



Integrated Pest Management Collaborative Research Support Program (IPM CRSP)

Impact Spotlight: Papaya Mealybug

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In 2008, the **Integrated Pest Management Collaborative Research Support Program (IPM CRSP)** identified the presence of the papaya mealybug in Indonesia and India. Since then, its efforts to control the devastating, invasive pest have **saved the livelihoods of thousands of farmers, helped create small businesses, and generated over \$100 million in benefits.**

Learn more about the IPM CRSP



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What is the IPM CRSP?

The Integrated Pest Management Collaborative Research Support Program (IPM CRSP), funded by USAID, promotes pest management methods that reduce damage caused by pests without harming the environment.

Since 1993, the Virginia Tech-managed program has worked to raise the standard of living of people in developing countries, improving crop production and increasing food security in the process. The program currently works in six regions and 16 countries, 12 of which are Feed the Future countries, and covers one-third of the world's population.

In addition to agricultural strategies, the program also deals with cross-cutting issues such as gender, health, nutrition, equitable use of resources, and agricultural education.



Healthy papaya for sale at a market in India.

Pests respect no borders. They cross fields, oceans, and large land masses, infesting crops in continents far away from their places of origin. The movement of plants, animals, wind, and water facilitates the spread of insects, plant diseases, weeds, and vertebrates, affecting farmers' abilities to grow healthy crops.

This cross-continental movement was certainly the case for the papaya mealybug (left), an unarmored scale insect found in moist, warm climates. It was identified in Mexico in 1992, moving swiftly and proliferating throughout the Caribbean and into the United States, Central and South America, South and Southeast Asia, and West Africa.



tropical countries, papaya is an important commercial crop and key component of the daily diet. Where papaya is produced, it means millions of dollars for farmers, middlemen, and processors. For these reasons, attacks by the papaya mealybug are a serious threat.

*What is papain?

Papain is a product of papaya, and you likely come in contact with it every day. It is used in the production of chewing gum and shampoo, toothpaste and tooth whiteners, as a meat tenderizer, and in the brewing and textile industries.

SMALL BUT DEVASTATING

The papaya mealybug is a particularly devastating pest because it is polyphagous – it feeds on many things. The insect's host range includes over 60 species of plants: cassava, papaya, beans, eggplant, melons, hibiscus, plumeria, pepper, sweet potato, tomato, citrus, mango, and sour sop. It also affects mulberries, a key component in the silk industry and vital to India's economy.

While feeding on papaya, the insect excretes honeydew that results in the development of sooty mold (right). The mold covers leaves, fruits, and stems, impeding photosynthesis and gaseous exchanges.



Papaya trees die within a few months after infestation. In West Java, Indonesia, IPM CRSP scientists found that it wiped out most of the region's papaya plantations (right).



WASPS TO THE RESCUE

So when IPM CRSP scientists discovered the presence of this pest, the program knew it had to act promptly. The scaly, white papaya mealybug is small – about 2.2 mm long – and leaves a telltale sticky residue where it has fed. It was this residue that program scientists spotted in Indonesia and then South India in 2008. In each case, the program's scientists alerted government authorities and advised them on appropriate actions to take.

The most effective solution, the program knew, was to use classical biological control* through the introduction of a parasitic wasp, the *Acerophagus papayae* (right). The wasp, which is smaller than a pin head, is extremely effective because it is species-specific, preying only on the papaya mealybug. The adult wasps lay their eggs inside the mealybug larvae. When the eggs hatch, the immature wasps eat the mealybug larvae until the larvae die.



*What is biological control?

Biological control is a method used by integrated pest management specialists that pits natural enemies against pests. It is safe, economical, and environmentally-friendly.

Through collaboration with the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (USDA-APHIS), the IPM CRSP was able to help India and Indonesia acquire and release the wasps and save an industry.

CELEBRATING THE BENEFITS

The tactic has proven so successful that there have been reports of 95%–100% control in areas where the wasp has been released. Farmers held a celebration in southern India in 2011 to recognize the work that had been done. A big tent was pitched, hundreds of farmers and government officials came, and the event was covered by Indian news media.

The wasps' production has now been transferred to small companies South Asia. An impact assessment of the IPM CRSP's efforts has revealed a staggering figure: **this single intervention has paid for the entire program over its lifetime, a benefit of over \$100 million.**

THE PAPAYA INDUSTRY

While papaya is an exotic fruit for us in the United States, we come in contact with papaya on a daily basis through a product called papain*. And in many



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