Agri Articles
(e-Magazine for Agricultural Articles)
Volume: 03, Issue: 01 (JAN-FEB, 2023)
Available online at http://www.agriarticles.com
©Agri Articles, ISSN: 2582-9882

Fungal Disease of Chilli and Its Management Approach

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Chilli (*Capsicum annuum* L.) is one of the important cash earning crop, mainly cultivated for its vegetable green chilli and dry chilli as a spice of commerce. India is the largest chilli producer and contributes to about 25 per cent to total world production followed by China and Pakistan.Majorchilli growing countries, producing 1.446 million tonnes of ripe dry chillies with an area of 0.869 million hectares and has been the second largest exporter of chilli in the international market, exporting products ranging from dried form of chilli to chilli powder and oleoresins across 90 countries (Muthukumar*et al.*, 2010). India also leads in the context of maximum area covered under chilli cultivation. Chilli fruit is used fresh, cooked, pickled and canned in sauces and as powder for hot spices (Parey*et al.*, 2013). Nadkarni (1927) has reported many medicinal value of chilli.It is economically very important and valuable crop throughout the world. The native home of chillies is considered to New Mexico. Portuguese brought chillies in Indo-Pak subcontinent from Brazil. The world's total production of chilli is approximately around 3.47million tonnes. India is the world's largest producer, consumer and exporter of chillies in the world. Other major chillies producing countries are China, Bangladesh, Peru, etc. Chilli is also an important cash crop of Pakistan. The reasons of this reduction are various and many but the major threat in chilli production are various pests and pathogens which cause considerable losses every year. Major insects and disease which attack on chilli plant are Aphids, Mites, Thripsetc beside pests, different pathogens also cause various diseases in chilli crop and reduce yield of the plant e.g. fungi, viruses, bacteria and nematodes. Among other pathogens the fungal diseases are more destructive than diseases cause by other pathogens. Common fungal diseases are Damping off, Phytophthora root rot, Powdery mildew, Fusarium wilt, Anthracnose etc.

Damping off – *Pythiumaphanidermatum*

Most *Pythium*species cause seed rot and damping off of many crops including chilli and tomato (Shah and Burns, 1996).Disease of nursery beds and young seedlings resulting in reduced seed germination and poor stand of seedlings.25-75% loss. A positive probably synergistic interaction between *Trichoderma*spp. Strains and bacterial strains have been reported for combined applications in controlling plant pathogens (Fogliano *et al.*, 2002). Sudharani *et al.*, (2014) reported a positive interaction between PGPR's and fungal bio-agents with increased seedling vigour and root and shoot biomass.

Symptoms

- Pre-emergence damping off: Seedlings disintegrate before they come out of soil surface.

- This is known as pre-emergence damping-off which results in poor field emergence / poor seed germination.
- Post-emergence damping off is 350haracterized by development of disease after seedlings have emerged out of soil surface but before the stems are lignified.
- Lesion formation at collar region.
- Infected areas appear brown and water soaked.
- Plants shrivel and collapse as a result of softening of tissues.
- Infected stems become hard, thin and infected seedlings topple. Disease appear in patches both in nursery and field beds.

Figure 1: Infected plant and fruit of chilli.

Disease cycle

- P.I: Oospores in soil or plant debris
- S.I: Zoospores through irrigation water

Favourable conditions

- Excessive and frequent irrigation.
- Poorly drained soil and close spacing.
- High soil moisture with temp around 25-30o C
- *P. aphanidermatum*, prefer temp above 200 C
- Heavy rainfall.

Management

- Raise nursery in light soil with proper drainage
- Burning farm trash on the surface of the beds.
- Sowing seed on raised beds of 6-8" high (15cm)
- *Using low seed rate of 650 g/cent.*
- Seed dressing with Argosan or ceresan or Thiram or captan @ 2-3 g/Kg.
- Soil drenching with 1% Bordeaux mixture or COC@ 0.3% .
- Biocontrol with *Trichodermaviride*and *Trichodermaharzianum*

2) Die-back (anthracnose)and fruit rot– *Colletotrichum capsici*

Chilli fruit rot and dieback is a fungal problem witnessed globally. This disease is observed at the flowering stage of chilli growth. Flowers dry up resulting in profuse shedding.

Symptoms

- December - October in transplanted crop
- Small, circular to irregular, brownish black scattered spots appear on leaves.
- Severely infected leaves defoliate.
- Infection of growing tips leads to necrosis of branches from tip backwards.
- Necrotic tissues appear grayish white with black dot like acervuli in the center.

- Shedding of flowers due to the infection at pedicel and tips of branches

Fruit symptoms

- Ripe fruits are more liable for attack than the green ones. Small, circular, yellowish to pinkish sunken spots appear on fruits
- Spots increase along fruit length attaining elliptical shape.
- Severe infection result in the shriveling and drying of fruits.
- Such fruits become white or grayish in colour and lose their pungency.
- On the surface of the lesions minute black dot like fruiting bodies called **"acervuli"** develop in **concentric rings** and fruits appear straw coloured.
- The affected fruits may fall off subsequently.
- The seeds produced in severely infected fruits are discoloured and covered with mycelial mat.

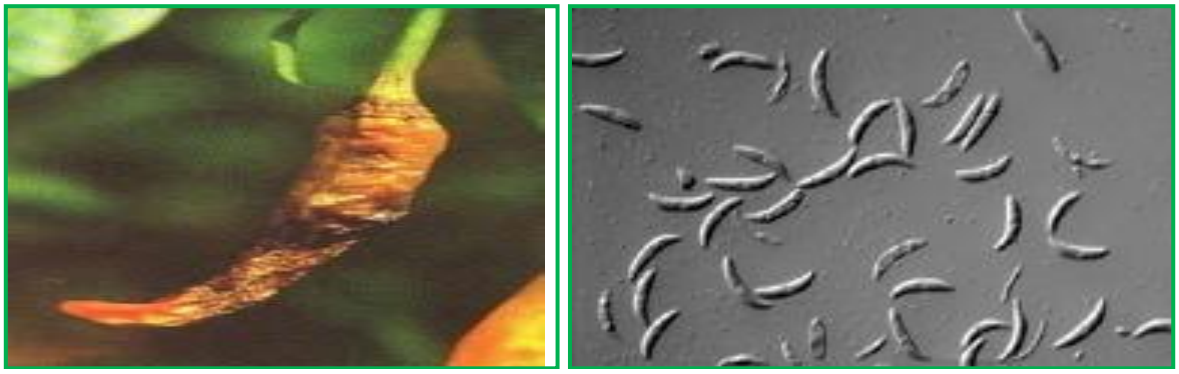

Figure 2: Infected fruit of chilli with inside microscope view of conidia.

Pathogen: The mycelium is septate and grows both inter and intracellularly in the host tissue. The asexual fruiting bodies, acervuli contain many rigid, brown coloured, 1-5 septate setae. A large number of conidia are borne on conidiophores in each acervulus which are falcate, unicellular and hyaline having a normally truncated base.

Disease cycle

- P.I: Infected seeds and diseased crop debris.
- S.I: Conidia dispersed by rain splash and wind.

Favourable conditions

- Temp, 280 C with RH more than 97%.
- Humid weather with rainfall at frequent intervals.

Management

- Collect and destroy all infected plant parts.
- Collect seeds only form fruits without infection.
- Removal and destruction of Solanaceous weed hosts and infected plant debris.
- Seed treatment with captan or Thiram 3-4g/kg.
- Spray thrice with captan@1.5% or mancozeb@0.25%.
- just before flowering, at fruit formation stage and 15 days after second spray. Resistant varieties: G3, G4, B61, etc.
- Findings of the earlier workers indicated that Mancozeb and Propiconazole fungicides were effective against Colletotrichumcapsici, when tested in vitro or in vivo (Sinde *et al.*, 2012; Pardhi and Raut, 2011).

3) Powdery mildew: – *Leveillulataurica*

- Usually seen from December - February

Symptoms

- White powdery coating appears mostly on the lower surface.

- Sometimes the powdery coating can also be seen on the upper surface.
- Correspondingly on the upper surface yellow patches are seen.
- Severe infection results in the drying and shedding of affected leaves.
- Powdery growth can also be seen on young fruits, and branches.
- Disease fruits do not grow further and may drop down.

Figure 3: White powdery coating appears in chilli plant.

Disease cycle

- P.I: Dormant mycelium in the infected crop debris.
- S.I: Air-borne conidia.

Favourable conditions

- Cool dry weather favours conidial germination.
- High RH favours disease development.

Management

- Spraying wettable S@0.3% or Dinocap or Carbendazim or Tridemorph 0.1%.

4) Cercospora leaf spot :–*Cercosporacapsici*

- October - November and continues up to February

Symptoms

- Circular spots with brown margins appear on leaves.
- The spots enlarge and coalesce with others.
- The central portion of the spot becomes white and the leaves turn yellow anddefoliate.
- Sometimes central portion of spot drops off.
- Spots also appear on stems and twigs as dark brown, irregular lesions with whitishcenters.
- In severe cases die-back of twigs occur.

Figure 4: Circular spots with brown margins appear on chilli leaves.

Disease Cycle

- P.I: Dormant mycelium in infected plant debris, infected seeds and volunteer plants.

- S.I: Wind borne conidia.

Management

- ST with carbendazim@2g/kg seed
- Spray carbendazim@0.1% or Difolaton@0.3% at 15 days interval

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