

Disease management

Club Root: *Plasmodiophora brassicae*

Symptoms : Affected plants look stunted. Pale green or yellow leaves develop, and later the plants die untimely.

Non-chemical management:

1. Apply long-term crop rotation (four years) with non-host crops
2. Destroy all cruciferous weeds
3. Avoid growing in fields with previous history of disease occurrence
4. Avoid growing mustard in acidic soils
5. Treat the soil with *Trichoderma*



Infected roots

Downy Mildew: *Peronospora parasitica*

Symptoms : Grayish white irregular necrotic patches develop on the lower surface of leaves. The affected inflorescence does not produce any siliqua or seed. The extent of damage is 17-32 % in mixed infection.

Non-chemical management:

1. Destroy the diseased crop residue
2. Follow crop rotation at least in three years
3. Varieties of *Brassica napus* groups are resistant to this disease
4. Timely sowing and use of healthy certified seeds
5. Application of potash in recommended doses reduces the disease index



Infected leaf

Chemical management: Spray the crop with Mancozeb 75 % W.P. @ 2 gm per liter of water at the onset of the disease for 2 to 3 times with an interval of 10 days. Treat the seeds with 6 gm of Metalaxyl (Apron) per kg seed, followed by single spray with Metalaxyl (Ridomil MZ) at 2.5 gm/liters at 60 days after sowing.

Disease management



Infected stem and siliquae

Powdery Mildew: *Erysiphe cruciferarum*

Symptoms : Dirty white, circular, floury patches on either side of the leaves. Under cold and cloudy environmental conditions, entire leaves, stems and siliquae are affected.

Non-chemical management:

1. Clean the field
2. Destroy crop residues
3. Application of potash in recommended doses reduces disease index.

Chemical management: Spray the crop with soluble sulphur @ 3 gm/liter of water at the onset of the disease and repeat it after 15 days if necessary or apply sulphur dust @ 30kg/ha. If required, use 12 kg per acre of land. Apply Dinocap or Tridemorph @ 1ml per liter of water.

White Rust: *Albugo candida*

Symptoms : White creamy-yellow raised pustules appear on the leaves, which later coalesce to form patches. Swelling and distortion of the stem and floral parts results in 'stag head.' In humid weather, mixed infection of white rust and downy mildew can develop on stag head structures.

Non-chemical management:

1. Use healthy certified seeds and follow crop rotation
2. Destroy crop residues of the last year, particularly stag heads of previous crop.
3. Avoid over-irrigation.

Chemical management: Spray the crop with Mancozeb 75 % W.P. @ 2 gm per liter of water at the onset of the disease. Repeat the spray after 15 days interval or spray with Metalaxyl @ 2.5 gm/liter of water. Treat the seeds with Apron SD-35 @ 6g/kg seed or Thiram @2.5 gm/kg seed.



Infected leaf

Insect pest management



Mustard aphid: *Lipaphis erysimi*

Damage : Both nymph and adults suck the sap from tender leaves, buds and pods. Curling may occur for infested leaves; and at advanced stage, plants may wither and die. Plants remain stunted, and sooty molds grow on the honeydew excreted by the insects. The infested field looks sick and blighted in appearance.

Non-chemical management:

1. Early sowing before 20th October reduces the damage
2. Grow aphid-tolerant varieties like Pusa Kalyani, Laha 101, C. 294, R.L.M. 84, and R.P. 09
3. Regular surveillance of pests and defenders, especially for aphids
4. Conserve native natural enemies like *Poxy nerids*, *Syrphids* and *C.carnea*
5. Ladybird beetles (*Cocciniella septem*, *Punctata*, *Menochilussex maculata*, *Hippodamia variegata* and *cheilomones vicina*) are the most efficient predators of the mustard aphid. Adult beetle may consume an average of 10 to 15 adults/day
6. Predatory bird *Motacilla cospica* is actively feeding on aphids in February-March. Therefore, provide bird perches @ 8-10/acre
7. Spraying of NSKE 5% or other neem formulations at recommended doses



Chemical management: Spraying should be done only when insect population is more than economic threshold level (ETL). Spraying should be done in the evening to avoid damage to pollinators. Spray the crop on as-needed base with either Oxydemetons methyl (Metasystox) or Dimethoate (Rogor) @ 400 ml/acre, or Imidacloprid (Confidor) 17.8 SL @ 50-60 ml/acre, or Thiamethoxam @ 50-60 g/acre.

Insect pest management



Larger Moth (Leaf webber): *Crocidolomia binotalis*

Damage : Newly hatched larvae feed gregariously initially on the chlorophyll of young leaves and later on older leaves, buds and pods; they make webbings and live within. Severely attacked plants are defoliated. Seeds in the pods are also eaten away.

Non-chemical management: Collection and careful destruction of the larvae at gregarious stage while on surveillance. Spraying of NSKE 5% or other neem formulations containing 300 ppm Azadirachtin @ 1 liter / acre. Spraying of BT formulation (Dipel, Delfin, Biodart, Halt, Bioasp, Biolep etc.) @ 400 gram/acre during evening hours at 7-10 days intervals from appearance of the pest.

Chemical management: Spray Endosulfan, Triazophos, or Monocrotophos @ 400 ml/acre or Carbaryl @ 800 gram/acre is effective.

Diamondback Moth: *Plutella xylostella*



Damage : Caterpillars feed on the foliage and make it white and papery. The leaves look withered but in later stages it may be eaten up completely. Caterpillars also bore into pods and feed on developing seeds.

Non-chemical management: Install eight to ten pheromone traps to control the adult males. Conserve its natural enemies like *Cotesia plutellae* and *Diadegma insulare* as they are an important parasitoid for diamond back moth. Spraying of NSKE 5% or other neem formulations containing 300 ppm Azadirachtin @ 1 liter /acre. Spraying of BT formulation (Dipel, Delfin, Biodart, Halt, Bioasp, Biolep etc.) @ 400 gram /acre during evening hours at 7-10 days intervals from appearance of the pest.

Chemical management : Spray Fipronil 5 SC (Regent) or Chlorfenapyr (Rampage) 10 SC or Triazophos 40 EC (Hostathoin) @ 400 ml/acre or Flufenoxuron (Cascade 10 WDC) @ 120 ml/acre.

Insect pest management



Cabbage Head Borer: *Hellula undalis*

Damage : Caterpillars initially mine the leaves and make it white and papery. Later they feed on leaves and bore into stems; entrance hole is covered with silk and excreta.

Non-chemical management: Collection and careful destruction of the larvae at gregarious stage on leaves twice a week. Spray NSKE 5% or other neem formulations containing 300 ppm Azadirachtin @ 1 liter /acre. Spray BT formulation (Dipel, Delfin, Biodart, Halt, Bioasp, Biolep etc.) @ 400 gram/acre during evening hours at 7-10 days intervals from appearance of the pest.

Chemical management: Spray Ethofenprox @ 200 ml/acre, Endosulfan, or Triazophos @ 400 ml/ acre two to three times at an interval of ten days.

Mustard Sawfly: *Athalia lugens proxima*

Damage: Initially the larva nibbles on leaves, later it feeds from the margins towards the midrib. Feeding results in drying up of seedlings and failure to bear seeds in older plants. The yield loss is up to 5 -18 %.

Non-chemical management: Maintain clean cultivation. Apply irrigation in seedling stage because most of the larvae drown to death. Collect and destroy grubs of the sawfly in morning and evening. Conserve *Perilissus cingulator* (a parasite of the grub). Use of bitter gourd seed oil emulsion as an anti-feedant. Spray NSKE 5% or other neem formulations containing 300 ppm Azadirachtin @ 1 liter /acre.

Chemical management: Spray the crop with Endosulphan 35 EC, or Quinolphos 25 EC or Triazophos 40 EC @400 ml/acre.

