



IN BRIEF

FIGHTING LATE BLIGHT: DO WILD RELATIVES HOLD THE SECRET?

CIP continues to make advances in its effort to combat late blight, the world's most devastating food-crop disease. After evaluating over 50 tuber-bearing wild potato species held in CIP's genebank, scientists discovered evidence of late blight resistance in at least seven species endemic to the South American center of origin of potatoes.

Moreover, researchers were able to identify a number of accessions that presented quantitative, or "horizontal" resistance to late blight. This means that while the late blight fungus is able to infect these potato plants, disease development is so slow that the crop continues to grow and prosper with lower fungicide inputs than would susceptible plants under conditions that would normally be devastating.

That is why breeders have placed greater emphasis on horizontal resistance in comparison to the previously favored qualitative resistance that is concentrated in a single gene. Unlike qualitative resistance—which provides complete protection for a time, but can readily be overcome by changes in the pathogen population—horizontal resistance—which may be comprised of a combination of resistance strategies—is expected to be stable in the field.

During the screening process, scientists gave priority to species that had never been evaluated and to those that have evolved in Andean climates conducive to late blight. Their findings confirm the value of conserving in-trust germplasm collections such as the potato collection held at CIP, which facilitates the systematic use of wild species in improvement programs.

CIP researchers believe that wild species may be key to future potato breeding efforts, helping scientists to broaden the genetic base of resistance to late blight and other serious diseases.

MODELS FOR MOUNTAINS

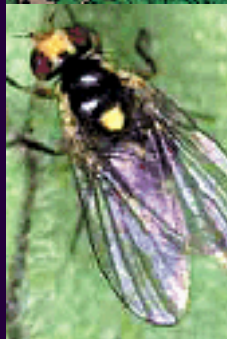
CIP's natural resource management team contributes to the understanding of complex highland production and ecological systems through the development and use of application models and powerful data-gathering and analysis tools.

These tools help the team and their partners to anticipate the effects of variables such as climate, management choices and policy interventions, thereby contributing to productive and sustainable natural resource management in the mountain areas of developing nations.

A process-based model for interpolating weather data in highland terrains, for example, has been created using data collected over an extended period of time from three weather stations set in the La Encañada watershed near Cajamarca, Peru. Documenting weather data is key to understanding how climate variables affect plant growth and soil-related processes.

Using geographical information system (GIS) capabilities, CIP scientists were also able to create a comprehensive "digital atlas" of the La Encañada area. The atlas, which combines agronomic information with social and economic data, helps to plan and implement development activities and infrastructure improvements in the region.

Similar tools are being developed in other key sites in the Andes, including Bolivia's Altiplano region and Ecuador's highlands. A case in point is the El Carchi Province in Ecuador, where CIP scientists are linking models of soil processes, pasture quality, dairy productivity and crop growth



with an economic tradeoffs model that quantifies the costs and benefits of diverse scenarios in terms of environmental impact, health, productivity and profitability. (See also pages 17-24.)

PLANT OILS MAY PROVE "ESSENTIAL" TO PEST CONTROL

CIP scientists made advances in their fight to control the leafminer fly, a pest that has been introduced in many developing countries in recent years and causes devastating losses.

The researchers found that a combination of abamectin, a commonly used biological pesticide, with plant oil not only can help farmers cut their use of chemical pesticides, but could also reduce treatment costs by as much as 60 percent.

Scientists began by testing abamectin for effectiveness in controlling the leafminer fly at different application levels. They then measured the efficiency of an abamectin-plant oil mixture.

Results confirmed that when used at commercially recommended dosages, abamectin is effective against the eggs and larvae of the fly. Lower dosages were less successful. The scientists also found that the combination of plant oil with abamectin increased the potency of the pesticide, resulting in a higher embryo mortality rate.

The oil used in this experiment was a commercial soybean oil commonly found in agricultural supply stores. The oil boosts abamectin's penetration into leaf tissue by dispersing the insecticide while helping it adhere to the plant. It also encapsulates the abamectin, greatly reducing losses caused by hydrolysis, evaporation and photo-degradation.

Because abamectin comes from a biological source, it offers an environmentally-friendly pest



management option. The abamectin-plant oil mixture does, however, have one important shortcoming: it is expensive when compared to alternative chemical products.

The fact that by combining these two ingredients, farmers can reduce their pesticide use by as much as three-fourths, may just make this combo a viable choice.

A SOLUTION FOR SALINE SOIL

Saline soils adversely affect crop production in many arid regions of the world.

In 1999 CIP's natural resources management program embarked on a project to study salt tolerance in quinoa, a millet-size, highly nutritious grain that thrives in dry, saline soils under cold, highland conditions.

After a series of greenhouse and laboratory experiments, scientists discovered that the Andean grain's salt tolerance—and in some cases its seed yield—are much higher than previously reported. Furthermore, quinoa absorbs salt ions from the soils, storing them in its tissue. This means that farmers could even grow quinoa to help clean salt-contaminated soils.

Aside from helping to identify the best quinoa varieties for saline soils, the experiment allowed scientists to identify salt tolerance mechanisms in quinoa. This information can enhance researchers' understanding of how to improve salt tolerance in other crops. Screening for only a minor reduction in, say, plant height, may allow farmers to benefit from higher yields and hardier crops. Salt-tolerant crops are especially important in



mountainous areas of developing countries, where food production faces serious limits.

NEW HOPE FROM A KNOWN LIFESAVER

Sweetpotato has a long history as a lifesaver, especially in times of crisis. This is particularly important for farmers in rural areas of Latin America, Africa and Asia.

The island nations of East Timor and Cuba are cases in point. When they were battered by violence—one by a civil war and another by a hurricane—sweetpotato became the crop of hope.

The civil strife that surrounded East Timor's struggle for independence from Indonesia left subsistence farmers in dire straits. To help respond to their urgent needs, in 2000 the Australian Centre for International Agricultural Research joined with CIP, four other Future Harvest Centers (CIAT, CIMMYT, ICRISAT and IRRI) and partners such as World Vision International and Catholic Relief Services to launch "Seeds of Life". This three-year, \$1.2 million collaborative program was designed to boost yields with well adapted, high-quality lines of cassava, green beans, rice, peanuts and sweetpotato.

"When you come into a post-conflict situation, where there has been a lot of displacement of people, one of the most important things you can do is restore the plant material of staple crops for the farmers," said Patrick Kapukha of World Vision. Seeds of Life is doing just that.

Farmers in East Timor are now producing six times their normal sweetpotato yields using planting material supplied by CIP. The dramatic boost in



production has translated into higher returns and a better life for them and their families. The success of the sweetpotato harvest was such that in Aileu, a mountain town, farmers made off with most of the vine cuttings that had been set aside as planting material

for the next season. Kapukha regarded the theft as an endorsement: "When the local people carried off a lot of vines, this was really an indication of their approval of the quality of the produce."

In Cuba, meanwhile, sweetpotato's quality as a survivor was confirmed when Hurricane Michelle battered the island in November of 2001, razing fields of basic food crops—including bananas, plantains, yucca and citrus—along its path. Only one crop survived the destruction: sweetpotato.

Because of its broad versatility and adaptability, sweetpotato has long been a staple food in Cuba. Its production normally covers one-fourth of Cuban agricultural land and runs at about 60,000 hectares a year. Soon after the hurricane subsided, local authorities decided to take advantage of the upcoming growing season, which runs from November to April, with massive planting of sweetpotatoes.

CIP and Cuba's Instituto de Investigación de Viandas Tropicales (INIVIT) had already been working to make more and better sweetpotato varieties available on the island: more than 50 percent of the sweetpotato growing area in Cuba was planted with varieties recommended by INIVIT. The partners had also disseminated integrated pest management principles, helping to reduce the damage produced by weevils from 40 to 10 percent in just five years. The added push from Cuban authorities is expected to increase the island's output by as much as 30 percent.

While scientists around the world continue to refer to the sweetpotato as a "small farmer's crop", its impact on rural farming communities—such as those of Cuba and East Timor—is anything but small.

FARMERS COME TOGETHER TO SOLVE SEED PROBLEMS

Farmers in Nepal have seized the opportunity to expand the country's potato production industry by participating in informal, farmer-run Seed Producer Groups (SPG) supported by CIP.

This approach—which has proven to be simple, cost effective, result-oriented and viable in small-farm communities—is so successful that the SPG are currently fulfilling close to 20 percent of Nepal's demand for potato seed.

Two years of trials to evaluate the quality of the SPG seed in Nepal's three major potato-producing regions showed it to be far superior to the alternative: seed produced through a contract system that is time consuming, costly and unsustainable. In most cases, yields from the SPG seed doubled those of the non-SPG alternative.

The country's Ministry of Agriculture has officially accepted the SPGs as national models for sustainable seed-potato production. Researchers and field workers hope that farmers will extend their use of the model to other crops.

CIP scientists are certain that the SPGs can be successfully replicated in the potato farming communities of many developing nations where the lack of low-cost, quality seed limits the crop's production.

