

Solutions to Plant Viruses Improve Crop Management Strategies

Successful crop management strategies require improved scientific understanding of how viruses survive and spread between crops and across seasons.



Photo: Naidu Rayapati

Vegetable production plays a vital role in food security and poverty reduction in developing countries. Besides providing nutritional supplements, vegetable production generates additional employment for the rural poor, many of whom are women.

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In recent years, diseases caused by plant viruses called tospoviruses have become a significant limiting factor in the sustainable production of vegetables in the smallholder farming systems of South and Southeast Asia. The Integrated Pest Management Collaborative Research Support Program (IPM CRSP) has recently initiated this research project to provide science-based knowledge for developing sustainable and eco-friendly integrated disease management strategies to reduce crop losses due to virus diseases in the region.

Crop failure due to debilitating viruses creates significant financial hardship and food insecurity for resource-poor farmers in developing countries. This can result in cascading effects such as the inability to support children's education as well as the lack of resources to repay debts and purchase inputs for the next cropping season. This hardship initiates a downward spiral of abject poverty from which it is very difficult to escape.

The globalization of agriculture and recent liberalized trade policies are changing agricultural practices and shifting cropping patterns. These changes have created many opportunities for insect-transmitted viruses like thrips-borne tospoviruses to spread from their original natural habitats and hosts to the favorable new environments of valuable crops. Consequently, insect-transmitted viruses have crossed national boundaries into new geographic areas, resulting in negative social and economic impacts on subsistence agriculture.

Successful crop management strategies depend on our ability to deal with these challenges in the coming decades. They also require improved scientific understanding of how viruses survive and spread between crops and across seasons, and perhaps how the trans-continental spread of viruses occurs. Unfortunately, plant viruses cannot be cured, so efforts to combat the viruses are usually aimed at prevention or the reduction of infection. There is no "one-size-fits-all" approach to the management of all virus diseases, since different diseases have distinct ecological and epidemiological characteristics. Thus, a complete understanding of a virus pathosystem in a given agroecosystem is vital for developing targeted solutions for stable production of a broad range of quality vegetables in different countries of South and Southeast Asia.

Intensive and widespread use of pesticides is the predominant tactic subsistence farmers deploy to manage viruses in developing countries. Although chemical control of insect vectors was for a long time the preferred method, there has been an increasing awareness of the limitations and disadvantages of pesticides, including harmful effects on human health and the environment,

toxic effects due to pesticide residues on food products, destruction of biological control agents, and the loss of a natural resource base, including biodiversity. Additionally, since thrips are small and difficult to identify, pesticides are often used against the wrong species or at the wrong time with no economic benefit. The best antidote is to switch from a pesticide-based mode of reducing losses to one that is ecologically sustainable, economically feasible, and socially acceptable in order to protect farming systems in developing countries.

This Global Theme project has developed linkages with IPM CRSP regional programs in South and Southeast Asia and interacts closely with a companion Global Theme project on insect-transmitted viruses in Central and South America and Eastern and Western Africa and other Global Theme Projects. The project is also seeking strategic partnerships with AVRDC-The World Vegetable Center, public and philanthropic agencies seeking international public good, national research organizations and universities, private sector organizations, and NGOs. USAID is instrumental in facilitating such a unified approach in moving from boutique projects to partnerships for progress in economic growth and poverty reduction in developing countries.

Specific Objectives

1. Conduct strategic research on tospoviruses and thrips vectors, and develop host plant resistance
2. Carry out applied and adaptive research to deploy eco-friendly integrated disease management strategies to control tospovirus diseases
3. Develop strategies for strengthening institutional capacities within host countries to conduct problem-oriented research on virus diseases

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