* Sigatoka Disease of Banana.

Black sigatoka is a leaf-spot disease of banana. It is also called black leaf streak disease, it was discovered in 1963. As per new findings sigatoka disease is formed by three closely related fungi: yellow sigatoka [Pseudocercospora musae), eumusae leaf spot (Pseudocercospora eumusae) and black sigatoka (Pseudocercospora fijiensis)

Plants with damaged leaves may have up to 50% lower yield of fruit and control can take up to 50 sprays a year.

This disease occurs in tropical regions of Asia, West africa, South America etc.

Symptoms -

The infected regions of leaves shows streaks that run parallel to the leaves. The tropical climate is good for banana cultivation, but it is also the environment where pathogen thrives. The optimum environment is same for both pathogen and banana tree.

The fungus infect matuse banana leaves. In easly stages of infection the plant shows lesions with rusty brown appearance. These lesions are faint and paint-like specks on the leaves. They become more visible on lower side of leaf. These spots contain ascocarp which contain ascospores used for dissemination to infect healthy new plants. The pathogen survives on dead plant tissue as mycelium The dimensions of the lesions are characteristically 20 x 2 mm. After some days

lesions become darker, sink into the leaf and turn into depressions. leaves with large infections will start to degrade and collapse and ultimately die.

Causal organism

The disease is caused by the ascomycete fungus Pseudocercospora fijiensis

Classification:-

Kingdom - Fungi
Division - Ascomycota
class - Dothideomycetes
order - Capnodiales
family - Mycosphaerellaceae
Genus - Mycosphaerella (Pseudocercospora)
species - Fijiensis.

Life cycle:-

Pathogen reproduce both sexually and asexually, and both conidia and ascospores are important in its dispersal. The conidia are mainly water borne for short distances, while ascospores are carried by wind to more remote places.

When spores are deposited on susceptible banana leaf, they germinate with in three hours if humidity is high or a film of water is present. The optimum temperature for germination of conidia is 27°c. The germ tube grows epiphytically over the epidermis for 2 to 3 days before penetrating the leaf through stomata.

The invasive hypha forms a vesicle and fine hypha grow through the mesophyll layers to an air chamber. Those hypha then grow into the palisade tissue and continue to other air chamber, eventually emerging through stomata in the streak that has developed. Further epiphytic growth occurs before the re-entry of the hypha into the leaf through another stomata. This growth is repeted. The disease cycle is very fast in Pseudocercospora fijiensis as compared to other two pathogens.

Control Measures :-

1. Sanitation :- collection and destruction of diseased plant parts.
2. Use of efficient drainage system of soil to maintain dry conditions.
3. cultivation of crop in dry areas to avoid the disease.
4. Intercroping is also effective method to control the disease.
5. Chemical control - fungicides like triazoles are effective.
6. Use of disease resistant varieties

Anthracnose of Mango.

Anthracnose is most important field and post-harvest disease of mango worldwide. It is the major disease limiting fruit production in all countries where mangoes are grown, especially where high humidity prevails during the cropping season. The post harvest phase is the most damaging and economically significant. It directly affects the marketable fruit making it worthless. This phase is directly linked to the field phase where initial infection usually starts on young twigs and leaves and spread to the flowers, causing blossom blight and destroying the inflorescences and even preventing fruit set.

Symptoms -

The anthracnose pathogen invades inflorescences, fruits, leaves and stems of mango. On leaf anthracnose appears as irregular-shaped black necrotic spots on both surfaces of the mango leaf. Lesions often coalesce to form large necrotic areas. Severely affected leaves usually curl. Lesions develop primarily on young tissue and conidia are formed and can be observed in lesions of all ages. In older leaves, lesions do not develop, but latent infections are formed and fungus remain dormant until the tissue senesces. Under favorable conditions, conidia are dispersed and invade young twigs causing twig dieback in some cases.

Classification - Div.- Amastigomycota; sub D.- Deuteromycota
Class - Deutoromycetes; s. clas - Hyphomycetidae
order - Melanconiales; family - Melanconiaceae
genera - colletotrichum.

Causal Organism :- Colletotrichum gloeosporioides (Penz.),
It is an asexual, facultative parasite, fungus prefer warm humid environment for spreading the antracnose disease. The fungus is primarily invade into injured or weakened tissues of plant, produces various specialized structures during infections i.e. conidia, acervuli, setae and appressoria are formed during the interaction between host and pathogen. It colonizes, injures, plant tissues and forms number of acervuli and conidia. Conidia can be spread over relatively short distances by rain splash or overhead irrigation and infect other healthy plant tissues. Penetration into host depends on formation of specialized infection structure called appressoria. Appressoria allow the fungus to penetrate the host cuticle and epidermal cell wall directly by narrow penetration peg that emerges from the base of appressoria. Acervli are also asexual bodies produced during the infection process in the tissue of infected host as small, flask shaped structure with a small cushion at the bottom, of which short crowded conidiophores are formed and can be observed on the surface of diseased plant. Conidia released through an opening at the top of acervuli. Setae are usually long brownish coloured emmerged from acervuli. Whole infection process,

including the formation of conidia, acervuli, setae and appressoria, and infection results into tissue necrosis. Dead wood and plant debris are also source of primary inoculum.

In India and Australia one more species i.e. colletotrichum aculatum has been reported to cause the disease.

Disease cycle:- conidia were the most important type of inoculum in mango orchards. They were produced in lesions on leaves, twigs, panicles and fruits. Infected, new leaf flushes were viewed as the most significant source of inoculum. Even though ascospores production in dry leaves on the ground has been reported. Since conidias are formed abundantly in the mango canopy, this is considered to be the primary source of inoculum. conidia are dispersed with rain splashes. Developing fruit can be infected and some aggressive isolates can cause pre-harvest fruit losses. In case of post harvest anthracnose developing fruit are infected in the field, but infection remain quiescent (dormant) until the onset of ripining, which occur after harvest. Once the climacteric period of fruit starts, lesions begin to develop. There is no fruit to fruit infection.

Control Measures :-

1. Proper fertigation, irrigation is important to keep plant healthy & resistant.
2. Sanitation :- Diseased plant parts must be collected and burned.
3. Spraying periodically with copper and other fungicide is effective to control the disease.
4. Biological control can be done with Bacillus cereus, Pseudomonas fluorescens, Bacillus subtilis are effective to control post harvest symptoms on fruits.
5. Yiest suspension applied to mango trees reduced the ~~~~ fruit anthracnose better than chemical fungicides.

Leaf blight of Rice

Bacterial blight of rice has high epidemic potential and is destructive to high-yielding cultivers in both temperate and tropical regions especially in Asia. Its occurance in the 70s in Africa and America has led to concerns about its transmission and dissemination.

Research on bacterial blight of rice was commenced in Japan as early as in 1901, and the efforts were focused mainly on ecological studies and chemical control. Since then, significant findings were done regarding interactions between X. oryzae and rice at many levels.

Causal organism :-

Xanthomonas oryzae pv oryzae is a bacterial pathovar which causes a serious blight of rice, other grasses and sedges.

Classification :-

Kingdom - Bacteria
Phylum - Proteobacteria
Class - Gamma Proteobacteria
Order - Xanthomonales
Family - Xanthomonadaceae.
Genus - Xanthomonas
Species - X. oryzae
Variety - X. o. pv oryzae.

The bacteria is rod-shaped, 0.5 - 0.8 × 1.0 - 2.0 µm in width and length, single, non capsulated, gram -ve, motile with single polar flagella, optimum temperature for growth is 25 to 30°C, thermal death point is 53°C. Cultural & physiological characters are similar to other Xanthomonas species.

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Symptoms -

1) It appear on the leaves of young plants as pale-green to grey-green, water soaked streaks near the leaf tip and margins
2) These lesions coalesce and become yellowish -white with wavy edges.
3) whole leaf may eventually be affected, becoming whitish or greyish and then dying.
4) leaf sheaths and culms of more susceptible cultivars may be attacked.
5) Systemic infection results in wilting, desiccation of leaves and death, particularly of young transplanted plants.
6) In older plants, the leaves become yellow and then die.

In advanced stages, the disease is difficult to distinguish from leaf blight caused by Xanthomonas oryzae pv. oryzicola, but lesion margins are wavy rather than linear as for the former. The disease is often associated with lepidopteran leaf rollers, leaf folders and hispa beetles, since the bacteria readily enter the damaged tissue caused by insect infestation.

Disease cycle :-

Rice plants become infected with Xanthomonas oryzae through rice seed, stem and roots that are left behind at harvesting, as well as alternative weed hosts. X. oryzae lives on dead plants and seeds and probably moves plant to plant best through pattywater. Up on

introduction to the host plant, the bacteria infiltrates the plant through natural openings (stomata, cracks, wounds etc). Veins as well as xylem causing blockages and plant wilting. Bacteria oozes from leaf lesions and is spread by wind as rain, specially when strong storms occur and causes wounds to plants.

Xanthomonas oryzae has wide host range (eg. grasses) which act as alternative host, which is most important source of primary inoculums.

Importance:

Bacterial blight of rice is found world wide in temperate and tropical regions. It can destroy up to 80% of crop if disease develops easily.

Bacterial blight is a prevalent and distructive disease which affects millions of hectares throughout Asia. In Japan alone, annual losses are estimated to be between 22,000 to 116,000 tons. In Philippines, susceptible variety loose up to 22.5% during wet season and up to 7.2% in the dry season. In resistant varieties these numbers are 9.5% and 1.8% respectively.

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Control Measures :-

1) Planting disease resistant varieties :-
PBSRc82 is standard variety of rice used in south east Asia. Macassane a new variety released in 2011 used in Mozambique. are disease resistant to Bacterial Blight.

2) Chemical Treatment :-
Use of copper compound and antibiotics is also effective to control B.B.

3) Genetically engineered resistant varieties
More than 30 genes have been identified as being associated with resistance to bacterial leaf blight called Xa1 to Xa33.

4) Biological control :-
This is recently developed methods in which other ~~wite~~ antagonistic microorganisms are used to control pathogenic bacteria. experimental data show 64% reduction in damage of crop.

5) Sanitation : collection and burning of diseased plant parts.

6) Seed treatment - Seed treatment with antibiotics is effective method.

7) Destruction of Alternate host also help to avoid primary inoculum.

Bacterial Blight of Pomegranate.

It is a major disease caused by bacteria Xanthomonas axonopodis p.v. punicae. It is become a very serious threat to pomegranate growers in India. It leads to decrease yield nearly by 90% and quality of fruit affecting the market value of fruits. In Maharashtra it is known as 'Telya' means oily spot (marathi).

causal organism

Xanthomonas auxanopodis p.v. punicae is causal organism of the disease. The bacterium is rod-shaped 1µm in length and width respectively. single, non-capsulated, gram -ve, motile with single polar flagella. optimum temperature for growth is 25 to 35°c. It produce yellowish, raised, smooth, shiny and round colonies on xanthomonas agar medium. other physiological characters are similar to other xanthomonas species.

classification

Domain - Bacteria
phylum - Proteobacteria
class - Gamma proteobacteria
order - Xanthomonadales
family - Xanthomonadaceae
Genus - Xanthomonas
Species - auxonopodis p.v. punicae

Symptoms:

=> Initially water soaked lesions or spots are developed on leaves and fruits, which later turns into brownish circular spot surrounded by yellow rings on leaves. Gradually these spots become necrotic and turns black. The infected leaves turn yellow and fall off from the plants. Infection spreads even to flowers, which lead the way for premature drop of flowers reducing fruit set.

=> The disease is more severe during the fruiting season. Black spots appear on fruits which later increase in size and covers the whole fruit surface causing cracking / splitting of fruits. Further the infected fruits will start to rot. The disease even spreads to branches and stem, which leads to drying of those affected parts. Under severe condition it leads to death of branches. If the infected branches are cut open, it shows brown patches. Before drying of infected plant, the complete leaves will turn yellow.

=> Irregular rains with cloudy weather are most favorable for fast development of bacterial blight disease of pomegranate. Deficiency of nutrients make plant weak and more susceptible for disease. Bacteria are gram borne, spread through rain splashes and with insect vectors. Bacteria enter the plant tissue through natural opening and wounds formed by insects, as wind or human activities.

Control measures:-

1. Use of healthy / disease free planting material for plantation.
2. Sanitation:- maintain cleanliness in the orchard by removing all infected plant parts and destroy them by burning.
3. Apply recommended dosage of fertilizers along with well decomposed farm yard manure and vermicompost, which increase the resistance of plants against the disease.
4. Application of bio-agents such as ~~Pseudomo~~ pseudomonas sp., Bacillus sp. and Trichoderma sp will give resistance against bacteria. These are antagonistic organism to xanthomonas.
5. Before and after pruning and after defoliation by spray with Ethrel spray the plants with 1% Bordeaux mixture and destroy fallen leaves by burning.
5. Use sanitized tools for pruning.
6. Application of Salicylic acid @ 3 gm/l will improve the systemic resistance of plants against the disease.
7. During initial stages of disease spray plants with Streptomycine sulphate @ 0.5 gm/lit + copper oxychloride @ 3 gm/lit with the interval of 7 to 10 days
8. During severe disease incidence spray with copper hydroxide @ 2.5 gm/lit + Bactinashak @ 0.5 gm/lit + Streptocycline @ 0.5 gm/lit

After every application of bactericidal, spray the plant with combination of $ZnSO_4$ 1 gm + $MgSO_4$ 1 gm + $CaSO_4$ 1 gm + Boron 1 gm + SOP 5 gm/lit of water and about 2.5 ml/lit of general liquid micronutrients help in effective management of the disease.