AGRI MAGAZINE
(International E-Magazine for Agricultural Articles)
Volume: 03, Issue: 05 (May, 2026)
Available online at http://www.agrimagazine.in

Black Rot of Crucifers and Its Control

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Black rot of crucifers is one of the most destructive diseases affecting crops of the family Brassicaceae such as cabbage, cauliflower, broccoli, mustard, and turnip. It is caused by the bacterium *Xanthomonas campestris* pv. *campestris* (Xcc), and occurs worldwide, especially in warm and humid regions. This disease leads to severe yield and quality losses, making produce unmarketable and economically damaging to farmers.

Causal Organism

Pathogen: *Xanthomonas campestris* pv. *campestris*
Nature: Gram-negative bacterium
Survival: Seed-borne, survives in crop debris and cruciferous weeds

Host Range

The pathogen infects almost all cruciferous crops, including:
Cabbage
Cauliflower
Broccoli
Brussels sprouts
Kale
Mustard
Radish and turnip
It can also survive on cruciferous weeds like wild mustard and shepherd's purse.

Symptoms

Typical symptoms of black rot include:
Leaf Symptoms
Yellowing at leaf margins
Formation of characteristic V-shaped lesions pointing toward the midrib
Necrosis (dead tissue) in affected areas
Vein Discoloration
Veins turn black, giving the disease its name
Net-like blackening visible when leaves are held to light
Systemic Infection
Bacteria spread through vascular tissues
Wilting, stunting, and plant death may occur
Advanced Symptoms
Internal stem tissues become black
Heads remain small and unmarketable

Disease Cycle and Epidemiology

The disease is primarily seed-borne, and even a very small percentage of infected seeds can initiate epidemics.

Bacteria enter plants through:
- Hydathodes (leaf margins)
- Wounds

Spread occurs via:
- Rain splash
- Irrigation water
- Tools, insects, and human activity.

Favorable Conditions
- Warm temperature (25–30°C)
- High humidity
- Frequent rainfall

These conditions accelerate disease development and spread.

Economic Importance
- Causes **10–50% yield loss** in severe cases
- Reduces both quality and storage life of produce
- Makes vegetables unsuitable for market

Management and Control Measures
1. Cultural Practices
- Use **disease-free certified seeds**
- Follow **crop rotation (2–3 years)** with non-crucifer crops
- Remove and destroy infected plant debris
- Control cruciferous weeds
- Avoid overhead irrigation to reduce leaf wetness

2. Seed Treatment
- Hot water treatment (50°C for 20–30 minutes)
- Chemical seed treatments to eliminate bacteria

These methods help reduce seed-borne inoculum.

3. Resistant Varieties
- Use resistant or tolerant cultivars where available
- Breeding programs are focusing on genetic resistance

4. Chemical Control
- Copper-based bactericides
- Antibiotics (in limited use)

However, chemical control is **not fully effective** alone and should be integrated with other methods.

5. Biological Control
- Use of beneficial microbes like:

✓ *Bacillus spp.*
✓ *Pseudomonas spp.*

These suppress pathogen growth and reduce disease severity.

6. Sanitation Measures
- Disinfect tools and equipment
- Avoid working in wet fields
- Maintain field hygiene

Conclusion
Black rot of crucifers is a serious bacterial disease with global importance. Due to its seed-borne nature and rapid spread under favorable conditions, it is difficult to control. An **integrated disease management approach** combining cultural, biological, and chemical methods is essential for effective control and sustainable production.

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