



Urban Plant Pathology: Challenges and Solutions

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According to Agrios (2005), "Plant pathology is a science that studies plant diseases and attempts to improve the chances for survival of plants when they are faced with unfavourable environmental conditions and parasitic microorganisms that cause disease". So, it is a discipline that has a practical and noble goal of protecting the food (quantity and quality) available for humans and animals. In cities plants provide multiple support, satisfactions along with their benefits but they are subject to a range of site circumstances, environmental factors and physical disturbances that affect their existence. Human activity produces urban soils that differ from their natural counterparts in physical, chemical, and biological characteristics. Surface crusting is water and gas resistant, with limited aeration and drainage. Vertical and geographical diversity is extensive. Contaminants and anthropogenic elements are present. The soil structure changes, causing compaction. Nutrient cycle is disrupted, and the activity of soil organisms changes. Environmental chemical pollution is a major stressor for urban plants.

The goal of trimming urban trees is to create plants that are safe, robust, healthy, and attractive, however wounds caused by topping and poor pruning can serve as access places for decay organisms. Individual trees may represent an unacceptable risk to people or property due to their condition and placement. Trees or tree pieces can fail, especially during loading events like windstorms and snowstorms. Trees break when the load (weight and movement of the crown) surpasses the mechanical strength of their stems, branches, or root systems. This applies to both sound and defective trees, but defective individuals can only bear a fraction of the strain that sound trees can. Urban environments are rapidly expanding, bringing with them unique challenges and opportunities for plant pathology. Unlike rural or agricultural settings, urban areas present distinct conditions that affect plant health, pathogen prevalence, and management strategies. This article delves into the challenges of urban plant pathology and explores innovative solutions to ensure the vitality of urban greenery.

Challenges in Urban Plant Pathology

Diverse Plant Species and Varieties: Urban landscapes are home to a wide range of plant species and varieties, from ornamental plants in private gardens to trees in public parks. This diversity can complicate plant disease diagnosis and management, as pathogens may affect different species in varied ways.

Loss of biodiversity Plant biodiversity, which is critical for sustaining long-term production, is under threat. Our farmed crops, which are



genetically homogenous, are extremely sensitive to external shocks such as biotic and abiotic stresses (ICAR 2015). The disease is most prevalent in cultivated plants, intermediate in wild plants managed by humans, and least prevalent in completely wild plants. On the other hand, biodiversity is highest in wild plant environments and lowest in cultivated plant ecosystems.

Environmental Stressors: Urban plants often face harsh environmental conditions such as air pollution, compacted soils, heat islands, and limited water availability. These stressors weaken plant defences and make them more susceptible to pathogens.

Climate change: Climate change entails long-term shifts in temperature and weather systems. These changes might be natural, such as variations in the solar cycle. However, since the 1800s, human activities have been the primary cause of climate change, owing mostly to the use of burning of coal, petroleum, and gas. A disease will develop when a virulent pathogen infects a susceptible host under favourable environmental conditions and at an appropriate time (Agrios 2005). Climate change can alter the environmental conditions to be favourable for pathogens or make the host susceptible to pathogen attack. Increases in temperature, moisture, and Carbon dioxide are the major consequences of climate change. Due to favourable weather conditions, pathotype 78S84 of wheat yellow rust was first detected from northern India posing a major threat to cultivar PBW343 in wheat (Prashar et al. 2007) and wheat yellow rust started appearing early in the last week of December (Jindal et al. 2012). Temperature affects Arabidopsis susceptibility to *Pseudomonas syringae* pv. tomato considerably (Huot et al. 2017). The relative prevalence of soil-borne fungal plant diseases increases as temperatures rise.

Limited Space and Poor Soil Quality: Urban areas frequently lack adequate space for root expansion and have poor soil quality due to construction activities, contamination, and compaction. Poor soil health can lead to weakened plants, increasing their vulnerability to diseases

High Human Activity: Increased human activity in urban areas can lead to the accidental introduction and spread of plant pathogens. Activities such as landscaping, construction, and transportation can disperse diseases across different parts of a city.

Solutions for Urban Plant Pathology

Integrated Pest Management (IPM): Implementing IPM strategies tailored for urban environments can effectively manage plant diseases. IPM emphasizes the use of multiple control methods, including cultural practices, biological controls, and chemical treatments, to reduce pathogen populations and minimize harm to the environment.

Regular Monitoring and Early Detection: Regular monitoring of urban plants for signs of disease can lead to early detection and timely intervention. Utilizing technology such as remote sensing and mobile apps can help in identifying and diagnosing plant diseases quickly and accurately.

Soil Health Improvement: Improving soil health is crucial for the resilience of urban plants. Practices such as composting, mulching, and using organic soil amendments can enhance soil structure, fertility, and microbial activity. Planting cover crops and employing no-till methods can also help in maintaining healthy soils.

Selection of Disease-Resistant Varieties: Choosing plant species and varieties that are resistant to common urban plant diseases can significantly reduce disease incidence. Urban planners and landscapers should prioritize the use of native and well-adapted species that are less prone to diseases.

Education and Outreach: Educating urban residents, gardeners, and city planners about plant health and disease management is essential. Workshops, seminars, and informational campaigns can raise awareness about the importance of plant health and the best practices for disease prevention and control.

Enhancing Biodiversity: Promoting biodiversity in urban landscapes can create more resilient ecosystems. A diverse plant community can disrupt the spread of pathogens and provide habitat for beneficial organisms that control pests and diseases.

Research and Collaboration: Collaborating with research institutions, universities, and extension services can provide urban areas with access to the latest knowledge and technologies in plant pathology. Research should focus on understanding the unique challenges of urban plant pathology and developing innovative solutions.