

IPM IL success story

NARANJILLA GRAFTING IN ECUADOR:

Reducing deforestation and promoting the growth of an industry

The little-known fruit, rich in vitamins and a source of dietary diversification, gets a boost in production from an IPM IL program in Ecuador.

IF YOU CAUTIOUSLY APPROACH A NARANJILLA (pronounced “nah-ran-hee-ya”) shrub or the fruit in a market, do not try to cut into it and eat it on the spot. It is terribly tempting, with its jewelled orange exterior and tomato-meets-citrus interior. But if you do, you’ll be met with a taste and consistency unpalatable, gooey, tart. Instead, treat the fruit the way those in Ecuador and Columbia do – juice it, sweeten the juice, and serve it over ice.



The scientific name of common naranjilla is *Solanum quitoense*, the species name derived from the Ecuadorian capital city of Quito (the fruit is native to northwestern South America). On the vine, it is fuzzy, muscadine grape-sized, looking like a distant relative of the kiwi fruit. By the time it reaches the market, its fuzz has been rubbed clean, and the fruit may be confused with an heirloom tomato or a persimmon.

In Tandapi, Ecuador, about 50 miles southwest of Quito, the Integrated Pest Management Innovation Lab (IPM IL) is working with local farmers to improve naranjilla production. Funded by the U.S. Agency for International Development, the program develops environmentally-friendly and sustainable approaches to reduce agricultural losses due to pests and diseases in the developing world.

Naranjilla consumption provides dietary diversification in Ecuador, as its pulp is rich in Vitamins A, C, and K. While it has the potential to be cultivated, produced, and marketed widely, common naranjilla faces significant agricultural problems from pests and diseases.

THE CHALLENGES OF DEFORESTATION

In the subtropical, humid conditions of the Andean slopes, naranjilla farmers often move their cultivation sites after just one season because of *Fusarium* wilt, a soilborne fungal disease. The disease, which affects a wide variety of plants, stays in the soil season after season, and there are no chemicals that can effectively control it. The movement of planting sites results in deforestation, easily spotted



A naranjilla shrub suffering from *Fusarium* wilt



Farmers graft naranjilla in a greenhouse in Ecuador.



on the slopes where precisely trimmed patches of forest hover over bare land.

These planting patterns have resulted in economic, logistical, environmental, and agricultural problems for farmers. Clearing the steep slopes results in increased erosion, and heavy rainfall creates deep crevices. As farmers choose locations further away to plant, they are faced with difficulties in maintaining the plants. Jeff Alwang, principal investigator for the project, cites runoff and river siltation in addition to deforestation and erosion as environmental impacts that are widespread and long-lasting.

CREATING A SUPERPLANT

Nestor Pillaluisa, dressed in work clothes and knee-high rain boots, sits with a small, clear plastic cup containing a seedling in his lap. His mother, Rosario Rodrigues, looks on from the background.



Pillaluisa is about to demonstrate an IPM IL method that reduces deforestation and produces healthier plants: grafting.

Program collaborators at INIAP — Ecuador's national institute for agricultural research — found that a wild solanaceous plant, *Solanum hirtum* (in the same family as naranjilla), is resistant to *Fusarium* wilt as well as an infesting roundworm, the nematode *Meloidogyne incognita*. The same variety is more tolerant to drought, making it climate smart. Meanwhile, the aforementioned *S. quitoense* and its fruit receive a price premium of nearly 50% over other varieties. Combining the two through grafting results in a superplant with the pest and disease resistance of *S. hirtum* and the production and market value of *S. quitoense*.

In under a minute, Pillaluisa cuts the bamboo-like rootstock, trims the leafy graft, and secures the two together with grafting tape. The grafted plant, now standing around one foot tall, may end up planted on the farm or sold to local farmers. While these grafted plants are more expensive than traditional plants, researchers have found that they could increase economic returns by 40%–60% compared with the traditional varieties commonly grown. The grafted plants also produce fruit for a longer period of time than the non-grafted plants. And now, instead of moving the naranjilla cultivation area for this year's crop, the family is in their third year in the same plot.

"The grafted naranjilla costs about \$.70 per plant, compared to \$.10-.15 for the common plant. This doesn't sound like much, but planting densities are about 1,000 per hectare, so it adds up," Alwang explains (one hectare equals about 2.47 acres). "The grafted plants, however, more than pay for themselves within a year."



A PACKAGE SOLUTION

Farmers face additional pest and disease problems with naranjilla cultivation, and program researchers have come up with a package — a holistic suite of IPM recommendations for a particular crop — to help them. Recommendations include field sanitation through removing dead plants, fruit borer control by using low-toxicity pesticides, and late blight control through organic fungicide application. Since chemical control is environmentally-damaging, hazardous to human and animal health, and sometimes prohibitively expensive for remote and poor producers, the program's methods are a welcome solution for naranjilla farmers.

The program is currently working with local government and a private producer to encourage using the grafted plants. And in the case of Pillaluisa and Rodrigues, program techniques have helped them grow healthier crops and start a potentially lucrative business. Alwang believes that the economic benefit alone of the grafting technology will justify and promote its spread, resulting in the growth of an industry and contributing to the rebirth of the forest.

Contact Information

Integrated Pest Management Innovation Lab

Virginia Tech
International Affairs Offices
526 Prices Fork Road (0378)
Blacksburg, VA 24061

www.oired.vt.edu/ipmil
[@IPM_IL](https://twitter.com/IPM_IL)
rmuni@vt.edu

Project Director
Muni Muniappan
Director, IPM IL
(540) 231-3516
rmuni@vt.edu

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Collaborators

IPM CRSP Latin America and the Caribbean Regional Program

Principal Investigator: Jeffrey Alwang
alwangj@vt.edu

INIAP (Ecuador)

Victor Barrera | victor.barrera@iniap.gob.ec
Jose Ochoa | jose.ochoa@iniap.gob.ec