per cent or Metalaxy 0.2 per cent is effective. It may be repeated at weekly intervals.

Q.4. Enlist the important diseases of citrus with causal organisms and describe in detail the symptoms, disease cycle and integrated disease management of citrus gummosis.

Answer: Diseases of citrus. **(2 marks)**

Name of the disease	Causal organism
Gummosis, leaf fall and fruit rot	*P. citrophthora , P. parasitica , P. palmivora*
Anthracnose	*Colletotrichum gloeosporioides*
Diplodia gummosis	*Diplodia natalensis*
Ganoderma root rot	*Ganoderma lucidum*
Powdery mildew	*Oidium citri*
Canker	*Xanthomonas axonopodis pv. Citri*
Greening:	Rickettsia – like organism.
Tristeza /Quick and slow decline	*Citrus tristeza virus (CTV).*
Psorosis/ California scaly bark:	A capillovirus.
Cirtus exocortis	Viroid

Gummosis of Citrus

Symptoms : (2 marks)

Profuse gumming on the surface of the attacked bark is the main symptom. When gumming occurs on the stem, droplets of gum trickle down the stem. The bark shows conspicuous brown staining along with hardened masses of gum on the surface . It gradually turns dark brown and develops longitudinal cracks. Due to severe gumming, the bark becomes completely rotten and the tree dries owing to girdling effect.. The fungus produces blight symptoms on leaves. Blighted leaves drop off. The fruits lying on the ground are invaded by the fungus. Affected fruits develop brown rot.

Disease cycle: (2 marks)

The fungi survives on fallen fruits, twigs, leaves and in cracks of the tree and spread by irrigation water, rain splashes, wind and insects to stems, leaves and fruits.

IDM (2 marks)

Resistant rootstocks: sour orange (*Citrus aurantium*) and Cleopatra mandarin .

Proper drainage facilities .

Excess irrigations should be avoided.

Injuries to plants should be avoided.

Adopting ring system of irrigation and by heaping earth around the base of plants. Double ring basin system around the trunk may be provided.

Planting pits may be dusted with a mixture of Zinc sulphate, Copper sulphate and quick lime (5:1:4) just before planting.

Diseased bark is painted with Zinc sulphate-Copper sulphate – Lime paste (0.6 : 0.2 : 0.5 kg in 100 litres of water).

Drenching the soil with Bordeaux mixtuer 1.0 per cent controls the disease.

Spraying with Bordeaux mixtutre 1.0 per cent alone or with tin sulphate or difolatan 0.3 per cent or metalaxyl-mancozeb 0.2 per cent and Fosetyl-Al (Aliette) controls the disease.

Q.5. Enlist the important diseases of mango with causal organisms and describe in detail the symptoms, disease cycle and integrated disease management of anthracnose of mango.

Answer: Mango diseases

Name of the disease	Causal organism
Malformation	*Fusarium moniliforme* var. *subglutinans*
Anthracnose	*Colletotrichum gloeosporioides*
Powdery Mildew	*Oidium mangiferae*
Bacterial blight	*Xanthomonas campestris* pv. *mangiferae indicae*
Red Rust	*Cephaleuros virescens*
Giant Mistletoe	*Dendrophtoe spp.*

Anthracnose of mango

Symptoms: (2 marks)

Brown or dark circular or irregular spots are formed on the leaves and such leaves are crinkled. On the lesions and dead portions minute, pink, cushion shaped, fructifications of the pathogen are seen during moist weather. The flowers wither and shed. Black, round or irregular sunken spots are formed on fruit skin.

Disease cycle (2 marks)

Inoculum remains on dried leaves, defoliated branches, mummified flowers bracts and they serve as primary inoculum.

Secondary spread is through air-borne conidia. The fungus can enter the pores of green fruits. The latent infection of mature fruits may takes place through lenticels.

IDM (2 marks)

1) Diseased twigs, leaves and fruits which fall on the ground in the orchard should be collected and burnt.
2) Spraying of Bordeaux mixture 0.6 percent in the young .
3) Spraying Carbendizim 0.1 percent or Thiophanate methyl 0.1 percent or Chlorothalonil 0.2 percent at 15 days interval until harvest effectively controls the disease.

Q. 6 Which are the fungal diseases responsible for low production of banana in India ? Describe in detail the symptoms, causal organism, disease cycle and integrated disease management of Panama disease.

Answer: Fungal diseases of banana. (2 marks)

Name of the disease	Causal organism
Fusarium wilt / Panama disease	*Fusanium oxysporum f.sp. cubense*
Sigatoka / Yellow Sigatoka leaf spot	*Mycosphaerella musicola*
Anthracnose / fruit Rot	*Gloeosporium musarum. (Colletotrichum musae)*
Cigar end rot	*Verticillium theobromae*

Panama disease :

Symptoms: (2 marks)

The fungus blocks the vascular system and causes wilting. The infected plants show characteristics yellowing of leaf blades developing as a band along the margin and spreading towards midrib. The cutted stem emits fishy oudour.

Disease Cycle : (2 marks)

The pathogen is soil-borne. It survives in the form of chlamydospores in soil for longer periods. The primary spread of the disease is through infected suckers and secondary spread is through irrigation water.

IDM (2 marks)

1) Healthy planting material should be obtained from disease free areas.
2) Dipping of suckers in Carbendizim 0.1 % solution before planting.

Q.7 a) **Enlist the viral diseases of papaya along with the causal agents and describe the collateral host, insect vector and integrated disease management practices of leaf curl disease.**

Answer : Viral diseases of papaya (1 mark)

Name of the disease	Causal organism
Mosaic of papaya	*Papaya mosaic virus* (PapMV), *carica virus 1.*
Leaf curl disease	*Tobacco leaf curl virus, Nicotiana virus 10.*
Ring Spot:	*Papaya ring spot virus* (PRSV)

Leaf curl disease

Collateral host (1 mark)

The virus infects tobacco, tomato, sunhemp, cape gooseberry, chilli, petunia, hollyhock, Zinnia, *Datura Stramonium* L. and several other weeds and ornamental plants.

Insect vector (1 mark)

White fly, *Bemisia tabaci.*

IDM (1 mark)

Infected plants should be destroyed even in the nursery. In the orchard the affected plants should be rouged and destroyed. In addition, spraying with monocrotophos 0.05 per cent or dimethoate 0.03 per cent controls the insect vector and reduces the disease in the field. Further the diseased plants in the crops of tomato and tobacco growing in the vicinity of papaya plantation helps to check the disease under control.

b) **Write causal organisms, symptoms, host range and IDM of abnormal leaf spot of rubber.**

Answer :

Causal organisms : (1 mark)

Phytohythora palmivora Butler, *Pmeadi* McRae and *P. nicotianae* var *parasitica and P. botyosa* Cke. *Phytothphora palmivora:*

Symptoms: (1 mark)

It induces the shedding of leaves during June-August, while general leaf fall occurs in December. Leaves shed prematurely either green or after turning coppery red. Defoliation may be completed within a fortnight under favourable conditions. A thick carpet of rotting foliage fallen on the ground emit foul odour. Initially the affected leaves show water soaked lesions, dull green either at the base or at the apex of the leaflets. In course of time the colour of the lesions changes from dull green to various shades of black. The entire leaf with petiole is shed. The leaf shedding may be severe and sometimes only base branches are seen.These branches show die-back symptoms. On the leaves dull grey circular spots are formed in the

initial stages and the spots enlarge and become irregular, the petioles exhibit sunken spots. Young leaf buds are also affected . The affected fruits rot. Rotting of bark near the tapping cut also occurs. Reduction in the yield of latex is noticed in the affected trees. Green pods are affected resulting in pod rot . In some years, all the fruits are destroyed and viability of seeds is lost..

Host range: (1 mark)

Arecanut, coconut, jack, palmyrah, *Citrus reticulatea, clerodendron infortunatum, Jatropha curcas* and many other wild and cultivated plants.

IDM : (1 mark)

Prophylactic sprays of the foliage prior to onset of South West monsoon with Bordeaux mixture 1.0 per cent effectively controls the disease.

Q. 8. Write short notes

a) Koleroga of areca nut (4 marks)

Causal organism of Koleroga:

Phytophthora arecae (Coleman) Peth. (Syn. *Phytophthora palmivora* var. *arecae).*

Symptoms:

Characteristic symptoms include rotting and excessive shedding of immature nuts form the trees. The first sign of the disease is on the nuts, on which a water soaked lesions usually develop towards the base. Infected nuts lose their luster. The green colour of the shell becomes dark green in the affected portions.

Mode of spread and survival :

Formation of oospores in the diseased nuts favors the perpetuation of disease. In the absence of oospores in nature the fungus over summer through mycelium persisting in tree tops and also through chlamydospores formed in fallen fruits.

IDM:

Cleanliness and field sanitation including destruction of diseased tree tops and plant parts is the foremost important in the control of this disease. Fallen infected fruits should be collected and burnt. Spraying with Bordeaux mixture 1.0 per cent is recommended.

b) Oily spot of pomegranate (4 marks)

Causal organisms of Oily spot of pomegranate :

Xanthomonas axonopodis pv. *punicae* .

Symptoms:

Small irregular, water- soaked spots appear on the leaves. Spots vary from two to five mm in dia. with necrotic centre of pin-head size. Spots are translucent, later turn light brown to dark brown and are surrounded by prominent water-soaked margins. Spots coalesce to form large patches. Severely infected leaves fall off. The bacterium attacks stems, branches and fruits also. On the stem, the disease starts as brown to black spots around the nodes. It leads to girdling and cracking of nodes. Finally the branches break down. Brown to black spots appear on the pericarp with L or Y shaped cracks. The spots on fruits are raised and oily in appearance.

Mode of spread and survival :

The bacterium survives on the tree. The pathogen survives for 120 days on the fallen leaves during off season. The primary infection is through infected cuttings. The disease spreads through wind splashed rains.

Epidemiology:

High temperature and low humidity favour the disease.

IDM :

Clean cultivation and strict sanitation in the orchard help to reduce the disease incidence. Spraying with Bordeaux mixture1.0 per cent controls the disease.

Q.9. Describe control measures of following diseases.

a) Fire blight of apple (2marks)

Answer :

1. During winter all the blighted twigs, branches and cankers should be cut out about 10 cm below the last point of visible infection and burnt.
2. Cutting of blighted twigs, suckers and root sprouts in the summer reduces the inoculum and prevent production of large cankers on the branches.
3. Cutting should be done about 30 cm below the visible infection.
4. The tools should be disinfected after each cut in mercuric chloride solution.
5. Best insect control programme should be followed to reduce or eliminate spread of bacteria by insects.
6. Bordeaux mixture (2.6:100) or Streptomycin 100 to 550 ppm are the effective blossom sprays.
7. Four sprayings of streptomycin should be applied either when maximum temperature are above 18°C or during the night.

b) *Ganoderma* wilt of coconut (2marks)

1. Removal of dead palms and palms in advanced stage of the disease and destruction of the boles and root bits of these palms.
2. Isolation of diseased palms from healthy palms by digging isolation trenches of 1 m deep and 30cm wide.
3. Application of 5 kg neem cake per palm per year.
4. Raising banana as intercrop.

c) Dieback of jackfruit (2marks)

1. Pruning of infected twigs followed by spraying of carbendazim 0.1 per cent or thiophanate-methyl 0.2 per cent or chlorothanlonil 0.2 per cent is recommended.
2. Controlling shoot borers and shot hole borers by suitable insecticides is also important in reducing die-back disease.

d) Heart rot of pine apple (2marks)

1. Deep planting should be avoided.
2. Soil should not be allowed to enter the hearts during planting.
3. Diseased plants should be removed and burnt.
4. The replants should be diffused in copper oxychloride 0.25% or Bordeaux mixture 1.0%
5. When clipping is done care should be taken not to cause injuries as they serve as points of infection.

Q.10. Describe in brief the following diseases.

a) Guava wilts. (4marks)

Causal Organism of Guava wilts :

Fusarium oxysporum f.sp. *psidii* ; *F. solani* ;*Macrophomina phaselina* and *Cephalosporium* sp.

Symptoms:

The disease is characterized by yellowing and browning of leaves, discolouration of the stem and death of the branches along one side. Sometimes the infection girdles the stem and the whole plant may wilt. Leaves die and the twig barks split.

Mode of spread and survival :

The fungus first colonizes on the surface of the roots and enters the stem tissues at the basal portions near the ground level. It multiples in vascular region and affects the cortical cells.

IDM :

1. Dry branches should be cut off and wilted plants uprooted.
2.. Soil should be treated with lime or gypsum to make the soil pH 6.0. to 6.5
3. Balanced nutrition of host reduces severity of the disease when organic nitrogen is supplied.
4. The soil of the pits should be treated with 40 percent formaldehyde

b) Base rot of pineapple. (4marks)

Causal Organism of Base rot of pineapple:

Ceratocystis paradoxa and *Ceratostomella paxadaxa* Dade;

Conidial stage: *Thielaviopsis paradoxa).*

Symptom:

It is typically black rot of the butt of the plant. The softer tissues are destroyed and only stringy fibers remain. Decay of the butt is followed by wilting of the foliage and the diseased plants break off at ground level. The leaves show grey spots with dark margins. The spots turn olive brown or white with the advance of the disease, tissues dry and leaves become distorted. Water blister appears as a soft watery rot of the flesh of the fruit which assumes darker water-soaked appearance. The skin overlying the decaying flesh is water-soaked and characteristically brittle. Finally, skin, flesh and core disintegrate. The fruit decay is accompanied by a sweetish odour. On rotting, the fruits and leaves develop masses of dark spores which impart a grey appearance to the rotting tissue.

Mode of spread:

The fungus survives in the form of black spores in the soil.

Management:

1. Curing process is to be carried out after the fruitlets are removed form slips or after stripping. Storing the material in heaps must be avoided. Dipping of the plants in an organomercurial fungicide 720 g a.i/ha or captafol 13.5 kg /ha or also spraying with these preparations on the upturned butts, will prevent the disease.
2. Dipping the fruits after harvest for three minutes in thiabendazole 0.1 per cent or benomyl 0.2 per cent ensures protection against the disease.
3. Careful handling of fruits to avoid injuries also help in reducing the incidence of the disease .
4. Base rot affected plants on the plantation or packing shed should be removed and burnt as they may form sources of further infection.
5. The packing shed must kept clean and all pineapple refuses should be promptly removed from the vicinity and destroyed.
6. Base of the fruit should be protected within 5 h of cutting of the cut surface of the stem pieces left on the fruit before packing with sodium salicylanilide 1.0 per cent solution as it leaves less residue.

SECTION "B"

Q.11 Answer in one sentence.

1) Which climatic conditions favors the powdery mildew of ber ?
Answer : Warm, humid condition with relative humidity more than 90%.
2) Why *Casuarina* or *Eucalyptus* is used as wind breaks around the cashew plantation ?
Answer : To check the spread of the anthracnose/ Brown leaf spot .
3) What is Viriod ?
Answer : :Free RNA without protein coat.
4) Which chemical in what concentration is used to control coconut wilt ?
Answer : Tetracycline@ 250 ppm.
5)Give the two examples of antagonistic bacteria ?
Answer : *Bacillus subtilis, Pseudomonas florescence, Enterobacter areogens*
6) Which insect vector transmit the pineapple wilt virus ?
Answer : Mealy bugs *Dysmicocus brevipes*
7) Which types of spores are produced by the fungus *Cerotilium fici* ?
Answer : Teletospore and urediospores
8) What is the primary source of infection of apple scab ?
Answer : Ascospores produced in pseudothecia

Q.12 (a). State True or False.

1) The powdery mildew fungus of mango can infect ber.
Answer : False
2) Angular leaf is caused by *Pseudomonas azadirachtae.*
Answer : True
3) Kadang kadang disese of coconut is caused by viroid.
Answer : True
4) The stem bleeding of coconut is a soil born disease.
Answer : True

(b). Fill in the blanks.

1. Powdery mildew of mint is caused by ***Erysiphe cichoracearum***
2. *Rhizoctonia* solani causes **root rot** disease of hemp.
3. The bacterial nature of fire blight of apple was described by the scientist **T. J. Burill** in 1882.
4. The causal organism of root rot of pyrethrum is ***Fusarium solani.***

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Dr. N. V. Savant
Asstt. Prof. of Plant Pathology
(Mob No. 9881430780)

Dr. A.P.Gaikwad
Prof. of Plant Pathology
(Mob No. 9420498811)