Model Answer Paper

MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END THEORY EXAMINATION

B.Sc. (Hons.) Agriculture

Semester	: **VI (New)**	**Term**	: **II**	**Academic Year**	: **2022-23** 2023-2
Course No.	: **PATH-365**	**Title**	:	**Diseases of Field and Horticultural Crops and Their Management-II**	
Credits	: **3(2+1)**				
Day & Date	:	**Time (hrs.)**	:	**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.

	SECTION 'A'	**Marking scheme**
Q. 1	**State important diseases of citrus. Write symptoms, transmission and management of citrus greening.**	
Ans:	**List of important diseases of citrus (Any four)**	**1 marks**
	Symptoms:	
	The chief symptom of the disease is yellowing of mid-rib and lateral veins of the leaves. Stunting of leaves, sparse foliation, twig die-back, poor crop of predominantly greened and worthless fruits are important symptoms. Young leaves appear normal but soon assumes on outright position, become leathery and develops prominent veins and dull olive green colour. Green circular dots are found on leaves. Many twigs become upright and produce smaller leaves. The side of fruit exposed to direct sunlight develops full orange colour but the other side remain dull olive green. Fruits are low in juice and soluble solids and high in acid. Fruits are worthless either as fresh fruit or for processing. Seeds are poorly developed, dark coloured and aborted.	**2 marks**
	Transmission: It is transmitted by infected budwoods and through citrus psylla (*Diaphorina citri*). Even a single psylla is capable of spreading the pathogen. The initial symptoms of greening appear in 20 to 45 days after the feeding by psyllid.	**2 marks**
	Management: 1. The disease can be controlled by removal of affected and unproductive trees and by replanting disease-free budded plants raised on improved root stock. 2. The insect vector can be controlled by spraying monocrotophos 0.05 per cent at periodical intervals helps to check the spread of the disease. 3. Tetracycline 500 ppm sprays at fortnightly interval reduces the incidence. 4. Infection of nursery stock should be avoided by restricting citrus nurseries to those localities where psyllid vector is virtually absent. 5. Certified pathogen free budwood should be used for propagation. 6. Use of disease resistant cultivars. Integrated pest management.	**3 marks**
Q. 2	**Write important symptoms of following diseases** (Any four)	**2 marks each**
Ans: a)	**1. Leaf curl of chilli :** The disease plant shows curling of leaves. Intense reduction in leaf size, short internodes, and dwarfing. These symptoms produces broom effect, causing failure of formation of setting of fruits. If fruits are formed,	

	they remain small, deformed and poor in quality. b) 2. **Red rot of sugarcane :** The first symptom of red rot is discoloration of young leaves. The margins and tips of the leaves wither and leaves droop. The withering will proceed and finally whole crown withers and cane dies within weeks time. 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. 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. Minute **red spots** also appear on the centre of the mid-rib and develop in both directions forming small or long lesions. The lesions are initially blood red with dark margins and later on with straw coloured centres. c) 3. **Purple blotch of onion :** This disease occurs mainly at the top of the leaves, the infection starts with whitish minute dots on the leaves with irregular chlorotic areas on tip portion of the leaves. Circular to oblong concentric black velvety rings appear in the chlorotic area. The lesions develop towards the base of the leaf. The spots join together and spread quickly to the entire leaf area. The leaves gradually die from the tip downwards. d) 4. **Dieback of rose** : The pruned surface of the twig dries from tip downwards. Twigs become brown to dark brown or black. The disease passes from the branch twig to the main stem and from where it spreads to the roots. Finally it kills the whole plant. Stem and roots show browning of the internal tissues. e) 5. **Loose smut of wheat:** The symptoms are evident only at the time of emergence of the panicle from boot leaf. All the spikelets in a panicle transform into a mass of **black powdery spores**. The infected panicle emerges two days earlier than healthy and the spores are covered with the silvery membrane. This thin membrane gets ruptured exposing the mass of black spores. The spores are easily blown by wind leaving the bare rachis. f) 6. **Rust of linseed :** Rust is readily recognized by the presence of bright orange and powdery pustules, also called uredia. Rust pustules develop mostly on leaves but also on stems and bolls. The pustules produce numerous urediospores which are airborne and cause new cycles of infections during the season. As the season progresses, the orange pustules turn black and produce overwintering telia and teliospores. The black pustules are most common on stems. The leaves become chlorotic, die prematurely and shed very early.	
Q. 3 **Ans:**	**Enlist important diseases of potato. Write in detail late blight of potato with respect to symptoms, perpetuation and control measures.** List of important diseases of potato (Any four) Late blight of potato – **Symptoms :** Water soaked spots appear on leaves, increase in size, turn purple brown& finally black colour White growth develops on under surface of leaves. This spreads to petioles, rachis& stems. In tubers, purplish brown spots and spread to the entire surface on cutting, the affected tuber show rusty brown necrosis spreading from surface to the center. **Perpetuation :** The infected tubers and the infected soil may serve as a source of primary infection. The air borne infection is caused by the sporangia. **Control measures** : 1)Use healthy tubers for planting.	**1 marks** **2 mark** **2 marks** **3 marks**

	2)Selected seed material from disease free seed. 3)Follow clean cultivation. 4)Dip the seed tubers for 5 minutes in solution of Ridomil @ 0.2% before planting. 5)Give two to three sprays at the interval of 15 to 21 days with mancozeb or zineb 0.2 % should be done to prevent infection of tubers. 6)Tuber contamination is minimized if injuries are avoided at harvest time and storing of visibly infected tubers before storage. 7)The resistant verities recommended for cultivation are Kufri Naveen, Kufri Jeevan, Kufri Alankar, Kufri Khasi Garo and Kufri Moti.	
Q. 4 Ans:	**State primary and secondary source of inoculum for following diseases** **1. Anthracnose of cotton :** The pathogen survives as dormant mycelium in the seed or as conidia on the surface of seed for about a year. The pathogen also perpetuates on the rotten bolls and other plant debris in the soil. The secondary spread is by air- borne conidia. The pathogen also survives in the weed hosts, viz., *Aristolachia bractiata* and *Hibiscus diversifolius.* **2. Powdery mildew of pea :** The fungus is an obligate parasite and survives as cleistothecia in the infected plant debris. Primary infection is usually from ascospores from perennating cleistothecia. The secondary spread is carried out by the air-borne conidia. Rain splash also helps in the spread of the disease. **3. Downy mildew of cucurbits :** The pathogen survives on the diseased plant debris. In warm and humid climates, transmission from old to younger crops takes place all the year round. They may overwinter as thick walled oospores. Sporangia are dessiminated by wind. **4. *Alternaria* blight of wheat:** The fungus survives as conidia on seed or as mycelia within seed. Sporulation on lower leaves provides inoculum that can be dispersed by wind, leading to secondary spread of the disease. Seed-borne inoculum often results in spike infections late in the crop cycle.	**2 marks each**
Q. 5 Ans:	**Write cause, symptoms, transmission and management of grassy shoot of sugarcane.** **Causal organism:** Phytoplasma **Symptoms:** The disease is characterized by the production of **numerous lanky tillers** from the base of the affected shoots. Leaves become pale yellow to completely **chlorotic**, thin and narrow. The plants appear **bushy** and 'grass like' due to reduction in the length of internodes, premature and continuous tillering. In a diseased clump one or two thin, weak and small canes are produced. In plant crop, young leaves of diseased plants are white (**Albino**) and the buds on such canes are usually white, **papery** and abnormally elongated. **Transmission:** Disease is readily transmitted by sap inoculation and by cutting knife but mostly it spreads by the use of infected cane setts. In nature, it spreads by aphids, *Aphis maydis, Aphis indosacchari, Aphis sacchari.* In addition, leaf hopper, *Proutista moesta* also involves in the transmission. Sorghum serves as a natural collateral host. **Management :** 1) Eradication of diseased cane. 2) Use of healthy cane setts for replanting. 3) Giving up practice of ratooning for 4 years at least. 4) Moist hot air 54°C for 8 hours or hot water treatment at 52°C for 1 hour (Rangaswami, 2002).	**1 mark** **2 marks** **2 marks** **3 marks**

	5) Hot Water Treatment (HWT) of setts at 52^0C for 30min or Aerated Steam Therapy (AST) at 50^0C for 1 hr followed by steeping in fungicidal solution of carbendazim@0.05% for 15 minutes. 6) Control the insect vectors with the help of suitable insecticides.	
Q. 6 **Ans:**	**Enlist important diseases of mango. Write symptoms, perpetuation and management of powdery mildew of mango.** **List of important diseases of mango (Any four)** **Powdery mildew of mango** **Symptoms:** The disease is easily recognized by the whitish, sometimes grayish powdery growth on the inflorescence and tender leaves. Infected floral parts are severely damaged and drop off. If the fruit is already set it may drop off prematurely. The fruits are also sometimes malformed and discoloured due to severe mildew attack. The axis may begin to dry showing characteristic die back symptoms. **Perpetuation :** Primary infection is through dormant mycelium on the tree. Secondary infection takes place through air borne conidia. **Management:** 1. Destruction of dead branches and plant debris by burning. 2. Regular pruning of infected inflorescences at an early stage. 3. Removal of fallen leaves, inflorescences, and malformed fruits from the tree base 4. Spray the crop with wettable sulphur 80 WP (0.2 %) or Carbendazim 50 WP (0.1%) or Karthane 50 WP (0.1%) or Benomyl (0.1%) or Dinocap (0.1%) or Tridemorph (Calixin) 75 EC (0.05%) or Hexaconazole (Contaf) 5 EC (0.05%) as soon as incidence is noticed. 5. *Bacillus subtilis* products should be used preventively for best results. Limit incidence of fungal diseases on foliage with these biofungicides.	**1marks** **2 mark** **2 marks** **3 marks**
Q. 7 **Ans:**	**Write causal organism, symptoms, perpetuation and management of bacterial wilt of chilli.** **Bacterial wilt of chilli** **Causal organism:** *Ralstonia solanacearum* (*Pseudomonas solanacearum*). **Symptoms :** Symptoms and severity of the disease is more at the flowering stage. A characteristic symptom is the loss of turgidity of leaves followed by dropping of entire plant. When wilted plants cut opened longitudinally, there is brown discolouration of the vascular tissue. Bacterial ooze is clearly visible from stem/root cut end, when immersed in water. **Perpetuation:** The bacterium is soil borne in nature and survives in soil for 2-2½ years. Secondary spread of the disease is due to the displacement of soil during land preparation, irrigation, rain splashes etc. **Management :** 1. Field sanitation 2. Summer deep ploughing to expose soil to high intense sun radiation 3. Soil disinfection with use of soil disinfectant such as formaldehyde or by soil solarization. 4. Long crop rotation with non-host crops viz. Cereals and legumes. 5. Use of disease resistant varieties like Jwala, Anugrah, Agnirekha or any other resistant variety. 6. Roughing of infected plants immediately after notice of disease.	**1 mark** **2 marks** **2 mark** **3 marks**

	7. Drenching of bleaching powder @ 10-15g/lit in a root zone.	
Q. 8 **Ans:**	**Write management practices for following diseases (Any four)** a) **1. *Loranthus* on mango :** **Management:** I. Removal by scrapping of the parasite form infected branch before flowering with the help of 'Amar' loranthus cutter. II. Well established loranthus bushes be cut below the point of penetration and destroyed. III. Application of 0.5% Glyphosate at the point from where the loranthus growth has been scrapped to avoid further re-emergence of the parasite from the established haustorium. IV. Removal and destruction of parasite infected branches. V. Regular pruning of the mango tree can help to remove loranthus. b) **2. *Alternaria* blight of sunflower :** **Management :** i) Remove and destroy infected plant debris. ii) Rogue out weeds at periodical intervals. iii) Sow the- crop early in the season (June sowing). iv) Treat the seeds with Thiram 6 g/kg for preventing primary infection. v) Prevent secondary infection by spraying 2.5% Mancozeb immediately after appearance of the disease. vi) Crop rotation with non-related crops. c) **3. *Fusarium* wilt of gram :** **Management :** i) Treat the seeds with Carbendazim or Thiram at 2 g/kg. ii) Treat the seeds with *Trichoderma viride* at 4 g/kg or *Pseudonomas fluorescens* @ 10g/kg of seed. iii) Apply heavy doses of organic manure or green manure. iv) Follow 6-year crop rotation with non-host crops. v) Grow resistant cultivars like Kranthi (ICCC 37), Swetha (ICCV-2), ICCV 10, Avrodhi, G 24, C 214, BG 244, Pusa 212 and JG 315. vi) The use of biological control agents such as Trichoderma spp. And Bacillus spp. vii) Soil fumigation with methyl bromide or chloropicrin. d) **4. Powdery mildew of pea :** **Management :** i) Early seeding is recommended because powdery mildew infection is more damaging on late-maturing pea crops. ii) Used disease resistant/ tolerant varieties iii) Crop rotation with non-related crops . iv) Field isolation may assist in reducing infection which occurs by wind movement. v) Avoid heavy application of fertilizer. Foliar fungicides should only be necessary when the disease appears early in the growing season Do not use sulfur on young plants. Apply chemicals according to directions on the label.	**2 marks each**

	5. *Botrytis* blight of marigold : **Management :** i) Remove and destroy all infected plant parts as soon as they are observed. ii) Give adequate space between plants to allow for good air circulation. iii) Avoid fertilizing with excessive amounts of nitrogen. iv) Avoid overhead watering/irrigation. v) Depending upon the susceptibility of the plant to this disease, spray every 10 days with a suitable fungicide like captan, mancozeb, maneb and thiophanate methyl. vi) Crop rotation **6. White rust of mustard :** **Management :** i) Collect and destroy infected plant debris ii) Rotation with non-cruciferous crops iii) Early sowing of the crop (in first week of October) iv) Seed dressing with Metalaxyl (Apron 35SD)@6g/kg seed followed by a single spray with Metalaxyl (Ridomyl MZ)@0.2% v) Grow resistant varieties like RC 781, PYSR 8 and PR 10 (or) tolerant varieties like Kranthi and Krishna. vi) Use disease free seed material.	
Q 9. **Ans:**	**State important diseases of cotton. Write symptoms, perpetuation and control measures for black arm disease of cotton.** **List of important diseases of cotton (Any four)** **Black arm of cotton** **Symptoms:** The bacterium attacks all stages from seed to harvest. Usually five common phases of symptoms are noticed. **i) Seedling blight:** Small, water-soaked, circular or irregular lesions develop on the cotyledons. Later, the infection spreads to stem through petiole and cause withering and death of seedlings. **ii) Angular leaf spot:** Small, dark green, water soaked areas develop on lower surface of leaves, enlarge gradually and become angular when restricted by veins and veinlets and spots are visible on both the surface of leaves. As the lesions become older, they turn to reddish brown colour and infection spreads to veins and veinlets. **iii) Vein blight or vein necrosis or black vein:** The infection of veins causes blackening of the veins and veinlets, gives a typical 'blighting' appearance. On the lower surface of the leaf, bacterial oozes are formed as crusts or scales. The affected leaves become crinkled and twisted inward and show withering. The infection also spreads from veins to petiole and cause blighting leading to defoliation. **iv) Black arm:** On the stem and fruiting branches, dark brown to black lesions are formed, which may girdle the stem and branches to cause premature drooping off of the leaves, cracking of stem and gummosis, resulting in breaking of the stem which hang typically as dry black twig to give a characteristic "black arm" symptom. **v) Square rot / Boll rot:** On the bolls, water soaked lesions appear and turn into dark black and sunken irregular spots. The infection slowly spreads to entire boll and shedding occurs. The infections on mature bolls lead to premature bursting of bolls. The bacterium spreads inside the boll and lint gets stained yellow because of bacterial ooze and looses its appearance and market value. The pathogen also infects the seed and causes reduction in size and	**1 mark** **2 mark**

	viability of the seeds. **Perpetuation:** 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. **Control measures:** 1) Remove and destroy the infected plant debris. 2) Rogue out the volunteer cotton plants and weed hosts. 3) Follow crop rotation with non-host crops. 4) Early thinning, good tillage, early irrigation, early earthing up and addition of potash to the soil reduces disease incidence. 5) Grow resistant varieties like HG-9, BJA 592, G-27, Sujatha, 1412 and CRH 71. Suvin is tolerant. 6) *Gossypium herbaceum* and *G. arboreum* are almost immune. *G. barbadense, G. hirsutum, G. herbaceum var typicum* and *G. herbaceum var acerifolium* have considerable resistance. 7) Delint the cotton seeds with concentrated sulphuric acid at 125ml/kg of seed. 8) 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°C for 10-15 minutes. 9) Spray with Streptomycin sulphate (Agrimycin 100), 500 ppm along with Copper oxychloride at 0.3%.	**2 marks** **3 mark**
Q. 10 **Ans:**	**Write causal organism, symptoms, perpetuation and management of powdery mildew of cucurbits.** **Powdery mildew** **Causal organism :** *Erysiphe cichoracearum* **Symptoms:** The leaves on the upper surface show small white or grayish superficial spots. These spots enlarge forming large patches of powdery growth of the fungus. Large area, sometimes the entire leaves, are covered by the fungal growth. Black pin point bodies, representing the ascigerous stage of the fungus, appear during winter months. When the attack is severe defoliation occurs. The fruits from affected plants are very small. Considerable reduction in yield has been noted. **Perpetuation :** Cleistothecia developed on left over cucurbit crop in isolated areas serve as primary inoculum. Wild cucurbits harbour the conidial stage of the fungus and release conidia for primary infection to the spring or summer sown cucurbits. Conidia are dispersed by wind, thrips and other insects. **Management :** 1. Spraying with carbendazim 0.1 per cent or dinocap 0.2 per cent or thiophanate methyl 0.1 per cent or benomyl 0.1 per cent controls powdery mildew effectively. 2. All the affected plant parts should be destroyed. 3. Use tolerant/resistant varieties of cucurbits. 4. Crop rotation. 5. Avoid heavy application of nitrogenous fertilizers. 6. *Bacillus subtilis* use as a biocontrol agent.	**1 mark** **2 marks** **2 mark** **3 marks**

SECTION 'B'

Q.11 Ans:	Match the pair 'A'	ANSWER	'B'	1 mark each
	1. Black spot of rose.	c	a) *Puccinia graminis tritici*	
	2. Leaf spot of turmeric	f	b) *Botryodiplodia theobromae*	
	3. Red rust of mango	g	c) *Diplocarpon rosae*	
	4. Apple scab	e	d) *Ramularia areola*	
	5. Rust of wheat	a	e) *Venturia inaequalis*	
	6. Grey mould	h	f) *Taphrina maculans*	
	7. Grey mildew	d	g) *Cephaleuros virescens*	
	8. Mango dieback	b	*h) Botrytis cinerea*	

Q.12 Ans: **State true or false** — **1 mark each**

1) Causal agent of 'Pokkah Boeng' disease is *Fusarium moniliforme*. **True**
2) Mango malformation is a bacterial disease. **False**
3) *Xanthomonas campestris* pv *citri* causes gummosis in citrus. **False**
4) Powdery mildew of rose is caused by *Xanthomonas rosae*. **False**
5) Cleistothecium is completely closed type of ascocarp. **True**
6) Amar loranthus cutter is used for eradication of Loranthus. **True**
7) Anthracnose disease of chilli is also known as ripe fruit rot disease. **True**
8) ApMV causes grape fan leaf disease. **False**

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