



Integrated Disease Management of Sclerotinia Stem Rot of Indian-Mustard (*Brassica juncea* (L.) Czern & Coss.)

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Indian-mustard (*Brassica juncea* (L.) Czern & Coss.) also known as the name of Rapeseed-mustard, Rai, Raya and Laha, is the most important edible oilseed crop in India and abroad which is consumed by human being in the form of oil and condiments. It's belongs to the plant family *Brassicaceae* (*Cruciferae*) or the mustard family and chromosome number $(2n)=36$. Mustard is a most important oilseed crop which is cultivated as *Rabi* crop season. During the late 19th century it was believed that *B. juncea* probably originated in China and entered India through a North Eastern route independent of any Aryan incursion.

The crop suffers from many fungal, bacterial and viral diseases but the important among them are powdery mildew, downy mildew, white rust, Alternaria blight and Sclerotinia stem rot. Stem rot of Indian-mustard is wide spread and worldwide in occurrence and has been reported from other countries like Canada, Holland, Germany, U.K., Nepal and China. In India reported this disease first time from Pusa, (Bihar) on mustard crop. Since then it was found to occur in other part of the country.

Sclerotinia sclerotiorum is a cosmopolitan species with a host range of over 350 species in 60 families. The pathogen can infect most of the cruciferous crops including Rapeseed mustard, Chinese mustard, Cabbage, Cauliflower and Broccoli at almost all the growth stages of the crop on major parts like leaves, stem, pods and roots. Losses due to this disease observed 72 percent yield from Uttar Pradesh and up to 50.9 per cent from Rajasthan.

Symptoms

The first symptoms of the disease are noticed on the ground level stem when the plants are about to flowering stage in the month of January to February and the temperature ranges from 10-15°C. The affected part of stem become water-soaked, turn brown and finally straw colored followed by appearance of thick white mycelial mat on the affected surface and discoloration of the underlying tissues at the soil level or a little higher above the soil. Dense white growth of the fungus with loosely attached black sclerotial bodies of variable size and shape, cover the stem a little below the soil level. At the later stage of the disease development, hyphae spread rapidly, especially inside the stem pith and from numerous irregular, black sclerotia of different sizes. On splitting of the diseased stem, the sclerotia are found attached on the inner lining of the stem, which can be seen, easily with naked eyes. As a result of such infection, the diseased plants wither-off. This gave a fragile and sometimes shredding appearance of the affected stem. The siliquae either do not develop or under develop due to infection of the inflorescence. The leaves of the affected plants also become yellowish and ultimately drop the ground.

			
Affected part of stem	Affected stem near the soil	Splitting of stem seen	Various shape of sclerotia
			
Germination of sclerotia	Formation of Apothecia	<i>Sclerotinia sclerotiorum</i>	

Management

1. Cultural Method:

- Crop debris and disease material should be collect and burn.
- Deep ploughing of field during summer season.
- Crop rotation with non-host crops like wheat, barley, rice, maize etc.
- Use of clean seeds (healthy seed), certified seed, without the presence of sclerotia should be used.
- Proper field sanitation.
- Removal of collateral host and weeds viz., *Chenopodium sp.*, *Asphodelus* (Pyazi).
- Follow optimum time of sowing (between 16-31 October).
- Apply recommended dose of fertilizers *i.e.* @ N: P: K: S – 60:40:40:40 kg/ha

2. Chemical Method:

- Seed treatment with Carbendazim @ 2g/kg of seeds was also found effective in minimize the disease incidence.
- The prophylactic foliar spray with Carbendazim @ 0.1% twice at 45 and 60 DAS was most effective in controlling *Sclerotinia* stem rot of Indian-mustard.
- Seed dressing with Carbendazim, Thiram, Bayleton @ 2g/kg seed against *Sclerotinia* stem rot of mustard.
- Foliar spray of fungicides Azoxystrobin @ 280-400 ml/acre (prior to 30% blooming stage) and Fluoxastrobin @ 59-118 ml/acre and Prothioconazole @ 125-150 ml/acre (prior to 20-50% blooming stage) was also very effective in *Sclerotinia* stem rot of mustard.

3. Bio-control/Eco-friendly Method:

- Seed treatment with *Trichoderma viride* @ 10g/kg, soil treatment @ 2.5 kg/ha and two foliar spray @ 0.2% at 50 and 60 days after sowing against sclerotinia stem rot of mustard.
- Seed and foliar spray with Garlic clove extract (10%) against *Sclerotinia* stem rot of mustard.
- Soil application of Zinc @ 25 kg/ha. with mustard cake @ 2 ton/ha. against *Sclerotinia* stem rot of mustard.
- Field application of Vermi-compost @ 5.0 ton/ha. + *Trichoderma harzianum* @ 5.0 kg/ha. has resulted in reduction of the disease incidence.
- Soil incorporation of mixture *Trichoderma harzianum* and *T. viride* @ 2.5 kg/ha. pre-incubated in 50 kg of FYM/ha. at the time of field preparation.
- Soil amendments with Mustard cake, Sesamum cake and Jamun seed powder (*Syzygium cuminii*) and poultry manure has also been effective in reducing seedling mortality, number of apothecia production, lesion length and disease intensity in mustard.

4. Resistant Varieties:

- Nine genotypes viz., Cutton, ZYR-6, PSM-169, Wester, PYM-7, Parkland, Tobin and Candle showed resistance to stem rot in India.
- Four genotypes viz., PCR-10, RW-8410, RW-9401 and RGH-8006 had resistance against *Sclerotinia sclerotiorum*.
- Genotypes/lines BLN 3630 (EC 597274) of *Brassica napus* and Berry (EC 597329) of *B. juncea* as resistant to disease.
- Other resistance varieties like- Norin-9, BOH-2600, RRN-505, Hyola-401, RH-492, PAB-9511, RH-1222-28, DRMR 2035.