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Blister Blight (*Exobasidium vexans*) - A Threatened Problem in Tea Industry

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Abstract

Tea is one of the most consumed beverages and is produced from the tender leaves of the tea plant. Various biotic and abiotic factors are directly related to tea productivity. Among the biotic factors the most destructive one is the blister blight disease of tea caused by an obligate parasitic fungus *Exobasidium vexans*. The pathogen attacks the tender leaves of the tea plant which directly interferes with the economic growth of the tea growing countries as tea has tremendous export value. Application of protectant and eradicant fungicides have shown promising results for controlling blister blight.

Introduction

Tea (*Camellia sinensis*) is one of the oldest knownbeverages and is a perennial monoculture crop that are cultivated both large- and small-scale plantations. Tea is famous worldwide as it has tremendous health benefits, stimulating property and relatively low-cost drink. Tea plants have been placed in the family Camelliaceae with 82 species of the genus Camellia.

The tea industry is one of the oldest organized trades in India. The national economy of many countries is largely dependent upon the production of tea (Hazarika *et al*., 2009). Tea production is an important component of Indian agricultural production and gross domestic product (GDP). According to International Tea Committee, India is the second largest producer of tea after China, which account for 25% of global tea production and during the last five years the overall production of tea in India has increased by 10 percent (Tea Board of India, 2019).

Blister blight is capable of causing enormous crop loss throughout the tea growing regions of Asia; especially in India, Sri Lanka, Indonesia and Japan. Since the pathogen attacks harvestable tender shoots, it inflicts a global yield loss of 40%.

Symptoms

• The young and tender shoots show susceptibility to the pathogen and develop symptoms.

• The first indication of blister blight disease is a small, pale-green, pale-yellow or pinkish, translucent spot on the tea leaf.

• These tiny spots are referred as first stage of the disease. The circular spots enlarge until they reach a diameter of 3-12.5 mm.

• On the upper side of the leaf, the spots slowly become sunken into a shallow depression and on the under-side; they become correspondingly convex, forming the typical blister lesion.

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• The concave upper surface of the lesion is smooth and shiny, whereas the lower convex surface is at first dull, then grey and finally pure white, due to a dense, velvety growth on which the spores are produced (Figure 1).

Figure 1: Typical velvety blister growth on lower surface of leaf

• On severity, tea leaves become folded or irregularly rolled, blister lesions reached to the mid-rib and the margin.

• In stem, spots without blisters are formed and damages stem, leaves and buds wither.

The Pathogen

Exobasidium vexans is an obligate parasitic fungus systematically placed under Exobasidiaceae, Exobasidiales, Exobasidiomycetes, Basidiomycota.

Mycelium grows intercellularly and produces finger like houstoria which penetrate the leaf parenchyma cells. The hymenium forms belowthe epidermis on the lower surface of the infected leaf. A palisade of paraphyses and basidia arises, forcing up the epidermis which forms the blister and then rupture. Paraphyses are single, septate and apically rounded. The basidia are clavate, generally bear two sterigmata. Basidiospores are unicellular at first, but a septum develops on maturity; they are ellipsoid, initially hyaline.

Disease Cycle

Blister blight has a multiple disease cycle with a relatively short fungal life cycle of 11-28 days. The perennating mycelia persist within the branches and on necrotic blister lesions of the tea bushes or may produce thick walled spores. During favorable climatic conditions the mycelium become active and grows intercellularly for some time before the hymenium develops below the epidermis on the under-surface of the tender tea leaves.

Spread and Survival

• Primary spread: Basidiospores from infected seedlings.

• Secondary spread: Wind borne Basidiospores.

Epidemiology

• Spore germinates well when the relative humidity (RH) is more than 80% and water film is available on the leaf surface.

• If RH is < 80%, infection is delayed.

• Temperature above 32 °C is lethal for the basidiospore.

Management

Cultural Method

Various cultural operations like adequate weed control, changes in plucking and pruning regimes, lane cutting, shade patter and the careful choice of planting material has been practiced for controlling blister blight disease.

Since the pathogen infects only tender shoots, efforts were directed to reduce the disease severity by adopting early pruning and hand plucking (Eden, 1947). Collection and destruction of blister leaves in a huge scale along with chemical spraying have been found to be an effective control measure (Barthakur and Dutta, 2005). Severely infected tender young tea plants should be pruned immediately. At the onset of monsoon and during plucking the shade trees are pruned which allows sunlight to fall on the tea plants that causes reduction in disease incidence.

Chemical Method

Both contact and systemic fungicides are used to control tea diseases. Application of copper fungicides like copper oxychloride (50% w/w @ 1:400) at seven days' interval can help to manage the incidence of blister blight in the field.

A combination therapy of nickel chloride hexahydrate with copper oxychloride gives better protection from the disease in comparison to copper oxychloride or nickel chloride alone. Copper in colloidal form when mixed with low metallic copper content (15%) were found to be effective at one-third of wettable dispersible powders. Systemic fungicides like Hexaconazole, Propiconazole and Baycor are also recommended as foliar spray at 15 days' interval. Also spray with copper oxychloride 0.25% or carbondazim @ 750 g ha^{-1} in 1,000 litres of water.

Biocontrol Method

Antagonists like *Trichoderma harzianum, Gliocladium virens, Serratia marcescens, Pseudomonas fluorescens* and *Bacillus subtilis* are experimentally used in controlling blister blight of tea.

These antagonists are applied as formulations based on talc/ vermicompost but the results were not encouraging. Use of *Pseudomonas fluorescens* and *Bacillus subtilis* as liquid culture supplemented with ammonium sulphate and salicylic acid enhanced bio-efficacy especially when the disease incidence is less.

Conclusion

This disease can be managed through an integrated approach inclusive of cultural, chemical and biological methods. More investigations are required to develop a holistic approach which will help the researcher to design an integrated management strategy by combining all the possible

system like legalization of application of fungicides through forecasting systems, limiting their dosages with botanicals, implementing biological control agents, coupled with the novel cultural practices for the control of blister blight.

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