



## Fungal Diseases of Capsicum and Their Management

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Capsicum is an important cash crop of India having several production constraints. Among various biotic factors; disease caused by fungal are important because fungal spores are easily disseminated by means of wind, seed, infected debris, humans etc. In this article, we discuss various fungal diseases and their management with brief description.

### Introduction

*Capsicum annum* L. is an important tropical and subtropical crop on the basis of its high consumption, nutritional and cash value to farmers and consumers. It contains approximately 20~27 species, 5 of which are domesticated namely *C. annum*, *C. baccatum*, *C. chinense*, *C. frutescens* and *C. pubescens* and among these *C. annum* is one of the most common cultivated crops worldwide followed by *C. frutescens*. Historically, domestic and wild species of Capsicum were found in the New World as early as prehistoric times and have its origin at southwestern Ecuador. It is one of the first cultivated crops in the Central and South America. Crop has high nutritional value comprising biochemical compounds such as capsteam; a volatile oils, fatty oils, capsaicinoids, carotenoids, vitamins (A, C, E), potassium, folic acid, protein, fiber and mineral elements. Capsicum suffers from both biotic and abiotic stresses which cause immense losses to the growers. Among various biotic stresses, crop is infected by as many as 26 diseases at various stages of crop. Out of these 5 diseases are considered to be of major importance while 21 are minor diseases. There are 12 diseases those are of fungal origin, 2 bacterial and 12 viral diseases that limits the capsicum production. Though, maximum losses in capsicum are caused by fungal pathogens to the tune of percent mold and mildew and leaf spot disease.

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| 1. Anthracnose (Ripe rot)          | 7. Alternaria Rot                          |
| 2. Cercospora leaf spot (Frog eye) | 8. Gray mould                              |
| 3. Choanephora Blight              | 9. Phytophthora blight                     |
| 4. Damping-Off and Root Rot        | 10. Powdery mildew                         |
| 5. Fusarium Wilt                   | 11. Stem rot (Southern blight, Collar rot) |
| 6. Gray leaf spot                  | 12. Verticillium wilt                      |

**1. Anthracnose (Ripe rot) *Colletotrichum* spp.**

Anthracnose occur in field as pre or post harvest decay with watersoaked, sunken lesions with dark red to light tan lesions have scattered concentric rings of spore masses. Disease is known to be caused by different *Colletotrichum* species complex viz., *C. gloeosporioides*, *C. acutatum*, *C. coccodes*, *C. boninense* and *C. truncatum*. Though the pathogen survives on infested debris, but disease is also known to be of seed born origin. Disease can be managed with seed treatment with Thiram (0.3%) or captan (0.3%). Foliar application of Carbendazim (0.1%) or Thiophanate methyl (0.1%) is beneficial. Avoid rotating tomato and pepper crops. Treat seeds with *T. viridae* 4g/ kg or *Pseudomonas flourescens* 10g/ kg of seed 24 hours before sowing is beneficial.

**2. *Cercospora* leaf spot (Frog eye) *Cercospora capsici***

Circular spots having reddish-brown margin with a dark ring and a yellowish halo around the ring is the origin of name “frog eye leaf spot. Disease is initiated primarily from sources of infection are infected seeds, volunteer plants and infected plant debris. Secondary spread is through air-borne conidia. Pathogen is most damaging in tropical and sub-tropical regions where a warm, wet condition prevails. Measures like treatment of seed with hot water at 52°C for 30 minutes, use of seeds from disease free areas. Spray of Mancozeb 2g/lit or Copperoxychloride 2.5 g/lit fungicides when the disease symptom appears in the field and repeating it fortnightly is useful in management of disease.

**3. Choanephora Blight – *Choanephora cucurbitarum***

Water soaked lesions appear on the leaves and the margins, leaf tips gets blighted. The disease causes greatest destruction in rainy season in tropical climates. Initial symptoms are associated with flowers, buds or apical growing points and later fungus grows downward killing the plant. Wet rot develops on affected parts. Infected parts of the stem appear wet and green. The bark easily peels off in shreds. Any method which increases air movement in the crop canopy to reduce the humidity may aid in management.

**4. Damping-Off and Root Rot - *Pythium* spp, *Rhizoctonia solani* and *Fusarium* spp.**

This disease causes pre-emergence and post-emergence damping off in the nursery. Young seedlings die in patches due to softening and decay of tissues in the collar region. The fungi of seedling disease are soil inhabitants whose activity is enhanced by undecomposed organic matter in soil and high soil moisture. Pre-emergence damping off may be prevented by treating the seeds with *Trichoderma viridae* at 4 g/Kg, Captan or Thiram at 2g/kg of seed 24 h before sowing. Drench nursery with copper oxychloride 2.5 g /lit or at 4 lit./m<sup>2</sup>. *Pythium* is more active at lower temperature and *R. solani* at higher temperature. Management strategies also include use of optimum seed rate, irrigation and raised seed beds away from shady places in well drained soils.

**5. Fusarium Wilt – *Fusarium oxysporium* f. sp. *capsici***

Slight yellowing of foliage with wilting of upper leaves with vascular system of plant discoloured in lower stem and roots. The disease appears in localized areas of the field where high percentages of the plant wilt and die. *Fusarium* is a soil-borne fungus. Once a field is

infested, the pathogen may survive in the soil for many years. Infection initiates from resting spore Chlamydo spores, Soil, Seed and later spread disease by microconidia, macro conidia, and water. Drenching with 1 % Fytolan in raised, well drained nursery and seed treatment with 4 g *Trichoderma viridae* or Carbendazim 2g per Kg seed is effective.

6. **Gray leaf spot** – *Stemphlium solani*

Small circular spots in leaf with white center and irregular lesions in stem and petioles. Most damaging in nursery beds whereas in field it exists in all stages of plant growth they seldom are numerous enough to cause problem in field and managed with fungicidal spray for other diseases.

7. **Gray mold** - *Botrytis cinerea*

Initial infection occurs when fruit are in direct contact with the soil. The fungus also colonizes dying flowers and fruit through the stem end, growth cracks and wounds. *Botrytis* also infects cold-injured fruits. Mostly symptoms appear sudden collapse of succulent tissue of the plant result in death later gray powdery masses of the fungus found on the surface of dead plant. Management tactics involves crop rotation with cereals for at least 2 years, proper drainage in nursery, avoiding over-fertilization with nitrogen. Thoroughly, incorporate green manures or cover crops and allow debris to decompose before establishing a new crop. Limit irrigation during and after bloom with restricted morning irrigation so that plants do not stay wet more than 12 hours.

8. **Phytophthora Blight** – *Phytophthora capsici*

The disease occurs on any growth stage or plant part. Disease is characterized mostly by collar rot and wilt brown stem discoloration extending upward from soil line. Pathogen is soil born and rain splashes carry inoculum into canopy that causes stem, leaf, and fruit infection. The long-term survival of oospores in absence of a host limits the effectiveness of this strategy as a stand-alone tool. Disease can also be managed by cultivation in elevated beds, good water management and fungicides such as mefenoxam, metalaxyl can minimize the disease losses.

9. **Powdery Mildew** – *Leveillulataurica* asexual stage *Oidiopsis sicula*.

Yellow blotches appear on upper surfaces initial stages of leaves. These areas later turn necrotic. Infected leaves curl upward, and a powdery, white growth is visible on the underside of leaves. Pathogen is air born with warm temperature together with low light conditions generally favor disease development. Spray wettable powder with 2.5 gm/ Lit. or carbendazim 1g/lit, Hexaconazole 5 E.C. (0.05%) at fortnightly intervals.

10. **Southern Blight (Stem rot, Collar rot, Sclerotium Wilt)** – *Sclerotium rolfsii*, sexual stage *Pellicularia rolfsii*

A sudden wilt of individual plants scattered about the field. It causes damping-off of seedlings below or at the soil level. Foliar symptoms include progressive yellowing with fan-like webs of whitish mycelium around the rotted stem having small mustard seeds sized brown sclerotia. These sclerotia are localized soil inhabiting resting structure and may be transported to long distance with farm equipment or poor quality seed. High humidity and warm temperatures generally favor rapid fungal growth and disease development. Deep ploughing to bury the

resting structure. Drenching the soil around plant with carbendazim 1g/lit is useful. Biological control using *Trichoderma* spp. and *Gliocladium virens* offer some protection.

11. **Alternaria Rot** – *Alternaria alternata*, *A. solani*

*A. alternata* and *A. solani*, can cause serious yield losses in capsicum crops. Symptoms may include leaf spots leading to defoliation, fruit rots and stem lesions on seedlings or transplants. Fruit and seedling infections often occur on areas with previous injuries. The larger lesions may show alternating light and dark-brown concentric zones. The effectiveness of a pre storage dry heat treatment and hot water dip in reducing storage rots of capsicum caused by *Alternaria alternata*. Treatment with hot air at 38 ° C for 48-72 h or hot water at 50 ° C to 53 ° C for 2 to 3 min, resulted in reduction in the pathogenicity and development of these pathogens in inoculate peppers. Fungicides like Indofil M-45 and Z-78, and Chlorothalonil were found effective against *Alternaria* leaf spot disease. Timely spray of Captan or Zeneb or Mancozeb @ 3g/ lit. is effective.

12. **Verticillium Wilt** – *Verticillium dahliae*, *V. albo-atrum*, *Verticillium* spp

Stunted plant with leaves upwards curling later defoliating leaves with fungus blocking the vascular system lead to wilting of plant. These soil borne pathogens have characteristic symptom of infection is a V-shaped lesion that develops on older leaf tips that later expands to cover the leaf. Crop rotation with non solanaceous crops up to 3-4 year is useful. Use of resistant varieties of *Capsicum annum* viz., Mariza 786 and 1005, Gorolyutlahot, UC-635 and PI-164847.

### Conclusion

Fungal diseases cause maximum losses in capsicum cultivation. Various strategies including crop sanitation, appropriate spacing, crop rotation and proper moisture levels along with seed treatment, biocontrol agents, selecting resistant varieties with judicious and timely application of alternate fungicidal spray reduces diseases.

### Literature for Further Reading

Black LL, Green SK, Hartman GL, Poulos JM. Pepper Diseases: A field Guide, AVRDC, Taiwan

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