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Tomato Bacterial Diseases: From Early Detection to Effective Management

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Abstract

Tomato (*Solanum lycopersicum* L.) is an economically important vegetable crop valued for its nutritional significance and diverse culinary uses. However, bacterial diseases pose a major constraint to tomato production, adversely affecting plant growth, fruit quality and marketable yield. The major bacterial diseases include bacterial leaf spot caused by *Xanthomonas* spp., bacterial speck caused by *Pseudomonas syringae* pv. *tomato*, bacterial canker caused by *Clavibacter michiganensis* and bacterial wilt caused by *Ralstonia solanacearum*. These diseases exhibit diverse symptoms, including leaf spots, defoliation, stem splitting, vascular discolouration, wilting and characteristic fruit lesions. Their development and spread are influenced by environmental conditions, infected planting material, contaminated tools, rain splash and infested soil. Effective disease management requires timely identification of symptoms and the adoption of integrated preventive measures. The use of healthy seeds and disease-free seedlings, maintenance of field sanitation, crop rotation, appropriate irrigation practices, removal of infected plant residues and application of suitable biological control agents and registered bactericides can help minimise disease incidence. In addition, regular field surveillance and laboratory-based diagnosis are important for distinguishing bacterial infections from other plant disorders and selecting appropriate management strategies. An integrated, preventive approach is essential for reducing disease spread, protecting fruit quality, minimising yield losses and promoting sustainable tomato production.

Introduction

Tomato (*Solanum lycopersicum* L.) is one of the most widely cultivated vegetable crops worldwide, valued for its nutritional importance and economic benefits. It is consumed fresh and processed into products such as puree, paste, soup and ketchup. India is the world's second-largest tomato producer, with Karnataka being an important contributing state. It is an important source of minerals and vitamin A and C therefore called as "Poor man's apple" by

Jiménez *et al.* (2024). Despite its importance, tomato production is threatened by several diseases, particularly bacterial diseases that adversely affect plant growth, fruit quality and marketable yield. Major bacterial diseases include bacterial leaf spot caused by *Xanthomonas* spp., bacterial wilt caused by *Ralstonia solanacearum*, bacterial speck caused by *Pseudomonas syringae* pv. *tomato* and bacterial canker caused by *Clavibacter michiganensis*.

These diseases may cause leaf spots, wilting, stem lesions and fruit blemishes, resulting in substantial economic losses. Their spread is favoured by infected seeds and seedlings, contaminated tools, rain splash and favourable environmental conditions. Early recognition and timely management are essential to minimise disease spread and protect tomato yield. Using healthy planting material, maintaining field sanitation, managing irrigation carefully, removing infected plants and adopting integrated disease management practices can help reduce disease incidence. Thus, recognising symptoms early and implementing appropriate preventive measures are key to healthier crops, improved fruit quality and better returns for farmers.

Major bacterial diseases of tomato

1. Bacterial leaf spot

Bacterial leaf spot, caused by *Xanthomonas* spp., Gram-negative, rod-shaped bacterium is favoured by humid weather and heavy rainfall. Infected leaves develop small, brown, water-soaked spots surrounded by yellow halos, often leading to defoliation. Green fruits develop raised, rough, scab-like lesions that reduce market quality as shown in Fig. 1. The pathogen survives in infected crop residues, volunteer plants and contaminated seeds, spreading through rain splash, irrigation water and infected seedlings (Babu *et al.*, 2026). Use healthy seeds and disease-free seedlings, practise crop rotation, remove infected residues, maintain field sanitation and prefer drip irrigation. Apply locally registered copper-based bactericides at the recommended rates. Early detection and timely preventive measures help minimise disease spread and maintain fruit quality.



Fig. 1. Characteristic spotting and scarring on green tomato fruits

2. Bacterial speck

Bacterial speck of tomato is caused by *P. syringae* pv. *tomato*, a Gram-negative, rod-shaped bacterium. The disease commonly develops under cool, humid weather with prolonged leaf wetness. Infected plants exhibit tiny, dark brown to black spots on leaves, stems, flowers and fruits often accompanied by yellow halos. Under favourable conditions, these lesions may enlarge and merge, causing tissue damage and deterioration of fruit quality. The pathogen persists on contaminated seeds, infected crop residues and other suitable substrates (Ahmed, 2022). Its spread occurs through rain splash, irrigation water, infected seedlings and contaminated agricultural tools.

Plant healthy seeds and disease-free seedlings, ensure proper field sanitation, destroy infected crop residues, minimise overhead irrigation and follow crop rotation with suitable non-host crops. Apply locally registered copper-based bactericides as recommended. Regular crop inspection and timely identification of symptoms are essential for limiting disease development and reducing yield losses.

3. Bacterial canker

Bacterial canker, caused by *Clavibacter michiganensis*, affects tomato leaves, stems and fruits. Symptoms include wilting, upward leaf curling, brown leaf-margin lesions, vascular discolouration and stem splitting, which may develop into cankers. Under humid conditions, bacterial ooze may emerge from stem cracks. Fruits develop characteristic bird's-eye spots with brown centres and white halos, reducing market quality as represented in Fig. 2. The pathogen survives in infected seeds and crop debris and spreads through contaminated seedlings and tools (Oliver, 2024).

Use healthy seeds and disease-free seedlings, remove infected plants and residues, maintain field sanitation, practise crop rotation and apply locally recommended preventive measures.



Fig. 2. Field symptoms of *Clavibacter michiganensis* on tomato: A. Longitudinal stem spiltting; B. Fruit lesions with white halos

4. Bacterial wilt

Bacterial wilt, caused by *R. solanacearum*, is a serious disease affecting tomato cultivation. Infected plants exhibit sudden wilting, followed by plant death under severe infection. Initial symptoms include drooping of older leaf petioles, upward curling of leaves, yellowing and stunted growth. Brown discolouration of vascular tissues can be observed in infected roots and stems. When the infected stem is cut transversely, whitish bacterial ooze may emerge. The pathogen survives in infested soil, infected plant materials and weed hosts, spreading through irrigation water and contaminated agricultural implements. Warm temperatures and high soil moisture favour disease development (Abu *et al.*, 2025).

Once a field becomes infested, management can be difficult, making preventive measures and careful field selection essential. Grow resistant tomato varieties, practise crop rotation with non-host crops, and remove infected plants and crop residues. Maintain proper field sanitation and avoid moving infested soil or contaminated irrigation water into healthy fields. Soil solarisation using transparent polyethylene sheets during hot summer months may help reduce soil-borne inoculum. Incorporating suitable *Brassica* spp. as green manure can also contribute to disease suppression. Biological control agents, such as *Pseudomonas fluorescens* and *Bacillus* spp., may be used as part of an integrated management programme.

Integrated management: Prevention is better than cure

Effective management of bacterial diseases in tomato requires an integrated approach involving preventive, cultural, biological and chemical

measures. Use healthy seeds and disease-free seedlings, maintain nursery hygiene, practise crop rotation with suitable non-host crops, and remove infected plants and crop residues. Proper irrigation management, adequate drainage and disinfection of agricultural implements help minimise pathogen spread. Locally registered copper-based bactericides and suitable biological control agents may provide disease suppression when applied according to recommendations.

Why accurate diagnosis matters

Not every leaf spot, yellowing symptom or wilt is caused by bacteria. Fungal diseases, viral infections, nutrient deficiencies, water stress and other disorders can produce similar symptoms. For example, concentric rings within leaf spots may suggest early blight, while bacterial leaf spot commonly produces small, dark lesions that may have yellow halos. Accurate diagnosis and early detection are essential for effective disease management.

Regular field surveillance and laboratory confirmation, when necessary, facilitate timely interventions, minimise disease incidence, reduce yield losses and improve fruit quality and marketability. Farmers and field workers should therefore avoid selecting treatments solely on the basis of visual symptoms. When possible, submit representative samples to a plant pathology laboratory for confirmation before adopting a disease-specific management programme.

Conclusion

Bacterial diseases are major constraints to tomato production, affecting crop health, fruit quality and marketable yield. Bacterial leaf spot, bacterial speck, bacterial canker and bacterial wilt differ in their symptoms, survival and modes of spread, challenging disease-specific management strategies. Early identification, accurate diagnosis and regular field monitoring are essential for timely intervention. The use of healthy planting material, field sanitation, crop rotation, appropriate irrigation management and suitable biological control agents and registered bactericides can contribute to effective disease suppression. An integrated, preventive approach is therefore crucial for minimising disease incidence, reducing economic losses and ensuring sustainable tomato production. Recognising symptoms early and adopting appropriate management practices are key to achieving healthier crops, better-quality fruits and improved returns for farmers.

Reference

Abu B., F., Ramaiya, S.D. & Min, K.Y., 2025. Molecular insight, pathogenesis and resistance management of bacterial wilt (*Ralstonia solanacearum*) disease. Cogent Food and Agriculture, 11(1), 2579885.

Ahmed, R. (2022). First report of bacterial speck of tomato caused by *Pseudomonas syringae* pv. *tomato* in AJK, Pakistan. Planta Animalia, 1(1): 29-30.

Babu, P.L., Devappa, V., Rajender, J., Geat, N., Devi, R.S., Patidar, R., Singh, A., Banarwal, V.K., Padaria, J.C., Kamra, A. and Singh, D., 2026. Unveiling the prevalence, pathogenic and molecular characterization of *Xanthomonas* strains responsible for bacterial leaf spot of tomato and pepper in India. Journal of Plant Pathology, 1-15.

Oliver, R. ed., 2024. Agrios' *plant pathology*. Elsevier.

Jiménez Bolaño, D.C., Insuasty, D., Rodríguez Macías, J.D. and Grande-Tovar, C.D., 2024. Potential use of tomato peel, a rich source of lycopene, for cancer treatment. Molecules, 29(13): 3079.