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Survey report of major plant diseases in Chinnamanur block of Theni District, Tamil Nadu

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Abstract

A plant disease is defined as anything that prevents a plant from performing to its maximum potential. Plant diseases have caused enormous economic losses in each one of the countries and impacted the society. Many studies show that quality of agricultural products may be reduced due to various factors of plant diseases. A survey was conducted during March 2019 to observe the disease prevalence in major crops of Chinnamanur block in Theni district. The results of this survey showed the prevalence of twenty major diseases in that region. The following crops were surveyed: Rice, Maize, Rose, Banana, Citrus, Tomato, Castor, Teak, Guava, Green gram, Ragi, Coconut and Sandalwood. Therefore, any intervention including direct research towards creating new or adopting an integrated disease management options must focus on those prioritized major diseases of the area to have higher, good quality agricultural produces.

Keywords: Plant disease, Survey report, Chinnamur, Pathogen diversity.

1. Introduction

Agriculture is a base of the world economy and for India, the role of agriculture in the economy is much more than other product. World agricultural production is affected by the annual loss of about 20-30% on an average due to plant diseases. So if agriculture is affected by any disease it will directly or indirectly affect our economy and the population which is dependent on agriculture. It needs to survey and analyze plant diseases very accurately within the specified time (Vipinadas and Tamizharasi, 2015) [15]. Theni district is bounded by Dindigul district to the north, Virudhunagar district to the southwest, and Idukki district of the Kerala state to the west. A range of hills which runs parallel to Western ghats from north to south separate it from the neighboring state of Kerala. The district is surrounded by the Westernghats, with its ubiquitous green stretches of cultivated lands and tea gardens (MSME-Development Institute, Chennai 2016). Chinnamanur is a revenue block in the Theni district. A survey was conducted during March 2019 to observe the disease prevalence in major crops in that region. The results of this survey showed the prevalence of twenty major diseases in that region. The following crops were surveyed: Rice, Maize, Rose, Banana, Citrus, Tomato, Castor, Teak, Guava, and Green gram, Ragi, Coconut and Sandalwood.

2. Resources and methods

Survey

A survey was conducted during March 2019 to record the occurrence of plant diseases in major crops in chinnamanur block of Theni district. The observations are described below:

3. Observation and Analysis

Rice blast: *Pyricularia oryzae* (Cavara.)

Symptoms: The fungus attacks the crop at all stages from seedlings in nursery to heading in mainfield. The typical symptoms appear on leaves, leaf sheath, rachis, nodes and even the glumes are also attacked.

Leaf blast: On the leaves, the lesions start as small water soaked bluish green specks, soon enlarge and form characteristic spindle shaped spots with grey center and dark brown margin.

Severely infected nursery and field show a burnt appearance. (Fig.1)



Fig1: Rice blast- *Pyricularia oryzae*

Pathogen character: Mycelium of the fungus, is hyaline to olivaceous, septate and highly branched. Conidia are produced in clusters on long septate, olivaceous slender conidiophores. Conidia are pyriform to obclavate or somewhat top shaped, attached at the broader base by a hilum. The perfect state of the fungus is *M. grisea*. It produces perithecia. The pathogen produces few toxins namely, α -picolinic acid, pyricularin and pyriculol (Farshad Karamian *et al.*, 2015) [3].

Rice stem rot: *Sclerotium oryzae* (Cattaneo.)

Symptoms: Small black lesions are formed on the outer leaf sheath near the water line and they enlarge and reach the inner leaf sheath also. The affected tissues rot and abundant sclerotia are seen in the rotting tissues. The culm collapses and plants lodge. If the diseased tiller is opened, profuse mycelial growth and large number of sclerotia can be seen. The sclerotia may be seen in the stubbles after harvest. (Fig.2)



Fig 2: Rice stem rot- *Sclerotium oryzae*

Pathogen characters: White to greyish hyphae produces smooth, spherical black and shiny sclerotia, visible to naked eyes as black masses (Gopika *et al.*, 2015) [4].

Maize northern corn leaf blight: *Exserohilum turcicum* (Pass.)

Symptoms: The leaf blight pathogen also causes seed rot and seedling blight of sorghum. The disease appears in the form of small narrow elongated spindle shaped spots in the initial stage. But in due course, they extend along the length of the leaf becoming bigger. On older plants, the typical symptoms are long elliptical necrotic lesions, straw coloured in the centre with dark margins. (Fig.3)



Fig 3: Maize northern corn leaf blight - *Exserohilum turcicum*

Pathogen characters: The mycelium is brown and intercellular and is localized in the infected lesion. Conidiophores emerge through stomata and are long, olivaceous, septate and geniculate. Conidia are olivaceous brown, 3-8 septate and thick walled. (Harlapur *et al.*, 2000) [5].

Rose Cercospora leaf spot: *Cercospora rosicola* (Passerini.)

Symptoms: Cercospora leaf spot also causes severe leaf loss in heavily infected plants. Symptoms are circular spots, usually 2-4 mm in diameter, but some can be as large as 10 mm in diameter. The size is variable depending on the species or variety of rose on which the lesions occur. When symptoms begin to appear, a small purplish area becomes apparent. (Fig.4)



Fig 4: Rose Cercospora leaf spot - *Cercospora rosicola*

Pathogen characters: The fungus produces clusters of dark brown septate conidiophores. The conidia are linear, hyaline, thin walled and 5-6 septate (Hagan and Akridge, 2005) [6].

Banana sigatoka leaf spot: *Mycosphaerella musicola* (Leach) & *Mycosphaerella fijiensis* (Morelet.)

Symptoms: On leaves small light yellow or brownish green narrow streaks appear. They enlarge in size becomes linear, oblong, brown to black spots with dark brown band and yellow halo. Black specks of fungal fruitification appear in the affected leaves. Rapid drying and defoliation of the leaves. (Fig.5)



Fig 5: Banana Sigatoka leaf spot - *Mycosphaerella musicola* & *Mycosphaerella fijiensis*

Pathogen characters: Conidia are elongated, narrow and multi septate and measure 20 – 80 x 2-6micron meter. Perithecia are dark brown to black and asci are oblong, clavate and measure 28.8- 36.8x8.0-10.8micron meter. Ascospores are one septate, hyaline, obtuse with upper cell slightly broader (Chillet *et al.*, 2008) [7].

Citrus greening: *Candidatus Liberobacter asiaticum* (Phloem limited bacteria)

Symptoms: This disease affects almost all citrus varieties irrespective of root stock. Stunting of leaf, sparse foliage, twig die back, poor crop of predominantly greened, worthless fruits. Sometimes only a portion of tree is affected. A type of mottling resembling zinc deficiency often predominates. Green circular dots on leaves. Many twigs become upright and produce smaller leaves. Fruits small, lopsided with curved columella. The side exposed to direct sunlight develops full orange colour but the other side remain dull olive green. Low in juice and soluble solids, high in acid. (Fig.6)



Fig 6: Citrus greening – *Candidatus Liberobacter asiaticum*

Pathogen characters: Rickettsia like organism - fastidious, obligate intracellular, coccobacilli that are transmitted to vertebrate hosts by arthropods. The disease is vectored and transmitted by the Asian citrus psyllid, *Diaphorina citri*, and the African citrus psyllid, *Trioza erytreae*, also known as the two-spotted citrus psyllid (Schwarz, 1967) [8].

Citrus canker: *Xanthomonas campestris pv citri*

Symptoms: Acid lime, lemon and grapefruit are affected. Rare on sweet oranges and mandarins. Affects leaf, twig and fruits. In canker, leaves are not distorted. Lesions are typically circular with yellow halo; appear on both sides of leaf, severe in acid lime (difference from scab) when lesions are produced on twigs, they are girdled and die. On fruits, canker lesions reduce market value. (Fig.7)



Fig 7: Citrus canker - *Xanthomonas campestris pv citri*

Pathogen characters: It is gram negative, non-spore forming, Aerobic bacteria. It is rod shaped, forms chains and capsules and is motile by one polar flagellum (Schubert *et al.*, 2003) [9].

Tomato septoria leaf spot: *Septoria lycopersici* (Speg.)

Symptom: The plant may be attacked at any stage of its

growth. The disease is characterized by numerous, small, grey, circular leaf spots having dark border. (Fig. 8)



Fig 8: Tomato septoria leaf spot- *Septoria lycopersici*

Pathogen characters: Mycelium is septate, branched, hyaline when young and darkens with age. Pycnidia are erumpent. Pycnidiospores are filiform, hyaline and septate (Suman Kumar *et al.*, 2000) [10].

Chilli Alternaria leaf spot: *Alternaria alternata* (Fr.)

Symptoms: The infection causes large dark concentric rings on leaf starting from leaf margin and causes blighting of leaves and ultimately defoliation. On the fruit, large greenish-brown to brown lesions covered, with grayish-brown mold are produced. (Fig.9)



Fig 9: Chilli Alternaria leaf spot – *Alternaria alternata*

Pathogen characters: Hyphae are septate, branched, light brown becoming darker with age and inter and intracellular. Conidiophores emerge through stomata. Conidia are single and muriform (Devappa and Thejakumar, 2016) [11].

Castor Alternaria leaf spot: *Alternaria alternata* (Fr.)

Symptoms: All the aerial parts of the plant, i.e., stem, leaves, inflorescence and capsules are liable to be attacked. These may appear on any portion of the leaf and are irregular, scattered, and have concentric rings. These are brown and later become covered with bluish-green or sooty growth. In one case the capsules, when half mature, wilt suddenly, turn brown and due to collapse of the pedicel the capsules fall or hang down. They are smaller in size and have underdeveloped and wrinkled seeds with little oil content. (Fig.10)



Fig 10: Castor Alternaria leaf spot – *Alternaria alternata*

Pathogen characters: Hyphae are septate, branched, light brown becoming darker with age and inter and intracellular. Conidiophores emerge through stomata. Conidia are single and muriform (Hiremani *et al.*, 2012) ^[12].

Teak rust: *Olivea neotectonae* (Buritica and Salazar.)

Symptoms: The infected leaves are almost plastered with yellowish brown fruit bodies of the fungus. The upper leaf surface presents a grey appearance due to the formation of flecks, which correspond to the position of sori on the lower surface. Infected leaves fall off prematurely resulting in retardation of plant growth. The disease is common in nursery and young plantations (Cabral *et al.*, 2010) ^[13]. (Fig.11)



Fig11: Teak rust - *Olivea neotectonae*

Guava algal leaf spot: *Cephaleuros virescens* (Kunze ex E.M. Fries.)

Symptoms: Disease symptoms are exhibited on both abaxial and adaxial leaf surfaces as orange, rust-colored, dense silky tufts ranging from 5 to 8 mm in diameter. Upon scraping away these spots, a thin, grayish white to dark-colored, necrotic crust remains on the leaf. These spots usually come together to form large irregular patches on a leaf. As the spots mature they take on a dull, grayish green color. Twigs and branches are also affected causing the bark to crack due to the growth and expansion of the pathogens filaments into the cortical tissues of the host. (Fig.12)



Fig 12: Guava red rust-*Cephaleuros virescens*

Pathogen characters: *Cephaleuros virescens* after a period of vegetative growth develops its reproductive structures. Sporangia formed directly on the thallus are sessile and thick walled with orange pigments. They are formed singly on the vegetative filaments. When the sporangia are ripped the contents are converted into Zoospores and liberated through an opening in the wall. The Zoospores are orange in colour, ovoid and swim actively by means of cilia (Misra, 2005) ^[14].

Green gram Cercosporaleaf spot: *Cercospora canescens* (Ellis & G. Martin.)

Symptoms: Small, circular spots develop on the leaves with grey centre and reddish brown margin. The several spots coalesce to form brown irregular lesions. Under favourable environmental conditions, severe leaf spotting and defoliation occurs at the time of flowering and pod formation. The brown lesions may be seen on petioles, branches and pods in severe cases. Powdery growth of the fungus may be seen on the centre of the spots. (Fig.13)



Fig 13: Green gram Cercosporaleaf spot - *Cercospora canescens*

Pathogen characters: The fungus produces clusters of dark brown septate conidiophores. The conidia are linear, hyaline, thin walled and 5-6 septate (Grewal *et al.*, 1980) ^[15].

Green gram powdery mildew: *Erysiphe polygoni* (DC.)

Symptoms: Small, irregular powdery spots appear on the upper surface of the leaves. These spots gradually increase in size and become circular covering the lower surface also. When the infection is severe, both surfaces of the leaf are completely covered by whitish powdery growth. In severe infections, foliage becomes yellow causing premature defoliation. The disease becomes severe during flowering and pod development stage. (Fig.14)



Fig 14: Green gram powdery mildew - *Erysiphe polygoni*

Pathogen characters: The fungus is ectophytic, spreading on the surface of the leaf, sending haustoria into the epidermal cells. Conidiophores arise vertically from the leaf surface, bearing conidia in short chains. Conidia are hyaline, thin walled, elliptical or barrel shaped or cylindrical and single celled. Later in the season, cleistothecia appear as minute, black, globose structures with myceloid appendages. Each cleistothecium contains 4-8 asci and each ascus contains 3-8 ascospores which are elliptical, hyaline and single celled (Rakhonde *et al.*, 2011) ^[16].

Cowpea mosaic: Cowpea yellow mosaic virus (Syn: Cowpea mosaic virus, yellow strain)

Symptoms: Chlorotic spots with diffuse borders (diam. 1-3

mm) are produced in inoculated primary leaves. Trifoliolate leaves develop a bright yellow or light green mosaic. The severity increases in younger leaves with moderate distortion and reduction in size. The affected leaves are leathery. The infected plants produce a few pods which are small and distorted. Chlorotic spots are also produced on pods. Plants do not show necrosis. (Fig.15)



Fig 15: Cowpea mosaic –*Cowpea yellow mosaic virus*

Pathogen characters: Cowpea mosaic virus (CPMV) is a plant virus of the *Comovirus* group. The virus is transmitted by chrysomelid beetles viz., *Ootheca mutabilis*, *Cerotoma variegata* and *C. ruficornis* (Bashir *et al.*, 2002) [17].

Ragi blast: *Pyricularia grisea* (Cokke) Sacc.

Symptoms: Infection may occur at all stages of plant growth. Young seedlings may be blasted or blighted in the nursery bed as well as developing young plants in the main field. There are three stages in disease development. (Fig.16)



Fig 16: Ragi blast – *Pyricularia grisea*

Pathogen characters: Young hyphae are hyaline and septate and turns to brown when become old. Numerous conidiophores and conidia are formed in the middle portion of the lesions. Conidiophores are slender, thin walled, emerging singly or in groups, unbranched, and pale brown in colour. Conidia are thin walled, sub-pyriform, hyaline 1-2 septate, mostly 3 celled with a prominent hilum (Patil *et al.*, 2016).

Coconut grey blight: *Pestalotia palmarum* (Cooke) Skey.

Symptoms: Initially symptoms develop only on the outer whorl of leaves, especially in older leaves. Minute yellow spots surrounded by a greyish margin appear on the leaflets. Gradually, the center of the spots turns to greyish white with dark brown margins with a yellow halo. Complete drying and shrivelling of the leaf blade occur giving a blighted or burnt appearance. Large number of globose or ovoid black acervuli appear on the upper surface of leaves. (Fig.17)



Fig17: Coconut grey blight - *Pestalotia palmarum*

Pathogen character: The fungus produces conidia inside the acervuli. The acervuli are black in colour, cushion shaped and sub epidermal and break open to expose conidia and black sterile structures, setae. The conidiophores are hyaline, short and simple, bear conidia at the tip singly. The conidia are five celled, the middle three cells are dark coloured, while the end cells are hyaline with 3-5 slender, elongated appendages at the apex of the spore (Rahman *et al.*, 2013) [19].

Guava scab: Pestalotia psidii (Pat.)

Symptoms: Symptoms occur generally on green fruits and rarely on leaves. Initially minute, brown or rust coloured, unbroken, circular, necrotic areas appears on fruits, which in advanced stage of infection; tears open the epidermis in a circinate manner. The margin of lesion is elevated and a depressed area is noticeable inside. In severe cases, raised, cankerous spots develop in great numbers and the fruits break open to expose seeds. Infected fruits remain underdeveloped, become hard, malformed and mummified and drop. Sometimes, small rusty brown angular spots appear on the leaves. (Fig.18)



Fig 18: Guava scab – *Pestalotia psidii*

Pathogen characters: Acervuli seen as minute black dots on affected portion. Mycelium is colored and septate. Conidia five celled, middle three cells are colored and the end cells are hyaline, slender 3-5 appendages are produced at the apex of the spore (Keith *et al.*, 2006) [20].

Jasmine leaf spot: Cercospora jasminicola (Sawada.)

Symptoms: Circular to irregular reddish brown spots of 2-8 mm diameter appear on the upper surface of the leaves. Later the spots become irregular covering larger areas of the leaves. (Fig.19)



Fig 19: Jasmine leafspot - *Cercospora jasminicola*

Pathogen character: The fungus produces clusters of dark brown septate conidiophores. The conidia are linear, hyaline, thin walled and 5-6 septate. (Thammaiah *et al.*, 1997) [21].

Conclusion

Major crops of the study area were Rice, Maize, Rose, Banana, Citrus, Tomato, Castor, Teak, Guava, Green gram, Ragi, Coconut and Sandalwood. In this study a total of twenty diseases were recorded. The diseases were Rice blast, Rice stem rot, Maize northern corn leaf blight, Rose Cercospora leaf spot, Banana sigatoka leaf spot, Citrus greening, Citrus canker, Tomato septoria leaf spot, Chilli Alternaria leaf spot, Castor Alternaria leaf spot, Teak rust, Guava algal leaf spot, Green gram Cercospora leaf spot, Green gram Powdery mildew, Cowpea mosaic, Ragi blast, Coconut grey blight, Guava scab, Sandal wood red rust and Jasmine leaf spot. Therefore, any intervention including direct research towards creating new or adopting an integrated disease management options must focus on those prioritized major diseases of the area to have higher, good quality agricultural produces.

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