



FUNGAL DISEASES OF AGRICULTURAL CROPS IN KHARSI REGION

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ABSTRACT

A survey of plant diseases caused to agricultural crops by fungal pathogens were carried out in cultivated field of Kharshi region. The disease affected plants in the field were found *Gossypium hisrsutum*, *Glycine max*, *Curcuma longa*, *Solanum lycopersicum*, *Carica papaya*, *Solanum tuberosum*, *Cajanus cajan*, *Triticum aestivum*. The agricultural crops were found affected with fungal pathogens like *Puccinia schedonnardii*, *Septoria glycines*, *Taphrina maculans*, *Alternaria solani*, *Oidium caricae*, *Oidiopsis taurica*, *Puccinia triticinia*. The highest percentage of brown rust disease (13%) was reported in *Triticum aestivum*. The lowest percentage (4%) of powdery mildew disease was reported in *Carica papaya*. In the field survey different types of diseases such as Leaf spot, Early blight, powdery mildew and rust diseases were recorded in different plants.

KEYWORDS: Fungal pathogens, Cotton, Soybean, Turmeric, Tomato, Papaya, wheat.

INTRODUCTION

The agricultural crops are important for survival. The cultivated crops give us food grains fodder for cattle. It is a need of time to protect crops from any kind of disease. The fungal pathogens attack crops by means of infection and disease development. The disease reduces the crop yield qualitatively and quantitatively. The fungal pathogens are non-chlorophyllous eukaryotic heterotrophic organism. The pathogens are obligate parasites of many host plants. The fungi decomposes the living host tissues and affect on the germination of seedlings and growth of plants. The Leaf diseases inside the hosts are caused the main yield and commercial losses and decrease within equally value and number of farming yield.^[1] The plant diseases are responsible for direct monetary and material loss. The loss of yield had affected millions of people from scarcity and starvation of food. The impact fungi in terms of plant health, food loss and human nutrition is key aspect of our life. The world's great famines and human suffering was due to plant diseases. The major plant diseases of agricultural crops include powdery mildew, rust, early blight, brown spot late blight, smut disease, downy mildew etc. There are large number of fungal pathogens present in air and in soil that affect on the plant life directly and indirectly. The fungi may live in latent state for long time and waiting for new healthy host for infection. The identification and control of fungal pathogens is important aspect of farmers, plant breeders and scientists'. The loss of crop yield due to fungal

pathogens has compelled the researchers to find solution and give proper information to the farmers. The data regarding crop disease can be collected from the field by regular visits.

Considering importance of agricultural crops and yield loss due to attack of fungal pathogens, attempts were made to find out diseases of regional cultivated crops.

MATERIALS AND METHODS

Site of Sampling

A survey of fungal diseases caused to agricultural crops was made from field region of Kharshi village which is under cultivation of different types of agricultural crops grown by local farmers. The study region comes under Pusad Tehsil of Yavatmal district in vidarbha region of Maharashtra state in India. The study area is located at latitude 19° 54' 45. 6336" N and 77° 34' 0. 8760" E longitude. The climate of study area is moderately cold in winter and dry hot during summer season.

Collection of Samples

The study site is cultivated with different kinds of agricultural crops such as Cotton, Soybean, Turmeric, Tomato, potato, wheat, pigeon pea etc. A frequent field visits were made in hundreds of acres of cultivated land. The visits were made in the month of December to February. The infected plants were collected in polythene bags and brought to the laboratory for further study. The herbaria of infected plants were made with

writing necessary details. The infected plant part such as leaf, stem, inflorescence were preserved in FAA for further sectioning and identification of fungal pathogen in infected plant material.

Identification of Fungal pathogens

The infected plant part was taken out and made into 1 cm pieces. The infected tissues were used to grow on fungal culture media which was composed of Potato, Dextrose and Agar. The PDA medium was made in sterilized petriplates and slants of pure culture were made. From the slants somatic and reproductive mycelia were taken on clean glass micro slide. The mycelia material was then stained in cotton blue and mounted in mounting medium Lactophenol. The stained mycelia were observed under compound microscope for identification of fungal mycelium. The fungal organism was identified

with the help of key to the identification of fungal pathogens.

RESULTS AND DISCUSSION

The agricultural crop field was screened for fungal diseases. During the field visit different crops were found diseased with fungal pathogens (Table 1). There found about eight different agricultural crops infected with fungal pathogens. The percent infection of diseased plants were measured with respect to total cultivated area of particular crop. The minimum percentage of infected plants was found (4 %) to the *Carica papaya* was affected with powdery mildew disease. The powdery mildew disease was caused by *Oidium caricae*. The maximum percentage (13%) of infected crops were found Triticum. The Triticum was found affected with a brown rust caused by fungal pathogen *Puccinia tritici*.

Table 1: The diseased plants found in cultivated area of Kharsi.

S. N.	Name of the Host plant	Name of the Disease	Causal Organism	% of infected plants
1	<i>Gossypium hirsutum</i>	Leaf rust of Cotton	<i>Puccinia schedonnardii</i>	9 %
2	<i>Glycine max</i>	Brown spot of Soybean	<i>Septoria glycines</i>	12 %
3	<i>Curcuma longa</i>	Leaf spot of Turmeric	<i>Taphrina maculans</i>	11 %
4	<i>Solanum lycopersicum</i>	Early blight of Tomato	<i>Alternaria solani</i>	7 %
5	<i>Carica papaya</i>	Powdery mildews of Papaya	<i>Oidium caricae</i>	4 %
6	<i>Solanum tuberosum</i>	Early blight of Potato	<i>Alternaria solani</i> .	6 %
7	<i>Cajanus cajan</i>	Powdery Mildew of Arhar	<i>Oidiopsis taurica</i>	8 %
8	<i>Triticum aestivum</i>	Brown rust of Wheat	<i>Puccinia triticia</i>	13 %

The cotton plant was found infected with leaf rust disease which is caused by a fungal pathogen *Puccinia schedonnardii*. The percent infection to the plant was found to be 9%. The Soybean crop was found infected with brown spot disease. The percent infection of the disease was recorded 12%. In the field different type of diseases was observed such as Brown spot disease, early blight disease, powdery mildew disease. The disease symptoms were observed in different crops.

1. Rust disease of Cotton

The host of the disease is *Gossypium hirsutum*. The disease is caused by fungal pathogen *Puccinia schedonnardii*. The pathogen typically affects the leaves which decreases the quality of the boll. Initially the yellow spots or pustules appears on leaves. The spots becomes oval to elongate with reddish brown elevated lesions or pustules which contain a powdery mass of orange to reddish brown spores on the upper and lower surface of leaves. The rust lesions affect on the leaves and makes leaves and stems weak. The photosynthesis intensity and ability of plant is reduced which in turn affect on the growth and yield of cotton fibres.

2. Brown spot disease of Soybean

The host of the disease is *Glycine max*. The disease is caused by fungal pathogen *Septoria glycines* The infected leaves may become rusty brown or yellow and fall off prematurely. Irregular, dark brown lesions or pustules or spots were developed on the leaves. The

lesions vary in size. The lesions were observed on both upper and lower surface of leaves. Generally the fungal infection found in lower canopy of a plant. The lesions later on merges together to form irregularly shaped blotches. The browning may occur along the leaf vein and leaf edges.

3. Leaf spot disease of Turmeric

The host of the disease is *Curcuma longa*. The disease is caused by fungal pathogen *Taphrina maculans*. The symptoms of the disease are found on leaves. There found oblong brown spots with grey centres. In the advanced stages of disease black dots are seen that representing fungal acervuli in concentric rings. The grey centres of infection become thin and leaves becomes dry, wilt and gets tear off. The infected area on leaves shows yellow halos. The infected spot area of leaf in turn enlarges and cover major portion of leaf surface.

4. Early blight disease of Tomato

The host of disease is *Solanum lycopersicum*. The disease is caused by fungal pathogen *Alternaria solani*. The disease is also known as *Alternaria* leaf spot disease. It is a common and damaging disease of tomato. The symptoms of the disease is the appearance of small dark brown spots on the leaves. These spots enlarge with a pattern of concentric rings. The infected spots form a narrow yellow zone. The spots enlarges and become irregular and yellow and ultimately the leaf die. The symptoms move from lower leaves which are damaged

or lost. The remaining aerial part of plant gets damaged. The stem and fruits may be invaded by the pathogen.

5. Powdery Mildews disease of Papaya

The host of the disease is *Carica papaya*. The disease is caused by the fungal pathogen *Oidium caricae*. The symptoms of the disease appear on the aerial part of plant. The infected plant forms small circular patches on both sides of the leaves. The patches later on extend, coalesce and cover the entire leaf surface. The infected leaves gets curl, dry up, hang down and ultimately fall off. The entire plant may die. The stem shrivels at the infected portion and collapses. The infected colonies spreading on the leaf surfaces of leaf and produces powdery mass of conidia. The infected portion of the leaves becomes yellow and necrotic. The water-soaked lesions and fluffy mycelial outgrowths are produced which gives appearance of downy mildew. The upper side becomes paler and necrotic lesions are produced.^[2]

6: Early blight disease of Potato

The host of the disease is *Solanum tuberosum*. The disease is caused by fungal pathogen *Alternaria solani*. The disease occur on the leaves at any stage of plant growth. The infected plant shows characteristic dark brown spots. These spots are later on surrounded by brown ring which looks like bull eye. The infected leaves may function as a new source of inoculums and infection.

7. Powdery Mildew disease of Pigeon pea

The Pigeon pea are commonly called as Arhar and scientifically it is known as *Cajanus cajan*. The disease is caused by fungal pathogen *Oidiopsis taurica*. The disease infected plant show white powdery growth of mycelia and conidia. The powdery patches is formed on the aerial parts of plant like leaves, flowers and pods. The severe infection causes heavy leaf fall of crop. The infection affects on the stunting plant. The white powdery growth may appear before the flowering stage of plant. The infection initiates the small chlorotic spots on the upper surface of leaves and subsequently on the lower surfaces. The chlorotic area is then turned to powdery patches appearing as white powdery mass.

8. Brown rust disease of Wheat

The host of this disease is *Triticum aestivum*. The fungal pathogen of the disease is *Puccinia triticina*. The infected plant shows small brown pustules on the leaf blades. The pustules are developed randomly over the leaf surface. The infection is observed on the leaf surface, leaf sheaths and also on stem. The infected pustules are known as Uredo pustules found on the leaves and stem part. The pustules may appear as small blisters. The brown pustules may turn into dark brown to black coloured and called as Teleuto pustules.

CONCLUSION

The plant diseases are predominantly caused by fungal pathogens. The disease to plant causes a great loss of

agricultural crops. The quantity and quality of crop is affected due to disease development. The infection of disease may start since from germination of seeds in soil. The plant can be infected at any stage of plant growth and development. The severe infection causes a great loss of yield to the growers or farmers. The disease directly reduces crop yield and in turn income of farmers. The diseases like rust, blight, powdery mildew, smut etc. are found in cultivated field of agricultural crops. The disease study may be helpful to the growers in understanding the disease incidence and loss of crop yield. The data regarding plant diseases may be useful in disease control.

FUTURE PERSPECTIVE

The control of plant disease needs data regarding disease incidence and development. The farmers can have information in terms of host, causal organism, symptoms and control measures of the disease. The infected host can be identified easily and destroyed as early as possible to avoid disease development. The disease can be controlled by applying different control measures such as chemical control, biological control, field sanitation, uprooting of infected plants, burning of infected field, integrated management of disease and use of disease resistance varieties. The chemical fungicides such as Bordo mixture, Mancozeb or Triforine may be applied by the farmers to eradicate the inoculums of pathogens. The Sulphur powder can be used to control fungal growth. The use of trusted fungicides play a key role in control of disease incidence and development. The cultural practices, proper irrigation, crop rotation, intercropping and sufficient soil drainage may help to reduce the crop diseases. The principles of disease control and management would be useful to prevent loss of crop yield.

REFERENCES

1. Pathak H, Maru S, Satya HN, Silawat SC (2015). Fungal Diseases of Trees in Forest Nurseries of Indore, India. *J Plant Pathol Microb*, 6: 297. doi:10.4172/2157-74.1000297.
2. Ullasa, B. and Sohi, H. (1978). Occurrence of *Leveillula taurica* on carica papaya in India. In *:Current Science*, 47(23): 911-913
3. Pawar VP, Vidya A, Patil (2011). Occurrence of powdery mildew on some wild plants from khandesh region of Maharashtra state. In: *Recent Research in Science and Technology*, 3: 94-95. 9.
4. O'Brien MJ, Rich AE, (1976). Potato diseases, US, Department of Agriculture Handbook. pp. 474. Parry DW, 1990. *Plant Pathology in Agriculture*, Cambridge University Press, 268-306.
5. Butler EJ (1997). Fungi of India, Biotech book Publication Delhi, 220.
6. Chankaew, S., Somta, P., Sorajjapinun, W., and Srinives, P. (2011). Quantitative trait loci mapping of *Cercospora* leaf spot resistance in mungbean, *Vigna radiata* (L.) Wilczek. *Mol. Breed*, 28: 255-264.