MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END THEORY EXAMINATION
B.Sc. (Agri)

Semester : VI (New) | Term : VI | Academic Year : 2022-23
Course No. : PATH-365 | Title : Diseases of Field and Horticultural crops and their Management-II
Credits : 3 (2+1)
Day and Date : | Time : | Total Marks : 80

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.

MODEL ANSWER
SECTION "A"

Q.1 Ans.	a	**Enlist diseases of wheat and explain diseases cycle and management of stem rust of wheat.** Enlist diseases: Disease cycle with fig : **Management :** 1. Eradication of self sown wheat plants and weed hosts.2. Adjust time of sowing 3. Grow resistant varieties, 4. Avoid late sowing. Balanced application nitrogenous fertilizers. 5. Spraying of fungicides viz. Tilt 0.1%, or contaf .1% or Mancozeb 0.25%.	1 mark 1.5 mark 1.5 marks
	b	**Explain typical symptoms and management of red rot disease of sugarcane.** **Symptoms :** The first external symptoms appear as **discolouration** of the young leaves. The margins and tips of the leaves wither and the leaves droop. The discolouration and withering continues from the tip to the leaf base until the whole crown withers away in four to eight days. In a single stool, most of the stalks may wither almost simultaneously. Typical symptoms of red rot are observed in the internodes of a stalk by splitting it longitudinally. These include the **reddening of the internal tissues,** especially the vascular bundles, which are usually elongated at right angles to the long axis of the stalk. The presence of **cross-wise white patches** interrupting the reddened tissues are the important diagnostic character of the disease. Split open stems emit a characteristic **acidic-sour odour.** As the disease advances the entire stem rots and the stalk becomes hollow and covered with white mycelial growth. **Management :** Removal and destruction of infected plant debris, stubbles and trash. Deep tillage to incorporate the left over debris. Adopt crop rotation by including rice and green manure crops. Select the setts from the disease free fields or disease free area. Avoid ratooning of the diseased crop. Avoid flow of irrigation water from diseased to healthy plants. Soak the setts in 0.1% carbendazim solution for 20 minutes before planting. Hot water	2marks 2marks

		treatment of setts at 52^0C for 30 min or 50^0C for 2 hours followed by steeping in 0.1% carbendazim solution. Setts can be treated with aerated steam at 52^0C for 4 to 5 hours and by moist hot air at 54^0C for 2 hours. Grow resistant varieties like CO 6907, CO 7219, CO 8013, CO 8021, CO 7706, CO A 7602, CO A 89082, CO A 89085, 87 A 397, CO T 8201, etc.	
Q.2 Ans.	a	**Write typical symptoms and management of Ascochyta blight disease of Gram.** **Symptoms :** The disease is usually seen around flowering and podding time as patches of blighted plants in the field. On leaves, small water-soaked necrotic spots appear that enlarge rapidly under favourable conditions leading to blighting of leaves. Pycnidia are observed on the blighted parts. The spots on the stem and pods have **pycnidia** arranged in **concentric circles** as minute block dots. **Management :** Grow resistant/tolerant varieties like **Gaurav**, C 235, G 543, GG 588, GG 688, BG 261 and GNJ 214. Remove and destroy the infected plant debris in the field. Follow crop rotation with cereals. Deep sowing of seeds, i.e., 15cm or deeper. Intercropping with wheat, barley and mustard. Treat the seeds with Thiram 2g or Carbendazim 2 g /kg. Exposure of seed at 40-50^0C reduced the survival of *A. rabiei* by about 40-70 per cent. Spray with Carbendazim@0.1% or Chlorothalonil@0.3%.	**2 marks** **2 marks**
Ans.	b	**Write symptoms and management of powdery mildew of Pea.** **Symptoms :** 1. White floury pathches on both sides of leaves, then spread to tendrils, pods and stems. 2. In advanced stage large areas of plant get covered 3. In extreme severe stage leaves shade. **Management :** 1. Avoid late planting 2. After harvest collect plants and burn them 3. Spray wettable sulphur such as sulfex and thiovit @ 3 kg/ha. 4. Grow resistant varieties viz. JP-83, PM-2, JP-4, JRS-14.	**2 marks** **2marks**
Q.3 Ans.		**Write the symptoms, favorable conditions, disease cycle and management of black arm disease of Cotton.** **Symptoms :** Seedling blight, Angular leaf spot, Vein blight/vein necrosis, black arm, square rot or boll rot. **Favorable condition :** Optimum soil temperature of 28^0C, high atmospheric temperature of 30-40^0C, relative humidity of 85 per cent, early sowing, delayed thinning, poor tillage, late irrigation and potassium deficiency in soil. Rain followed by bright sunshine during the months of October and November are highly favourable. **Disease cycle :** The bacterium survives on infected dried plant debris in soil for several years. The bacterium is also seed-borne and remains in the form of slimy mass on the fuzz of seed coat. It multiplies soon after the	**2 marks** **2 marks** **2 marks**

		seed is sown and infects the seedling through the micropyle. Volunteer plants that arise from the bolls falling off prematurely also provide a source of primary infection. The bacterium also attacks other hosts like ***Thurbaria thespesioides, Eriodendron anfructuosum*** and ***Jatropha curcas***. The primary infection starts mainly from the seed-borne bacterium. The secondary spread of the **bacteria** may be through wind, wind blown rain splash, irrigation water, insects and other implements. The bacterium enters through **natural openings** or insect caused **wounds.** **Management :** Remove and destroy the infected plant debris. Rogue out the volunteer cotton plants and weed hosts. Follow crop rotation with non-host crops. Early thinning, good tillage, early irrigation, early earthing up and addition of potash to the soil reduces disease incidence. Grow resistant varieties like HG-9, BJA 592, G-27, Sujatha, 1412 and CRH 71. Suvin is tolerant. *Gossypium herbaceum* and *G. arboreum* are almost immune. *G. barbadense, G. hirsutum, G. herbaceum var typicum* and *G. herbaceum var acerifolium* have considerable resistance. Delint the cotton seeds with **concentrated sulphuric acid** at 125ml/kg of seed. Treat the delinted seeds with Carboxin at 2 g/kg seed or soak the seeds in 1000 ppm Streptomycin sulphate overnight or treat the seed with hot water at 52-56^{0}C for 10-15 minutes. Spray with Streptomycin sulphate (Agrimycin 100), 500 ppm along with Copper oxychloride at 0.3%.	2 mar
Q.4 Ans	1	**Write short notes** **Sunflower rust : causal organism** ***:Puccinia helianthi*** Symptoms: Small, reddish brown pustules (uredia) covered with rusty dust appear on the lower surface of bottom leaves. The black coloured telia are also seen among uredia on the lower surface. The disease is **autoecious** rust. The pycnial and aecial stages occur on volunteer crops grown during off-season. The uredospores are round or elliptical, dark cinnamon-brown in colour and minutely echinulate. Teliospores are elliptical or oblong, two celled, smooth walled and chestnut brown in colour with a long, colourless pedicel. The pathogen survives in the volunteer sunflower plants and in infected plant debris in the soil as teliospores. The disease spreads by wind-borne uredospores. Weather parameters like temperatures of 25.5 to 30.5^{0}C with RH of 86-92% favours rust disease severity. **Management :** Remove and burn the infected plant debris in the field. Remove the volunteer sunflower plants. Crop rotation for 3 years, Grow	4 marks

tolerant variety like BSH-1. Spray Mancozeb or Zineb@0.2%, 2-3 times at 10 days interval. The first spray should be given as soon as the disease is noticed or 35 DAS.

2 **Downy mildew of mustard :causal organism:** ***Peronospora parasitica*** 4 marks

Symptoms appear on all aerial parts but usually on leaves and inflorescence. Greyish white irregular necrotic patches develop on the lower surface of the leaves. The most conspicuous and pronounced symptom is the infection of inflorescence causing hypertrophy of the peduncle or inflorescence (Stag head).

Etiology : The fungus is an obligate parasite. The mycelium of the fungus is non-septate, intercellular which produces haustoria. Sporangiophores are dichotomously branched with sterigmata which are pointed with acute angles usually of equal length. Oval and non- papillate sporangia are produced over the pointed sterigmata. Sporangia always germinate by germ tube and behave as conidia.

The fungus survives through oospores formed in affected host tissues and on weed hosts. The secondary spread is through wind borne sporangia.

Management : Collect and destroy infected plant debris, Rotation with non-cruciferous crops. Early sowing of the crop (in first week of October) Seed dressing with Metalaxyl (Apron 35SD)@6g/kg seed, followed by a single spray with Metalaxyl (Ridomyl MZ)@0.2%

Grow resistant varieties like RC 781, PYSR 8 and PR 10

3 **Apple scab : causal organism** ***Venturia inaequalis*** 4 marks

First reported from Sweden (1819)First reported on Ambri variety in Kashmir valley (1935)

Symptoms : Scab infections usually noticed on leaves and fruits Scabby spots on fruit begin as sooty, gray-black lesions and may have a white or red halo The lesions later become sunken and tan and may have spores around their margins Infected fruit become distorted and may crack, allowing entry of secondary organisms Severely affected young fruit may drop.

Mode of survival and spread

P.I: Ascospores formed from pseudothecia

S.I: Wind borne conidia

Management : Clean cultivation , Resistant varieties: Emira, red free, Ambstraking, Ambroyal, Ambrich and Ambred. Spray captan@0.2% or dodine@0.25% at short intervals after petal fall. Single application of difolaton@0.3% at green bud stage followed by captan@0.2% at petal fall.

Q.5		**Explain the following diseases on the basis of symptoms, mode of perpetuation, favorable conditions and management.**	4 marks
Ans		**1. Gummosis of citrus :** *Phytophthora nicotianae var. parasitica* **Symptoms :** Disease starts as water soaked large patches on the basal portions of the stem near the ground level, First symptoms are dark staining of bark which progresses into the wood. Bark in such parts dries, shrinks and cracks and shreds in lengthwise vertical strips. Bark at the base is destroyed resulting in girdling and finally death of the tree. Later profuse exudation of gum from the bark of the trunk occurs. There may be a considerable amount of gum formation in sweet oranges, but relatively little in grapefruit. Infection extends to crown roots. Prior to death, the plant usually blossoms heavily and dies before the fruits mature. **Favourable conditions** Prolonged contact of trunk with water as in flood irrigation; water logged areas and heavy soils predispose the disease. Incidence is more in black soils than in light soils; high water table leads to high incidence. The disease is severe in high rainfall areas. **Mode of spread and survival :** The fungus survives as oospores or as dormant mycelium. Sporangia and zoospores spread by splashing rain water and irrigation water. **Management :** **Preventive measures:** Selection of proper site with adequate drainage and **high budding** (30 to 46 cm or above). Provision of an **inner ring** about 45 cm around the tree trunk to prevent moist soil. **(Double ring method of irrigation)** Avoid irrigation water from coming in direct contact with the trunk. Avoid injuries to crown roots or base of stem during cultural operations. Use resistant **sour orange rootstocks** for propagating economic varieties Painting Bordeaux paste or with $ZnSO_4$, $CuSO_4$, lime (5:1:4) to a height of about 60 cm above the ground level at least once a year. **Curative measures:** Scrape the diseased portion with a sharp knife. Protect the cut surface with Bordeaux paste followed by spraying of 0.3% fosetyl-AL reduces the spread. Soil drenching with 0.2% metalaxyl and 0.5% *Trichoderma viride* commercial formulation is also effective. **2. Downy mildew of Grape :** ***Plasmopara viticola*** **Symptoms :** appear on all aerial and tender parts of the vine. Symptoms are more pronounced on leaves, young shoots and immature beries. Irregular, yellowish, translucent spots on the upper surface of the leaves. Correspondingly on the lower surface, dirty white, powdery growth of fungus appears. Affected leaves become, yellow and brown and gets dried due to necrosis Premature defoliation. Dwarfing of tender shoots. Infected leaves, shoots and tendrils are covered by whitish growth of the fungus. White	**4marks**

		growth of fungus on berries which subsequently becomes leathery and shrivels. Infected berries turn hard, bluish green and then brown. Later infection of berries results in soft rot symptoms. Normally, the fully grown or maturing berries do not contact fresh infection as stomata turn non-functional. No cracking of the skin of the berries. **Spread and survival :** Sporangia or zoospores by wind, rain etc. Oospores present in the infected leaves, shoots and berries. Also as dormant mycelium in infected twigs. **Favourable conditions :** Optimum temperature : 20-22°C Relative humidity : 80-100 per cent **Management:** Collect and burn fallen leaves and twigs, Sanitation of the orchard. Vine should be kept high above ground to allow circulation of air by proper spacing. Pruning (April- may & September and October) and burning of infected twigs. Grow resistant varieties like Amber Queen, Cardinal, Champa, Champion, Dogridge and Red Sultana. The disease can be effectively managed by giving 3-5 prophylactic sprays with 1% B.M or Fosetyl-Al (Aliette)0.2% or metalaxyl + mancozeb 0.3 to 0.4%. Five sprays with 1% B.M. 1. Immediately after pruning of vines. 2. When new flush formed (3-4 weeks after pruning). 3 – Before buds open 4.When bunches or berries have formed 5. During growth of shoots.	
Q.6 Ans		**Write typical symptoms and management of following diseases.(Any two)** **1. Late blight of Potato : *Phytophthora infestance*** **Symptoms :** Initially starts from leaf tips or margins and spread inward. Small faded green patches on upper surface of leaf which turn into brown spots. Downy growth of the pathogen on subsequent lower surface. Progressive defoliation and collapse of plants under favourable conditions .Water soaked stripes on stem which becomes necrotic. Purplish brown spots appear on skin of tubers. On cutting, the affected tubers show rusty brown necrosis spreading from surface to the centre. Decay of plant parts under favourable weather which emits foul smell. **Management:** Regulatory measures. Select healthy tubers for planting. Delayed harvesting. High ridging to about 10-15cm height reduces tuber infection. Grow resistant varieties such as Kufri Jyothi, Kufri Badshah, Kufri Jeevan, Kufri Sherpa, etc. Resistant sources: *Solanum demissum* and *S. phureja* **2. Downy mildew of Cucurbits : *Pseudoperonospora cubensis*** **Symptoms :** Yellow, angular spots appear on upper surface of leaves. The corresponding lower surface of these spots shows a purplish downy growth in moist weather. The spots turn necrotic with age. The diseased leaves become yellow and fall down. Diseased plants get stunted and die. Fruits produced may not mature and have a poor taste **Management :** Destruction of cucurbitaceous weeds around field. Spray	**2 mark** **2 mark** **2 mark** **2 mark**

		metalaxyl@0.2% or chlorothalonil@0.2% . Spray zineb@0.3% at 10 days interval **3. Turmeric leaf spot : *Colletotrichum capsici*** **Symptoms :**Fungus attacks only leaves and usually infection is confined to leaf blades and occasionally extend to leaf sheaths.On leaves, elliptic to oblong spots of different sizes appear on both the surfaces, but more on upper surface.Spots gradually increase in size and attain a length of 4-5cm and breadth of 2-3cm. Mature spots have grayish center with dark brown margins surrounded by a yellow halo.Central portion of the spot becomes thin and papery. Several spots coalesce to form irregular necrotic patches **Management :** Remove and destroy infected plant debris. Treat rhizomes with COC@0.25% solution. Spray Carbendazim@0.1% or Mancozeb@0.25%. during Aug-Dec along with sandovit@0.5 ml/lt . Avoid excess shading . Tolerant varieties: TS-2, TS-4, TS-9, TS-88	**2 marks** **2marks**
Q.7 Ans		Write typical symptoms of following diseases (Any four) **1. Neck and bulb rot of Garlic: causal organism : *Botrytis alli*** Found commonly at the time of harvest. Affected scale tissue become soft, dense layer of grey mould appear at the neck, the infection progresses most rapidly down the scales which have been originally infected. Dark sclerotia appears on the older tissue. **2. Leaf spot of Strabery:** Initially small deep purple, round to irregular shaped spots appear on the upper leaf surface. Spots enlarge to 3-6 mm in diameter. They retain dark red margin, but the center turns brown, then grey and finally white. Spots may join and kill the leaf. On petiole, stolon, calyxes and fruit trusses, elongated lesions may form and interfere with water transport in the plant, weakening the plant ans mking it more susceptible to invasion by secondary organism. **3. Onion smudge : *Colletotrichum circinans*** **Symptoms :** mainly disease of scale of the bulb. In seed bed fungus may cause damping off if soil is wet and warm. Appearance of subcuticular dark green to almost black smudge. On the lesion concentric rings of dark stroma and mycelium. The outermost ring is the broadest. Inner scales are also attacked. The lesions are small, sunken and yellow later they enlarge and coalesce. **4. Alternaria blight of Marigold :** *Alternaria tagetica* produce small blakish brown, circular spots occur initially which spread fast and become irregular latter and cover large area. *Alternaria zinnia* produce leaf blight or marginal blight symptoms. The infection appears as minute spots which later enlarge, coalesce to form large irregular spots or blotches, that are amphigenous and light brown to dark brown. **5. Powdery mildew of rose : Caused by *Sphaerotheca pannosa,*** Slightly raised blister like areas on young leaves. Soon leaves are covered with a grayish white, powdery fungal growth. Leaves get curled and distorted. It also appears on young, green shoots. Buds may also covered with fungal growth and fails to open.	**2mark** **2mark** **2mark** **2mark** **2mark**

Q.8	a	**Purple blotch of onion:causal organism:** ***Alternaria porri*** **Symptoms :** Minute whitish dots on the leaves with irregular chlorotic areas on tip portions. Circular to oblong, concentric velvety rings appear in the chlorotic area. Sometimes yellow halo is seen around lesions. Spots coalesce and leaves die from tip backwards. Diseased leaves break at point of infection & hang down. Infection also seen on outer scales of bulb, seed stalk and neck. Severely infected crop dries up. Bulbs become dry and papery **Management :** Select disease free bulbs for planting. Seed treatment with thiram @3g/kg seed. Spray mancozeb@0.2% or chlorothalonil@0.2%	4mark
	b	**Anthracnose of chilli :** ***Colletotrichum capsici*** **Symptoms :** December - October in transplanted crop Small, circular to irregular, brownish black scattered spots appear on leaves. Severely infected leaves defoliate. Infection of growing tips leads to necrosis of branches from tip backwards. Necrotic tissues appear grayish white with black dot like acervuli in the center. Shedding of flowers due to the infection at pedicel and tips of branches. **Fruit symptoms :** Ripe fruits are more liable for attack than the green ones. Small, circular, yellowish to **pinkish sunken spots** appear on fruits. Spots increase along fruit length attaining elliptical shape. Severe infection result in the shrivelling and drying of fruits. Such fruits become white or greyish in colour and lose their pungency. On the surface of the lesions minute black dot like fruiting bodies called **'acervuli'** develop in **concentric rings** and fruits appear straw coloured. The affected fruits may fall off subsequently. The seeds produced in severely infected fruits are discoloured and covered with mycelial mat. **Management :** Collect and destroy all infected plant parts. Collect seeds only form fruits without infection. Removal and destruction of Solanaceous weed hosts and infected plant debris. Seed treatment with captan or Thiram 3-4g/kg. Spray thrice with captan@1.5% or mancozeb@0.25%. just before flowering, at fruit formation stage and 15 days after second spray. Resistant varieties: G3, G4, B61, Lorai, etc.	4mark
Q.9 Ans		**Write management of following diseases.(Any four)** **1. Stem gall of Coriander :** Sowing around 16 october to 16 Novemer gave minimum losses. Use clean and healthy seed follow suitable crop rotation. Use resistant varieties viz. JD-1, Pant Haritma, UD-20, Pant-1, Rcr-41, CIMAP-2055. **2. Peach leaf curl :** Removal and destruction of infected debries. During warm temp. fungus produce spores, before this spray copper fungicides. The best time to spray early spring before bud open. **3. Grape fan leaf virus :** **Management:** Soil application with nematicide controls the nematode	2 marks each

vectors and reduce the spread of disease.

4. Powdery mildew of cucurbit : 1.Collect and destry affected plant debries. 2. Spray with Carbendazim 0.1% or dinocap 0.2% or Thiophanate methyl 0.1% or Benomyl 0.1% 3. Use resistant varieties.

5. Linseed rust : 1. No specific chemical control have been suggested. 2. Use resistant varieties viz. 1198, Type-1, 1150-5, VA-491, 408, RR-38, S-36, C-429. Avoid excess use of nitrogenous fertilizers.

Q.10 **Explain in detail powdery mildew disease of Mango.**

Oidium mangiferae (Eyrsiphe polygoni)

Symptoms: The disease can easily recognized by whitish or grayish powdery growth on the inflorescence and tender leaves. Generally the infection starts from the inflorescence and spreads downwards covering the floral axis, tender leaves and stem. Leaves become twisted, curled and defoliate. Infected floral parts are severely damaged and drop off. If the fruits are set, they do not grow in size and may drop before attaining pea size. Fruits are sometimes malformed, discolored due to severe mildew attack. Because of poor fruits set and heavy flower and fruits drop, the loss due to the disease may go as high as 70-80%. **2marks** **2 marks**

Favourable conditions : Disease spread is favored by warm humid weather with cool nights.

Pathogen and Disease cycle: P.S: ***Erysiphe polygoni*** **-(Rare) in India.** Mycelium branched, hyaline, superficial, septate, haustoria lobate. Conidia hyaline, unicellular, elliptical, borne singly or rarely in chains of two. conidiophores simple, erect with two or more basal cells. **2marks**

Mode of spread: Dissemination is by wind and the progress of the disease in the orchard is along the direction of wind. P.I: Through infected plant debris by conidia S.I: Wind borne conidia of ***Oidium mangiferae.*** **2marks**

Management : Can be controlled with two preventive sprays with wettable sulphur 0.3% once before the flowers open and 2nd after the fruit set. Dusting twice or thrice with fine sulphur will check the disease. Spraying with Karathane 0.1% or cosan 0.1% before flowering and after fruit set (peanut stage). Resistant varieties: Neelum, Zardalu, Banglora, Torapari-khurd and Janardhan pasand

		SECTION "B"	
Q.11		Fill in the blanks 1. *Ustilago nuda tritici* 2. 52^0c 30 minutes 3. Teliospore 4. Stag head 5. *Uromyces ciceris* 6. Oospore 7. *Diplocarpon rosae* 8. White fly	
Q.12		a = viii b = vii c = i d = vi e = ii f = iii g = iv h = v	

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