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Occurrence of Sclerotinia rot and Botrytis gray mould on lettuce under protected conditions in Himachal Pradesh

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ABSTRACT

Two new diseases on lettuce (*Lectuca sativa*) grown under protected conditions in the Department of Vegetable Science, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan, HP were reported and described for the first time in the region. The diseases were identified as Sclerotinia rot also known as lettuce drop and another Botrytis gray mould. The disease incidence of Sclerotinia rot and Botrytis gray mould was observed to be 0 to 68 per cent and 0 to 35 per cent respectively in different polyhouses at Nauni. The pathogens associated with these diseases were isolated in pure culture on PDA and identified. Two species of Sclerotinia namely *S minor* and *S sclerotiorum* were found associated with Sclerotinia rot and the pathogen causing gray mould was identified as *Botrytis cinerea*. Both the diseases are reported and described for the first time under protected conditions in Himachal Pradesh.

Keywords: Sclerotinia rot; lettuce drop; Botrytis gray mould, *Sclerotinia sclerotiorum, S minor, Botrytis cinerea*

INTRODUCTION

Lettuce (*Lactuca sativa* L) is an annual plant of family Asteraceae grown worldwide as a leafy vegetable and most often used for salads. It is also seen in other kinds of food such as soups, sandwiches and wraps. Lettuce is a good source of vitamin A and potassium as well as a minor source for several other vitamins and nutrients. In India lettuce is grown especially in temperate and sub-temperate regions in open as well as under protected conditions. Hilly states like Himachal Pradesh provide a congenial climate for commercial cultivation of lettuce. Hence work on its cultivation under protected conditions has been initiated in Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan, HP. Sufficient quantity of germplasm has been collected from various parts of the world for evaluation studies. Various agronomic

practices are also being standardized for its commercial cultivation under open and protected conditions. Since work on its cultivation has started recently no major diseases have been observed in this area till now. The crop is however known to be affected by various diseases caused by fungi, bacteria and viruses in various lettuce growing areas worldwide. During the present investigations two diseases caused by fungi have been reported and discussed for the first time in this region under protected cultivation conditions.

MATERIAL and METHODS

The present studies were conducted at experimental farm of the Department of Vegetable Science, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan, HP during 2011-13. Nauni is located at an altitude of 1,270 m above msl lying between 35.5° North latitude and 77.8° East latitude with sub-temperate climate. 28 different genotypes/ cultivars of lettuce were cultivated in a naturally ventilated polyhouse for evaluation studies. The healthy nursery plants were transplanted at a spacing of 30 x 30 cm in a plot of 1.50 x 1.20 m in the month of October during both the years. The standard cultural practices recommended in the package of practices of the university (Anon 2010) were followed to ensure a healthy crop stand. The crop was observed periodically for occurrence of any symptoms of disease. The crop was found infected with two diseases one causing drop and soft rot type and another causing gray mold and crown rot type of symptoms. The incidence of both the diseases was observed by following formula:

$$\text{Disease incidence (\%)} = \frac{\text{Number of plants infected}}{\text{Total number of plants}} \times 100$$

The symptoms of both the diseases were recorded during the growing period from time to time. The samples of diseased plant parts were observed under microscope separately as per standard procedures. The pathogens associated with both the diseases were isolated on potato dextrose agar (PDA) medium in the laboratory for further studies following standard procedures. The identification of the pathogens was done after microscopic observation on the morphological characters of the fungi as per Mordue and Holliday (1976) and Beever and Weeds (2004). The pathogenicity tests were performed and Koch's postulates were also proved for both the pathogens separately after artificially inoculating one month old lettuce seedlings grown in pots containing sterilized soil.

RESULTS and DISCUSSION

On lettuce crop grown under protected cultivation condition in the experimental farm of the Department of Vegetable Science two new diseases one Sclerotinia rot or drop and another Botrytis gray mold were observed during 2011-13. The symptoms and the pathogens associated with these two diseases are described as follows:

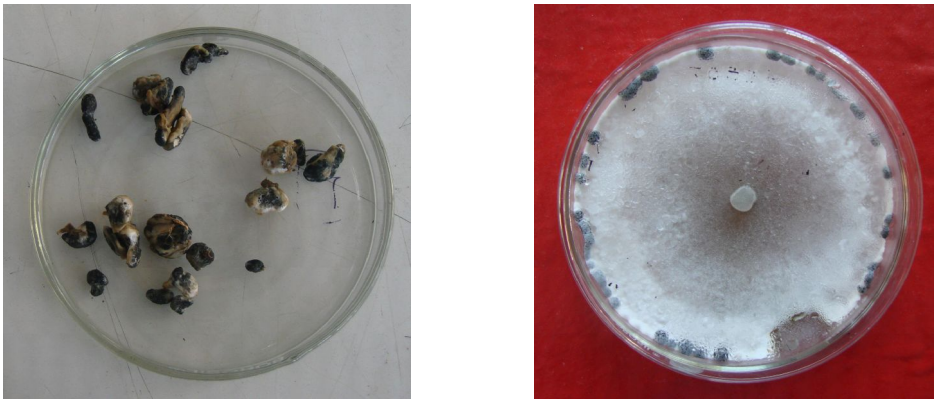
Sclerotinia rot

On leaves water soaked areas appeared which later got enlarged covering larger area of the foliage (Fig 1a). The infected tissues of leaf blade, leaf lamina and stem ultimately became soft and rotten (Fig 1b). On the diseased areas black coloured large sclerotia were also formed. The incidence of the disease ranged between 0 to 68 per cent on different genotypes of lettuce. The sclerotia were black in colour, smooth, rounded or elongated and 1-20 x 1-6 mm in size (Fig 1c). Sclerotia were formed by the fungal pathogen both in culture and infected tissues. The pathogen associated was isolated on potato dextrose agar medium and incubated at 25 ± 2^0C. The mycelium appeared as white in colour with dark coloured sclerotia appearing on the sides of the petri plates (Fig 1d). Under microscope the mycelium of the fungus was observed as hyaline, profusely branched and septate (Fig 1e). The morphological characters of the fungus were corresponding with published descriptions of *Sclerotinia sclerotiorum* and *S minor* (Mordue and Holliday 1976). The disease is known to occur worldwide causing heavy losses to the growers and both the pathogens *S minor* and *S sclerotiorum* have been found to be associated with lettuce drop (Subbarao 1998, Hao and Subbarao 2005). The fungus *S sclerotiorum* is considered as a polyphagous and has been reported to cause diseases in different vegetable crops like peas (Gangopadhyay and Kapoor 1975), cauliflower (Sharma et al 1982), carrot (Bharat et al 2012) in this region but not on lettuce. Hence to the best of our knowledge present is the first report on occurrence of Sclerotinia drop of lettuce caused by *S sclerotiorum* and *S minor* under protected conditions in Himachal Pradesh, India.

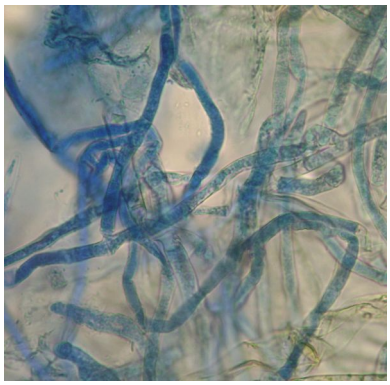
Botrytis gray mould

The initial symptoms of gray mould appeared as a water soaked gray to brown discolored areas and a fuzzy whitish gray to tan mould growing on the surface of affected plant parts (Fig 2a). Crown tissues of the severely infected plants turned brown to orange-brown in color with a soft rot (Fig 2b). The characteristic fuzzy gray growth of the fungal pathogen was also present on the affected crown tissue in contact with the soil. The affected plants wilted, collapsed and ultimately died. The incidence of the disease ranged between 0 to 35 per cent on different genotypes of lettuce. The pathogen when isolated in pure culture produced mycelium which was

a **b**



c **d**



e

Fig 1. Sclerotinia rot of lettuce, a. Symptoms on leaves, b. Soft rot of leaf lamina and stem, c. Sclerotia of *S sclerotiorum* and *S minor*, d. Culture of *Sclerotinia* spp on PDA, e. Mycelium of *Sclerotinia* spp under microscope (40X)

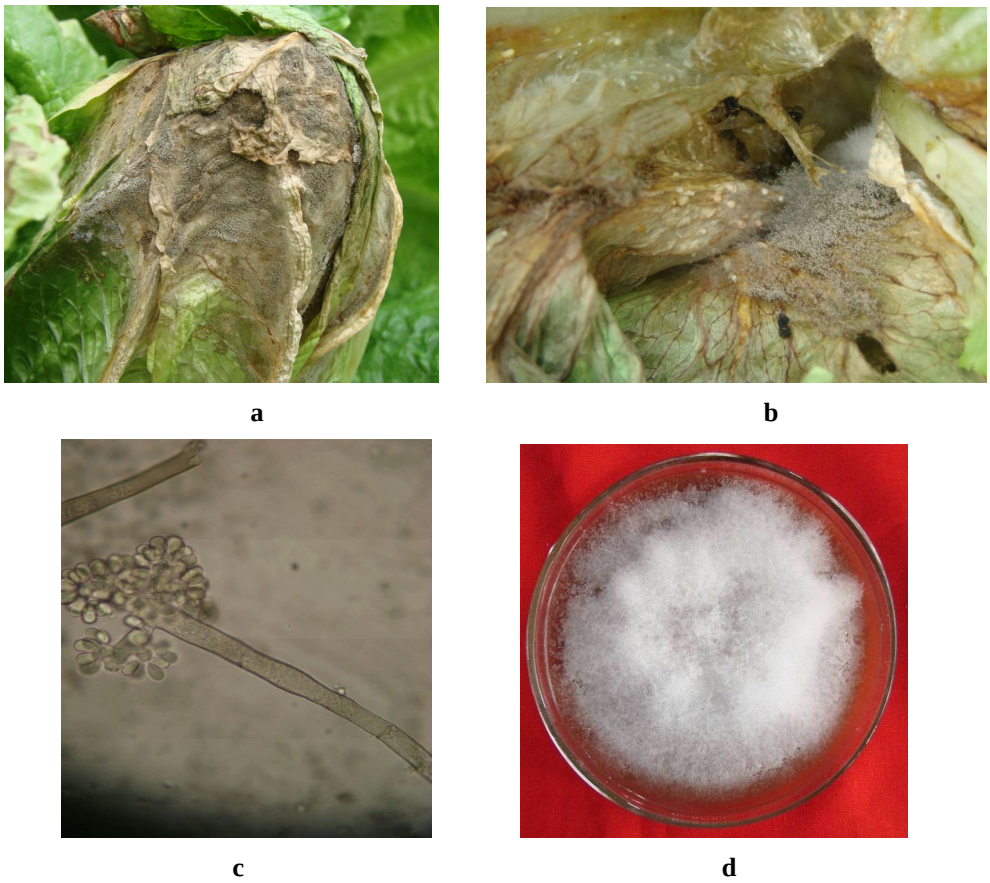


Fig 2. Botrytis gray mould of lettuce, a. Symptoms on leaves, b. Rotting and mould on stem, c. Culture of *Botrytis cinerea* on PDA, d. Conodiophore and conidia od *Botrytis cinerea* (40X)

white, dirty white or grayish white in color, or hyaline at first but soon became light gray, dark gray to dark brown (Fig 2c). Under microscope the mycelium appeared as branched, septate, hyaline to brown. Conidiophores were more or less straight, septate, branched towards the apex often dichotomously. Conidia were hyaline or pale brown and in mass they appeared ash-gray. They were ovate, ellipsoidal, narrowly ellipsoidal, pyriform or sometimes globose to subglobose. They were smooth, unicellular and measured 7.0-13.5 × 7.0-10.5 µm (Fig 2d). On the basis of the morphological characters of the fungus and its analogy with that given by Beever and Weeds (2004) it was identified as *Botrytis cinerea* Pers ex Fr. The fungus *B cinerea* is known to be a ubiquitous phylloplane inhabitant both as a saprophyte and a plant

pathogen. As a pathogen it is known to cause severe losses in many fruit, vegetable and ornamental crops by infecting leaves, stems, flowers and fruits. The complexity of the diseases caused by *B cinerea* in greenhouses makes this fungus one of the most important pathogens of vegetable crops grown under greenhouses (Elad et al 2004, Gupta and Bharat 2013). The fungus is known to cause Gray mould disease on lettuce in various lettuce growing areas of the world (Fiume and Fiume 2005). However this constitutes the first report on occurrence of Botrytis gray mould caused by *B cinerea* on lettuce under protected cultivation conditions in Himachal Pradesh, India.

Further studies are needed on both the diseases reported under present investigations as the intensity of these diseases may increase as the cultivation of lettuce is intensified in the area.

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