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# The Silent Threat: Sclerotinia Stem Rot's Impact on Indian Mustard Production

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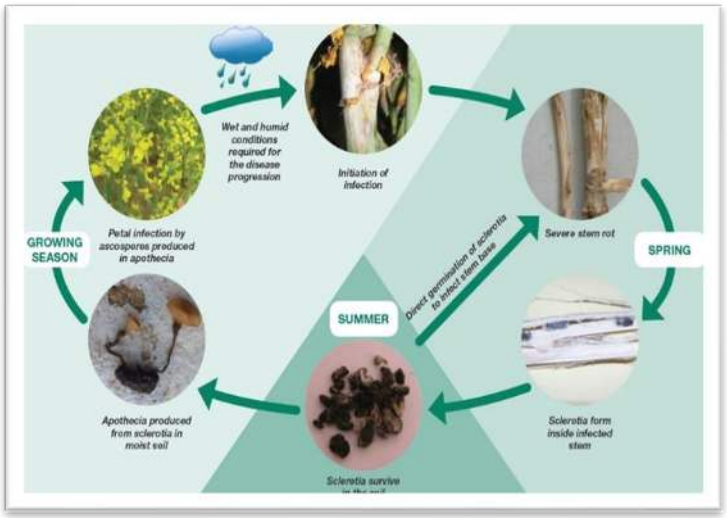
**Jashanpreet Singh[1], Rohit Kumar[1], Rinku Bhaskar[1]**

[1]Ph.D. Research scholar, Department of Plant Pathology, Sardar Vallabhbhai Patel University of agriculture and Technology, Meerut (U.P.) 250110

Indian mustard [*Brassica juncea (L.) Czern. & Coss.*] is one of the most important and oldest known oil seed crops of the Indian subcontinent. The crop is mainly cultivated during rabi season in different ecosystem and cropping sequences in North-western part of the country predominantly in the states of Rajasthan, Uttar Pradesh, Haryana, Punjab, Madhya Pradesh, etc. More than 20 diseases are known to occur on rapeseed-mustard, which cause substantial losses in yield, seed quality, oil content and reduce its market value. But only few are considered as major diseases such as Alternaria blight (Alternaria brassicae, A. brassicola and A. raphani), White rust (Albugo candida) + Downy mildew (Perenospora parasitica) complex, Sclerotinia stem rot (SSR) caused by Sclerotinia sclerotiorum (Lib.) de Bary is known as most ubiquitous and destructive disease that occurs from major rapeseed-mustard growing countries of the world. The disease occurs particularly in cool and wet seasons in many countries and first it was reported from Pusa (Bihar) in India. The yield losses caused by this disease in rapeseed-mustard vary from year to year or the percentage of plants infected with their different growth stages.




## Symptomology

- Being a highly necrotrophic and a non-specific nature, S. sclerotiorum produced white rot or mold or soft rot symptoms on different plant parts of rapeseed-mustard viz., leaf, stem, root and silique.
- The characteristic symptoms first appeared on leaves with round brown spots followed by shoot hole which later develop as the elongated water-soaked lesions at the base of the stem approximately 25-50 cm above soil level.
- Such lesion expands rapidly and usually become bleached and necrotic with subsequently

development of patches of fluffy white mycelium on affected part.

- ❖ The affected stems show shredding and bear many greyish-white to black, sclerotia either on the surface or in the pith of the stem of the affected plant.
- ❖ At the maturation, the plant tends to lodge, touching the silique to the soil level.

## Causal Pathogen

The disease is caused by the fungus *S. sclerotiorum (Lib.) de Bary.*

The pathogen belongs to the sub-division Ascomycotina, Class–Discomycetes, Order-Heliotiales in the family of Sclerotiniaceae, thus considered as higher fungi. It produces hyaline, septate and branched hyphae (never branched at the right angle) with multinucleate cells which may appear white to tan in culture and in the plant. The hyphae become thickened and produce white cottony growth of mycelium which covering with small liquid droplets that later fuse together to form a large sclerotium. The sclerotia are developed by rounding off the growing margins of the white fluffy mycelium that measures 2-10 x 3-15 mm in size with irregular, globose to cylindrical in shape. The ascospores are hyaline, uniseriate, ellipsoid and binucleate, 10–14 × 4–5 µm developed in ascus.

## Disease Cycle and Epidemiology

*S. sclerotinia* spent about 90 per cent of their life in soil or on crop debris as sclerotia (resting structure). Therefore, the disease cycle of S. sclerotium begins with overwintering of sclerotia and comprises various asexual and sexual forms that help in recurrence of the disease in successive seasons. The sclerotia serve as the primary surviving structure that provides the source of infection of the pathogen year after year by mixing in soil during harvesting or by sowing of contaminated seeds. Such buried Sclerotia in soil can germinate either myceliogenically to produce vegetative hyphae or cryogenically to produce apothecia. During carpogenic germination, sclerotia germinate to produce a cup shaped structure called apothecia that mature to produce thousands of ascospores which facilitate the infection in crop plants. However, the secondary infection occurs through the contact of infected tissues with green, healthy tissues. It has been reported that pathogen needs continuous moisture for about 10 days for development of apothecia which even not develop under low moisture conditions. The pathogen does not produce apothecia at either 30 or 5 ℃. The temperature ranges 10–20°C was the most congenial for disease development. The Ascospores required continuous leaf wetness for 48-72 h approximately for infection in susceptible host plants.

## Disease Management

The disease can be managed effectively by the integration of various practices of crop management i.e. cultural, physical, biological and chemical methods which increase attainable crop yield. Ploughing of field is become as one of the most effective cultural practices that significantly reduce the inoculum of the pathogen from the soil.

The application of balanced fertilization with macro and micronutrients reduced the disease severity. A minimum of 5-year crop rotation of two non-host crops is essential to decrease the infection level of *S. sclerotiorum*. Flooding of the field (once a week) prior to sowing resulted in the least disease incidence of *S.*

*sclerotiorum* while an optimum irrigation applied once in 3 or 7 days of interval produced lower disease intensity as compared to the control. A number of biocontrol agents i.e. fungi and bacteria have been characterized for reducing the build-up of the pathogen by degrading their soil–borne inoculum. The application of balanced fertilization with macro and micronutrients reduced the disease severity.

Flooding of the field (once a week) prior to sowing resulted in the least disease incidence of *S. sclerotiorum* while an optimum irrigation applied once in 3 or 7 days of interval produced lower disease intensity as compared to the control. Several beneficial fungi viz., *Coniothyrium minitans*, Trichoderma spp., *Gliocladium spp.,* etc. and bacterial species viz., Bacillus spp., Pseudomonas spp., Streptomyces sp., etc showed strong antagonistic activities against *S. sclerotiorum*

## Conclusion

Sclerotinia stem rot caused by *S. sclerotiorum*, is a most devastating disease of rapeseed-mustard. In India, during eighty- ninety this disease was of minor importance but in recent years it has gained importance and become a serious threat to rapeseed-mustard production in major growing areas and causes considerable yield losses. The pathogen causes disease at the flowering stage; therefore, it is necessity to aware to farmers for this stage and also suggest to adopt the suitable management tactics at this stage that significantly manage this disease and increase farmers income.

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