Late blight 2011: biology, resistant varieties, disease forecasting and management.
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Biology: As part of an AFRI grant involving more than 20 collaborators from throughout the USA, we received in 2011 more than 120 suspected late blight samples. All but a few were positive for late blight. We received samples from Connecticut, Delaware, Florida, Maine, Minnesota, New Hampshire, North Dakota, Oregon, Pennsylvania, Rhode Island, Virginia, Washington, and Wisconsin. Our major focus was to determine genotype (using microsatellite markers), and convey information as rapidly as possible to extension personnel who submitted the sample. Microsatellite analysis can be done on infected tissue or on sporangia from lesions, so data can be obtained without culturing the pathogen. In many cases, information was returned to the submitter within 24-48 hr of receipt of the sample. The data were uploaded to a national website that reported these various occurrences of late blight.

Preliminary analyses to date (10 October, 2011) indicate that the vast majority of genotypes of *Phytophthora infestans* strains in these samples corresponded to those that had been detected in previous years. These lineages were:
US8 (A2 mating type, resistant to mefenoxam, not aggressive on tomato, very pathogenic to potato, one sample)
US11 (A1 mating type, resistant to mefenoxam, aggressive to tomato and potato, one sample)
US22 (A2 mating type, sensitive to mefenoxam, aggressive on tomatoes, but also pathogenic on potato, > 15 samples (from NY and ME)
US23 (A1 mating type, sensitive to mefenoxam, aggressive on both tomatoes and potatoes, > 50 samples, from many NE states)
US24 (A1 mating type, sensitive to mefenoxam, aggressive mainly on potatoes, >14 samples, from WA, OR, ND, MN, ME, NY)

There were at least ten samples containing genotypes that we had not previously seen.   We are currently investigating their mating types, sensitivities to mefenoxam, host preference and relative aggressiveness. There appear to be both A1 and A2 mating types in this group and they also appear to have diverse sensitivities to mefenoxam. We are also investigating their relatedness to other strains.

Phenotypic analyses were conducted in the lab on isolates from the US8, US22, US23 and US24 clonal lineages collected in 2010. Isolates from the US8 and US24 clonal lineages had been obtained almost exclusively from potatoes. We found that sporulation on tomatoes was typically only about 10% that of sporulation on potatoes for each of these two lineages. Thus, it seems that neither US8 nor US24 is likely to cause a sustained epidemic on tomatoes. US8 and US23 appeared to sporulate about equivalently on potato, and more abundantly than did US22 or US24, so US8 and US23 may be the most aggressive potato pathogens.   In contrast, US22 and US23 were aggressive to both potato and tomato. Using lesion growth rate and sporulation as criteria, US23 appeared to be somewhat more aggressive on both potato and tomato than was US22.

Resistant varieties. We've investigated also the relative resistances diverse potato and tomato cultivars to late blight. Most of the popular cultivars are susceptible, but some recently available tomato cultivars are immune to the currently dominant strains of *P. infestans*. The relative resistances of many cultivars will be presented. The resistance of potato foliage to *P. infestans* is not necessarily related to the resistance of tubers. Therefore, we are separately obtaining data on the relative resistances of tubers of the most popular cultivars.

Forecasting and Management: Host resistance, weather, pathogen characteristics, and fungicide can be integrated via a Decision Support System (DSS) to achieve efficient late blight suppression. The DSS is currently available on the web at http://blight.eas.cornell.edu/blight/. The system requires a password, but these are readily available. The DSS uses weather data observed at a site chosen by the user. Additionally, the DSS uses weather forecasts (for the next 7 days) that are very specific to the user's location. This enables one to make predictions of late development specific to one's location. The system contains two disease forecasts: Blitecast and Simcast. Simcast incorporates the effects of host resistance and fungicide as well as weather effects. Blitecast incorporates only the effects of weather. This past year, chlorothalonil was the only fungicide in the system, but experiments conducted during the last several years will provide data to include the effects of additional fungicides. In field trials, standard fungicides have been demonstrated to be quite effective to suppress late blight. Even copper is quite effective in suppressing foliar blight. Chlorothalonil was consistently among the most effective at suppressing foliar blight. Unfortunately, we could detect no disease suppressing effect of oxidate. Several fungicides provided significant protection to tubers. These included Gavel, Presidio and Ranman.

The DSS was evaluated in field experiments in 2010 and 2011. Use of the DSS enabled much more efficient use of fungicide compared to standard grower practice –disease suppression equivalent to that of standard grower practice (weekly sprays), but with fewer fungicide applications. Unsprayed plots in the experiments were severely diseased. Sprayed plots were not significantly different from each other, each with a very low level of late blight.