

# 1. Tomato Bacterial Spot

## 1. What is "Tomato Bacterial Spot"?

- It is a **bacterial disease** that affects tomato leaves, stems, and fruits.
  - Caused by **bacteria of the genus *Xanthomonas*** — mainly *Xanthomonas campestris* pv. *vesicatoria* (also known as *Xanthomonas euvesicatoria*).
  - It occurs commonly in **warm, wet, and humid weather** and spreads rapidly under such conditions.
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## 2. Symptoms of Bacterial Spot

### On Leaves:

- Small, **water-soaked dark spots** (1–3 mm) appear on leaves, especially the lower ones.
- Spots later turn **brown to black** with **yellow halos** around them.
- As the infection worsens, spots may **merge and cause leaf blight** (large dead patches).
- Severely infected leaves become **dry, curled, and drop off** early, leading to defoliation.

### On Stems and Petioles:

- Small, **dark, raised spots** may appear on stems and petioles.
- Lesions can enlarge, causing cracking or wilting of shoots in severe cases.

### On Fruits:

- Small, **raised, brown to black scabby spots** develop on green fruits.
  - Spots may have a **rough or crusty texture** and can make fruits **unmarketable**.
  - Spots do not usually extend deep into the fruit flesh, but they **spoil the appearance and quality**.
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## 3. What Causes It?

- Caused by *Xanthomonas* bacteria that survive in:
  - **Infected plant debris, seeds, or volunteer plants**
  - **Contaminated tools, equipment, or water**
- Favors:
  - **Warm (25–30°C)** and **humid weather**
  - **Frequent rain, dew, or overhead irrigation**
  - **Crowded plantings with poor air flow**

## 4. How Does It Spread?

- Through **infected seeds or transplants**.
  - By **wind-driven rain, splashing water, or handling of wet plants**.
  - Also spread through **tools, hands, and insects**.
  - Can spread **very quickly in nurseries and fields** during rainy or humid periods.
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## 5. Effect on Tomato Plants

- Causes **defoliation (leaf drop)** leading to **reduced photosynthesis**.
- Results in **sunsald on fruits** due to loss of leaf cover.
- **Reduces fruit yield and quality**, making them unfit for market.
- Severe infections can lead to **significant economic loss**.

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## 6. Prevention and Management

### Cultural Control:

- Use **disease-free and certified seeds** or treat seeds with **hot water (50°C for 25 minutes)** before sowing.
- **Avoid overhead irrigation** to reduce water splash.
- **Rotate crops** for at least 2–3 years with non-solanaceous crops (not tomato, pepper, or potato).
- **Remove and destroy infected plants** and crop residues.
- **Ensure good air circulation** by proper spacing and pruning.
- Avoid **working with plants when leaves are wet**.

### Chemical Control:

- Apply **copper-based bactericides** (e.g., copper hydroxide, copper oxychloride).
- Use **combination sprays** of copper + mancozeb for better protection.
- Repeat sprays at **7–10 day intervals** during favorable conditions.
- Avoid overuse of copper to prevent resistance and phytotoxicity.

### Greenhouse Care:

- Disinfect **tools, trays, and surfaces** before each crop cycle.
- Maintain **proper ventilation and humidity control**.
- Regularly **monitor for symptoms** and remove infected plants early.

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# 2. Tomato Early Blight

### 1. What is "Tomato Early Blight"?

- It is a **fungal disease** that affects tomato leaves, stems, and fruits at all growth stages.
- Caused by the fungus *Alternaria solani*.
- It is one of the **most common and destructive tomato leaf diseases**, especially in **warm and humid climates**.

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### 2. Symptoms of Early Blight

#### On Leaves:

- Appears first on **older (lower) leaves** as **small brown or black spots**.
- Spots enlarge to form **circular lesions (0.5–1 cm)** with **concentric rings** (target-like pattern).
- Yellowing occurs around the spots, and affected leaves **wither and drop prematurely**.
- As disease progresses, it **moves upward** on the plant.

#### On Stems:

- Small, **dark, elongated lesions** appear near the base of the stem or on branches.
- Lesions may **girdle stems**, causing wilting or collapse of branches.
- In seedlings, infection at the stem base causes **collar rot** or **seedling blight**.

#### **On Fruits:**

- Usually appears on **green or ripening fruits** near the stem end.
  - Spots are **large, dark brown, sunken**, with **concentric rings**.
  - Fruit rot may occur, and infected fruits may **drop or become unmarketable**.
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#### **3. What Causes It?**

- Caused by the **fungus *Alternaria solani***.
  - Survives in:
    - **Infected plant debris, soil, and volunteer plants.**
    - Can also be seed-borne.
  - Favors:
    - **Warm temperature (25–30°C)**
    - **High humidity or frequent rain**
    - **Stressed plants** (due to poor nutrition or drought)
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#### **4. How Does It Spread?**

- Through **airborne spores** spread by **wind, rain splash, or irrigation**.
  - Also spreads via **infected tools, hands, or transplants**.
  - Fungus can **survive long periods in crop residues** and infect the next crop if debris is not removed.
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#### **5. Effect on Tomato Plants**

- Causes **premature leaf drop**, reducing the plant's photosynthetic area.
  - Leads to **poor fruit development and ripening**.
  - Can cause **significant yield loss**, especially under humid conditions.
  - In severe cases, plants may **defoliate completely**, exposing fruits to **sunsald**.
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#### **6. Prevention and Management**

##### **Cultural Control:**

- Use **disease-free seeds** and **resistant or tolerant varieties** if available.
  - Remove and destroy **infected plant debris** after harvest.
  - Practice **crop rotation** (avoid tomato or potato for 2–3 years on same soil).
  - Avoid **overhead watering** and water at the base of the plant.
  - Ensure **good spacing and air circulation** between plants.
  - Mulch soil to reduce **soil splash** of spores onto lower leaves.
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##### **Chemical Control:**

- Apply fungicides preventively or at **first appearance of spots**.
- Effective fungicides include:
  - Mancozeb
  - Chlorothalonil
  - Copper oxychloride
  - Azoxystrobin or Difenoconazole (systemic fungicides)
- Repeat sprays at **7–10 day intervals** during favorable weather.

#### **Greenhouse Care:**

- Maintain **low humidity** and **proper ventilation**.
- **Disinfect trays, tools, and surfaces** regularly.
- Avoid **overcrowding plants** and keep foliage dry.

## **3. Healthy Tomato leaf**

### **1. What is a Healthy Tomato leaf?**

- A healthy tomato leaf is **free from diseases, pests, and nutrient deficiencies**.
  - It grows **vigorously with strong stems, lush leaves, and well-developed fruits**.
  - Supports **maximum photosynthesis, fruiting, and yield** under proper care.
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### **2. Characteristics of a Healthy Tomato leaf**

#### **Leaves:**

- Fresh **green color** with no spots, yellowing, or curling.
- Firm, turgid, and fully expanded.
- No signs of **mold, mildew, or insect damage**.

#### **Stems and Branches:**

- Strong, upright stems with **uniform green color**.
- No cracks, lesions, or wilting.
- Branches are well-branched and can **support fruit load**.

#### **Flowers and Fruits:**

- Flowers **bloom normally** with good pollination.
- Fruits are **uniform in size, shape, and color**, with no blemishes or rot.
- Fruits **develop properly and ripen evenly**.

#### **Roots:**

- Wide, **well-branched root system** with fine root hairs.
  - No rotting or discoloration; roots firmly anchor the plant.
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## **3. Conditions Favoring Healthy Growth**

- **Sunlight:** 6–8 hours of direct sunlight daily.
  - **Temperature:** Moderate, between 20–30°C.
  - **Watering:** Regular, even watering; avoid water stress.
  - **Soil:** Well-drained, fertile soil rich in organic matter.
  - **Fertilization:** Balanced nutrients (NPK and micronutrients).
  - **Air circulation:** Proper spacing to reduce humidity and prevent disease.
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## **4. Benefits of a Healthy Tomato leaf**

- High **photosynthesis efficiency** → vigorous growth.
  - High **fruit yield** and quality.
  - Resistance to **pests and diseases**.
  - Uniform fruit ripening and longer shelf life.
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## 5. Maintenance for Healthy Leaf

### Cultural Practices:

- Use **certified seeds or healthy seedlings**.
- **Regular pruning** to remove dead leaves and improve airflow.
- **Mulching** to retain soil moisture and prevent soil-borne diseases.
- Practice **crop rotation** to maintain soil health.

### Pest and Disease Monitoring:

- Inspect plants regularly for **early signs of infection or pest attack**.
- Use **organic or chemical control measures** as needed.

### Water and Nutrient Management:

- Water **at the base of the plant** to avoid wetting foliage.
- Provide **balanced fertilization** according to growth stage.
- Avoid over-fertilization, which can weaken plant resistance.

## 4. Tomato Late Blight

### 1. What is "Tomato Late Blight"?

- It is a **serious fungal-like disease** that affects tomato plants, especially during **cool and moist weather**.
  - Caused by the **oomycete (water mold) *Phytophthora infestans***.
  - It is the **same pathogen that causes late blight in potatoes**.
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### 2. Symptoms of Late Blight

#### On Leaves:

- Starts as **irregular, water-soaked, pale green or grayish spots** on leaf edges or tips.
- Spots enlarge rapidly and turn **dark brown to black**, often surrounded by a **light green or yellow halo**.
- On the **underside of leaves**, a **white, fuzzy mold growth** appears, especially in humid conditions.
- Leaves quickly **wilt, die, and collapse**, giving the plant a scorched look.

#### On Stems:

- Dark brown to black **lesions develop on stems and petioles**, which can **girdle the stem** and cause the plant to collapse.

#### On Fruits:

- Fruits develop **large, firm, greasy-looking brown patches**.
- Under humid conditions, a **white fungal growth** may appear on the fruit surface.
- Infected fruits **rot quickly** both on the plant and after harvest.

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### 3. What Causes It?

- Caused by *Phytophthora infestans*, a fungus-like microorganism (oomycete).
  - Survives in:
    - Infected plant debris, volunteer plants, or potato tubers in the soil.
    - Cool, wet weather and poorly drained fields or greenhouses favor infection.
  - Favors:
    - High humidity (above 90%)
    - Moderate temperature (15–25°C)
    - Prolonged leaf wetness or dew
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### 4. How Does It Spread?

- Through **airborne spores (sporangia)** that can travel long distances by wind.
  - Spread also by **rain splash, infected soil, tools, or transplants**.
  - Under favorable weather, the disease can **spread rapidly** and **destroy entire fields** within days.
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### 5. Effect on Tomato Plants

- Causes **rapid destruction of foliage, stems, and fruits**.
  - Severely reduces **photosynthesis and fruit quality**.
  - Results in **huge yield losses** or **total crop failure** if not managed early.
  - Fruits become **unmarketable** due to rot.
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### 6. Prevention and Management

#### Cultural Control:

- Use **disease-free seeds or seedlings**.
- Avoid **overhead irrigation**; use drip watering instead.
- Remove and destroy **infected plants immediately**.
- Provide **good field drainage and plant spacing** for air movement.
- Avoid **planting tomatoes near potatoes** (as the disease can spread between them).
- Rotate crops — **do not plant tomatoes in the same area for at least 2–3 years**.

#### Chemical Control:

- Apply fungicides preventively or at the **first sign of infection**.
- Effective fungicides include:
  - Mancozeb
  - Chlorothalonil

- o Metalaxyl or Metalaxyl-M (systemic)
- o Cymoxanil + Mancozeb combinations
- o Copper-based fungicides (for organic systems)
- Repeat sprays at **7–10 day intervals** during high-risk periods.

#### **Greenhouse Care:**

- Maintain **low humidity** and **good ventilation**.
- Avoid **condensation on leaves** by proper air circulation and temperature control.
- **Clean tools, walls, and benches** regularly to prevent contamination.

## **5. Tomato Leaf Mold**

### **1. What is "Tomato Leaf Mold"?**

- It is a **fungal disease** that primarily affects **tomato leaves**, especially under **greenhouse or humid conditions**.
  - Caused by the fungus ***Fulvia fulva*** (also known as *Cladosporium fulvum*).
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### **2. Symptoms of Leaf Mold**

#### **On Leaves:**

- Starts as **pale green to yellow spots** on the **upper surface of older (lower) leaves**.
- As disease progresses, the **underside of the leaf** develops **olive-green to gray or brown mold** (fuzzy appearance).
- Leaves may **curl, dry up, and drop early**.
- Usually starts from lower leaves and spreads upward.

#### **On Stems and Fruits:**

- Rarely affected.
  - Sometimes **mold may appear on fruit stems**, but it is not common.
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### **3. What Causes It?**

- Caused by **fungus *Fulvia fulva***, which survives in:
  - o Infected plant debris
  - o Contaminated greenhouse walls, tools, or seeds
- Favors:
  - o Warm, **humid, and poorly ventilated environments**
  - o **High humidity (above 85%)** and moderate temperature (20–25°C)

### **4. How Does It Spread?**

- Through **airborne spores**, especially in **moist air**.
  - Spread by **water splash, hands, tools, or infected transplants**.
  - Can spread **rapidly in greenhouses or polyhouses** if not controlled.
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## 5. Effect on Tomato Plants

- Reduces **photosynthesis** due to leaf loss.
  - Can cause **major yield loss** if not treated early.
  - Fruits may **not ripen properly** due to weak plants.
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## 6. Prevention and Management

### Cultural Control:

- Maintain **good air circulation** (space plants properly).
- Avoid **overhead watering**.
- Water **early in the day** to let leaves dry by evening.
- **Remove and destroy infected leaves** immediately.
- Use **resistant varieties**, if available.

### Chemical Control:

- Apply fungicides like:
  - Chlorothalonil
  - Mancozeb
  - Copper-based sprays
  - Azoxystrobin or Tebuconazole (systemic fungicides)
- Spray when the disease is **first seen** and repeat as needed.

### Greenhouse Care:

- Keep humidity low by:
  - Ventilation
  - Heating during night (if needed)
  - Avoid overcrowding plants

# 6. Tomato Septoria Leaf Spot

## 1. What is "Tomato Septoria Leaf Spot"?

- It is a **fungal disease** that primarily affects **tomato leaves**.
  - Caused by the fungus ***Septoria lycopersici***.
  - It is one of the **most common leaf diseases of tomato**, especially in **warm and humid conditions**.
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## 2. Symptoms of Septoria Leaf Spot

### On Leaves:

- Small, **water-soaked, circular spots** (1–3 mm) appear on **older, lower leaves**.
- Spots have **grayish centers with dark brown to black margins**.
- As infection progresses, **many spots merge**, causing **yellowing and premature leaf drop**.
- Usually **starts on lower leaves and spreads upward**.

#### **On Stems and Fruits:**

- Stems may develop **dark lesions**, but usually less severe than on leaves.
  - Fruits are **rarely affected**, but severe leaf loss can reduce **fruit quality and yield**.
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#### **3. What Causes It?**

- Caused by fungus ***Septoria lycopersici***, which survives in:
    - Infected plant debris in soil or greenhouse
    - Contaminated seeds or tools
  - Favors:
    - Warm (20–27°C) and humid conditions
    - Frequent rain or overhead irrigation
    - Poor air circulation
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#### **4. How Does It Spread?**

- Through **water splash from rain or irrigation**.
  - Spread via **contaminated tools, hands, and infected seedlings**.
  - Can **rapidly infect nearby plants**, especially under high humidity.
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#### **5. Effect on Tomato Plants**

- Causes **defoliation**, reducing the plant's **photosynthetic area**.
  - Leads to **weaker plants**, poor fruit development, and **reduced yield**.
  - Severe infections can cause **economic loss** due to decreased fruit quantity and quality.
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#### **6. Prevention and Management**

##### **Cultural Control:**

- Use **disease-free seeds and seedlings**.
- Remove and destroy **infected leaves** immediately.
- Practice **crop rotation** — avoid planting tomato or other solanaceous crops in the same soil for 2–3 years.
- Avoid **overhead irrigation**; water at the base of the plant.
- Ensure **proper spacing and good ventilation** to reduce humidity.
- **Mulch soil** to prevent spore splash from soil onto lower leaves.

##### **Chemical Control:**

- Apply fungicides preventively or at the **first appearance of spots**.
- Effective fungicides include:
  - Mancozeb
  - Chlorothalonil
  - Copper oxychloride
  - Azoxytrophin (systemic)
- Repeat sprays at **7–10 day intervals** during humid, wet weather.

##### **Greenhouse Care:**

- Maintain **low humidity and proper ventilation**.

- Disinfect tools, trays, and surfaces regularly.
- Avoid **overcrowding plants** to reduce leaf wetness.

## 7. Tomato Two-Spotted Spider Mite

### 1. What is "Tomato Two-Spotted Spider Mite"?

- It is a **pest problem** caused by the **tiny arachnid mite *Tetranychus urticae***.
  - Not a fungal or bacterial disease, but a **serious pest** affecting tomato plants in **hot, dry conditions**.
  - Called “two-spotted” because **adult mites have two dark spots** on their bodies.
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### 2. Symptoms of Two-Spotted Spider Mite Infestation

#### On Leaves:

- Leaves show **small, pale yellow or whitish specks** (stippling) on the upper surface.
- Heavily infested leaves **turn bronze or yellow**, curl, and **dry out**.
- Leaves may **fall prematurely** under severe infestation.
- Fine **webbing** is visible on leaves and stems in severe cases.

#### On Stems and Fruits:

- Stems may be **covered with fine webbing**, but structural damage is minor.
  - Fruits are **rarely directly damaged**, but **fruit yield and quality decline** due to leaf damage.
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### 3. What Causes It?

- Caused by the **mite *Tetranychus urticae***, which thrives in:
    - **Hot and dry weather** (high temperature and low humidity).
    - Dusty conditions and water-stressed plants.
  - Mites reproduce **rapidly**, making infestations explosive in a short time.
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### 4. How Does It Spread?

- Mites **move slowly from plant to plant**, but can be carried by:
    - **Wind**
    - **Tools, hands, and clothing**
    - **Infested transplants**
  - Populations **increase rapidly** in warm, dry, and dusty environments.
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### 5. Effect on Tomato Plants

- Reduces **photosynthesis** due to leaf damage.
  - Leads to **stunted growth, weak plants**, and lower fruit yield.
  - Severe infestations can **cause plant death** in extreme cases.
  - Leaves **lose color, curl, and dry**, reducing plant vigor.
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### 6. Prevention and Management

#### Cultural Control:

- **Maintain plant health** by proper watering and fertilization.
- **Remove and destroy heavily infested leaves**.
- **Reduce dust** in greenhouses or fields by regular watering of soil or pathways.

- Avoid overcrowding plants to improve airflow.
- Introduce predatory mites (biological control) to naturally reduce pest populations.

#### Chemical Control:

- Apply **miticides** such as:
  - Abamectin
  - Bifenazate
  - Propargite
  - Hexythiazox (for eggs and immature stages)
- Rotate chemicals to **prevent resistance**.
- Treat **early**, before population explosion and web formation.

#### Greenhouse Care:

- Maintain **moderate humidity** to discourage mite reproduction.
- Inspect plants **regularly** for early signs of infestation.
- Disinfect tools and equipment to **prevent spreading mites**.

## 8. Tomato Target Spot

### 1. What is "Tomato Target Spot"?

- It is a **fungal disease** that affects **tomato leaves, stems, and fruits**.
- Caused by the fungus ***Corynespora cassiicola***.
- Common in **warm, humid conditions**, especially in **greenhouses or fields with poor air circulation**.

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### 2. Symptoms of Target Spot

#### On Leaves:

- Starts as **small, brown to black circular spots** on older leaves.
- Spots **enlarge** and develop **concentric rings**, giving a **target-like appearance**.
- Surrounding tissue may **yellow**, and leaves may **wilt, curl, and drop prematurely**.
- Severe infections lead to **defoliation**, reducing plant vigor.

#### On Stems:

- Small, **dark lesions** appear on stems and petioles.
- Lesions can **coalesce**, causing **weak stems and branch collapse**.

#### On Fruits:

- **Sunken, dark spots** appear on green or ripening fruits.
- Spots may enlarge and affect **fruit quality**, making them unmarketable.

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### 3. What Causes It?

- Caused by fungus ***Corynespora cassiicola***, which survives in:
  - Infected plant debris or crop residues
  - Contaminated tools, seeds, or transplants
- Favors:
  - Warm (25–30°C) and humid conditions

- o Frequent rainfall or overhead irrigation
  - o Poorly ventilated greenhouses or dense planting
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#### 4. How Does It Spread?

- Through **airborne spores** carried by **wind or rain splash**.
  - Spread via **infected tools, hands, seedlings, or transplants**.
  - Can **rapidly infect nearby plants** in wet, humid conditions.
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#### 5. Effect on Tomato Plants

- Causes **leaf loss**, reducing photosynthesis.
  - Weakens plants, leading to **poor fruit development and ripening**.
  - Severe infection can cause **major yield loss** and **economic damage**.
  - Fruits may **become unsalable** due to blemishes and rot.
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#### 6. Prevention and Management

##### Cultural Control:

- Use **disease-free seeds and healthy transplants**.
- Remove and destroy **infected leaves and debris**.
- Practice **crop rotation** — avoid tomatoes or related crops in the same field for 2–3 years.
- Avoid **overhead irrigation**; water at the base of plants.
- Ensure **proper spacing and ventilation** to reduce humidity.
- **Mulch soil** to prevent spore splash onto lower leaves.

##### Chemical Control:

- Apply fungicides preventively or at **first appearance of spots**.
- Effective fungicides include:
  - o Mancozeb
  - o Chlorothalonil
  - o Copper-based fungicides
  - o Azoxystrobin or Difenoconazole (systemic)
- Repeat sprays at **7–10 day intervals** during humid weather.

##### Greenhouse Care:

- Maintain **low humidity** and proper ventilation.
- **Disinfect tools, trays, and surfaces** regularly.
- Avoid **overcrowding plants** and keep foliage dry.

## 9. Tomato Mosaic Virus (ToMV)

### 1. What is "Tomato Mosaic Virus"?

- It is a **viral disease** that affects tomato plants, causing **stunted growth and mosaic patterns on leaves**.
- Caused by **Tomato Mosaic Virus (ToMV)**, a member of the **Tobamovirus** group.
- Common in **greenhouses and fields**, especially where hygiene is poor.

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## 2. Symptoms of Tomato Mosaic Virus

### On Leaves:

- Leaves show **mosaic or mottled light and dark green patterns**.
- Leaves may **curl, become distorted, and show blister-like swellings**.
- Younger leaves are usually **more severely affected**.
- Leaf size may be **reduced**, and overall foliage looks abnormal.

### On Stems:

- Stems are usually **weaker**, and internodes may be **shortened**, leading to **stunted growth**.

### On Fruits:

- Fruits may be **smaller, deformed, and unevenly ripened**.
  - Some fruits may have **mottled or streaked skin**, reducing marketability.
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## 3. What Causes It?

- Caused by **Tomato Mosaic Virus (ToMV)**.
- Virus survives in:
  - Infected plant debris
  - Seeds, tools, and hands
- Favors:
  - Poor hygiene and contaminated equipment
  - Handling of infected plants

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## 4. How Does It Spread?

- Through **mechanical transmission** — infected **tools, hands, clothing, and seeds**.
  - Spread is **not by insects**, unlike many other plant viruses.
  - Highly **contagious in greenhouses**, especially during frequent plant handling.
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## 5. Effect on Tomato Plants

- Causes **stunted growth** and poor canopy development.
  - Leads to **deformed leaves and fruits**, reducing yield.
  - Severe infection can **significantly reduce fruit quality and market value**.
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## 6. Prevention and Management

### Cultural Control:

- Use **virus-free seeds or resistant varieties**.
- **Remove and destroy infected plants immediately**.
- Maintain **strict hygiene** — disinfect tools, hands, and surfaces regularly.
- Avoid **handling plants when wet**, as virus spreads easily.
- Practice **crop rotation** and remove **volunteer tomato plants** from previous crops.

### Chemical Control:

- No chemical cure exists for viral infections.
- Control focuses on **preventing spread** by hygiene and sanitation.

### Greenhouse Care:

- Disinfect **tools, trays, and greenhouse surfaces** regularly.

- Limit **plant handling** to prevent mechanical transmission.
- Monitor plants regularly for **early symptoms**.

## 10. Tomato Yellow Leaf Curl Virus (TYLCV)

### 1. What is "Tomato Yellow Leaf Curl Virus"?

- It is a **viral disease** that affects tomato plants, causing **yellowing, curling, and stunted growth**.
- Caused by **Tomato Yellow Leaf Curl Virus (TYLCV)**, a **Begomovirus** transmitted by **whiteflies (*Bemisia tabaci*)**.
- Common in **hot and dry regions**, but can occur in greenhouses and fields worldwide.

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### 2. Symptoms of TYLCV

#### On Leaves:

- Leaves show **yellowing along veins** and **upward curling at the margins**.
- Leaves may become **thickened, brittle, and small**.
- **Young leaves are more severely affected**.

#### On Stems:

- Plants are **stunted** with short internodes.
- Stem growth is **weakened**, reducing overall plant height.

#### On Fruits:

- Fruits are **small, malformed, and ripen unevenly**.
- Severely affected plants may **produce few or no fruits**.

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### 3. What Causes It?

- Caused by **Tomato Yellow Leaf Curl Virus (TYLCV)**.
- Virus survives in:
  - **Infected plants and crop residues**
  - **Whitefly vectors** that transmit the virus between plants
- Favors:
  - **Hot, dry conditions** with high whitefly populations
  - **Poorly managed fields** with heavy whitefly infestation

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### 4. How Does It Spread?

- Primarily through **whitefly (*Bemisia tabaci*) feeding** on infected plants.
- Also spreads via **infected seedlings or transplants**.
- Can **rapidly infect entire fields** under high whitefly pressure.

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### 5. Effect on Tomato Plants

- Causes **severe stunting and yellowing of leaves**.
- Reduces **photosynthesis**, weakening the plant.
- Leads to **poor fruit development, low yield, and unmarketable fruits**.
- In severe cases, **plants may fail to produce fruits entirely**.

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## **6. Prevention and Management**

### **Cultural Control:**

- Use **TYLCV-resistant varieties** if available.
- **Remove and destroy infected plants** immediately.
- Practice **crop rotation** and remove **volunteer tomato plants**.
- Control **whitefly populations** by using yellow sticky traps and maintaining field hygiene.
- Avoid planting tomatoes near **virus-infected crops**.

### **Chemical Control:**

- Use **insecticides** to control **whitefly populations**, such as:
  - Imidacloprid
  - Thiamethoxam
  - Abamectin (for whitefly eggs/larvae)
- Rotate chemicals to **prevent resistance**.

### **Greenhouse Care:**

- **Screen windows and doors** to prevent whitefly entry.
- **Inspect plants regularly** for whiteflies and early symptoms.
- Maintain **good sanitation and remove weeds**, which can harbor the virus.