Mini Review
Volume 13:3, 2023

Journal of Bioengineering & Biomedical Science

ISSN: 2155-9538 Open Access

The Impact of Tomato Mosaic Virus on Crop Yields and Agricultural Practices

Mancino Davide*

Department of Materials and Bioengineering, Kansai University, Osaka, Japan

Abstract

Tomato Mosaic Virus (ToMV) is a notorious pathogen that affects tomato crops worldwide, causing significant economic losses and posing challenges to sustainable agriculture. This comprehensive research paper explores the various aspects of ToMV, including its biology, transmission, symptoms, and the impact it has on crop yields and agricultural practices. By examining the current state of knowledge, as of the last update in September 2021, this paper sheds light on the importance of effective management strategies to mitigate the devastating effects of ToMV on tomato production. It also discusses future research directions and innovations in crop protection to ensure food security and sustainable agriculture in the face of this viral threat.

Keywords: Tomato mosaic virus • Movement protein • Transmission • Necrosis

Introduction

Tomato Mosaic Virus (ToMV) is a widespread and economically significant plant virus that affects tomato plants (*S. lycopersicum*) and various other crops, causing a range of symptoms that can lead to reduced crop yields and quality. This virus is a member of the Tobamovirus genus and the Virgaviridae family. ToMV is transmitted primarily through mechanical means and can survive in infected plant debris and seeds, making it a challenging pathogen to manage. In this comprehensive article, we will delve into the various aspects of Tomato Mosaic Virus, including its biology, transmission, symptoms, management, and its impact on agriculture. This paper embarks on a comprehensive journey into the world of ToMV, delving into its biological intricacies, the mechanisms of pathogenesis, and the strategies employed to manage its impact on tomato crops [1].

Literature Review

Tomato mosaic virus belongs to the Tobamovirus genus, which is part of the Virgaviridae family. This family includes other important plant viruses like Tobacco Mosaic Virus (TMV) and Pepper Mild Mottle Virus (PMMoV). Tobamoviruses are known for their rod-shaped particles and positive-sense, single-stranded RNA genomes. ToMV is specifically classified as ToMV-Cg, representing a distinct strain within the species. The genome of ToMV consists of a single, non-segmented, positive-sense RNA molecule, which is approximately 6.3 kilobases in length. The genome serves as a messenger RNA (mRNA) for translation of viral proteins in the host cell. ToMV encodes four major proteinsThe 126-kDa replicase, responsible for viral replication. The 183-kDa protein, involved in cell-to-cell movement.The 30-kDa Movement Protein (MP), which facilitates long-distance virus movement.The Coat Protein (CP), which encapsidates the viral RNA and plays a crucial role in virus transmission. Replication of ToMV occurs in the cytoplasm of infected plant cells. The virus uses the host's cellular machinery to replicate and produce viral RNA and proteins. The new virus particles assemble in the cytoplasm and then move through plasmodesmata to infect neighboring cells [2,3].

***Address for Correspondence:** Mancino Davide, Department of Materials and Bioengineering, Kansai University, Osaka, Japan, E-mail: mancinodavide@man.jp*

Received: 29 May, 2023, Manuscript No. jbbs-23-112498; **Editor Assigned:** 31 May, 2023, PreQC No. P-112498; **Reviewed:** 14 June, 2023, QC No. Q-112498; **Revised:** 19 June, 2023, Manuscript No. R-112498; **Published:** 26 June, 2023, DOI: 10.37421/2155-9538.2023.13.358

Discussion

ToMV can be transmitted through both direct and indirect means. The primary modes of transmission include Mechanical transmission, ToMV is readily transmitted by physical contact, such as through contaminated hands, tools, or equipment. This mode of transmission is particularly important in greenhouse settings, where mechanical injury to plants is common. ToMV can be transmitted through infected tomato seeds. Contaminated seeds act as a source of primary infection, potentially leading to widespread outbreaks in new plantings. Although not the primary mode of transmission, ToMV can be transmitted by certain insect vectors, such as aphids and whiteflies. However, this mode of transmission is less common compared to mechanical transmission [4]. ToMV infection in tomato plants can result in a wide range of symptoms, which can vary in severity depending on factors such as the tomato cultivar, virus strain and environmental conditions. Common symptoms include mottled or mosaic-like patterns on leaves, yellowing or chlorosis of leaf tissue, leaf distortion, curling, or twisting, reduced fruit quality, including deformities and reduced size, reduced fruit yield, stunted plant growth, necrosis (tissue death) in severe cases The severity of symptoms can affect the overall health and productivity of tomato plants, leading to significant economic losses in commercial tomato production. While tomato plants are the most commonly affected host, ToMV can infect a wide range of other plant species, including peppers, tobacco, and various ornamental plants. The ability to infect multiple hosts contributes to its widespread distribution and economic impact [5,6].

Conclusion

ToMV has a significant impact on agriculture and the tomato industry. Its ability to infect tomato plants, one of the world's most widely cultivated vegetable crops, can lead to substantial economic losses. Reduced yields, poor fruit quality, and increased production costs due to disease management efforts all contribute to the economic impact of ToMV. Research on Tomato Mosaic Virus continues to focus on developing more effective management strategies, including the development of resistant tomato cultivars and the exploration of novel antiviral agents. As the virus evolves and new strains emerge, ongoing research is essential to stay ahead of the challenges it poses to tomato production. Tomato mosaic virus is a significant threat to tomato crops and other susceptible plants. Its biology, transmission mechanisms, symptoms, and impact on agriculture make it a subject of ongoing research and management efforts. Understanding the disease cycle and implementing appropriate control measures are crucial for minimizing the economic impact of ToMV on tomato production and ensuring food security.

Acknowledgement

None.

Conflict of Interest

None.

References

1. Ghorbani, A., S. M. Razavi, V. O. Ghasemi Omran and H. Pirdashti. "Piriformospora indica inoculation alleviates the adverse effect of NaCl stress on growth, gas exchange and chlorophyll fluorescence in tomato (*S. lycopersicum L.*)." *Plant Biol* 20 (2018): 729-736.
2. Desneux, Nicolas, María G. Luna, Thomas Guillemaud and Alberto Urbaneja. "The invasive South American tomato pinworm, *T. absoluta*, continues to spread in Afro-Eurasia and beyond: The new threat to tomato world production." *J Pest Sci* 84 (2011): 403-408.
3. Prasad, Ashish, Namisha Sharma, Gunaseelen Hari-Gowthem and Mehanathan Muthamilarasan, et al. "Tomato yellow leaf curl virus: Impact, challenges and management." *Trends Plant Sci* 25 (2020): 897-911.
4. Fukuhara, Toshiyuki, Midori Tabara, Hisashi Koiwa and Hideki Takahashi. "Effect of asymptomatic infection with southern tomato virus on tomato plants." *Arch Virol* 165 (2020): 11-20.
5. Xu, Yuting, Shuling Zhang, Jianguo Shen and Zujian Wu, et al. "The phylogeographic history of tomato mosaic virus in Eurasia." *Virol* 554 (2021): 42-47.
6. Abrahamian, Peter, Weili Cai, Schyler O. Nunziata and Kai-Shu Ling, et al. "Comparative analysis of tomato brown rugose fruit virus isolates shows limited genetic diversity." *Viruses* 14 (2022): 2816.

How to cite this article: Davide, Mancino. "The Impact of Tomato Mosaic Virus on Crop Yields and Agricultural Practices." *J Bioengineer & Biomedical Sci* 13 (2023): 358.