2016 Rust Symposium

Rusts: An Evolving Problem in a Shrinking World

March 8–9, 2016

Pensacola Beach Hilton • Pensacola, Florida

PROCEEDINGS

Sessions and Posters

Poster Viewing Times

Monday, March 7

5:00 – 7:00 p.m. ..... Poster set-up

Tuesday, March 8

7:00 – 8:00 a.m. ..... Poster viewing
10:00 – 10:30 a.m. ..... Break and poster viewing
12:00 – 2:00 p.m. ..... Lunch and poster viewing
1:00 – 2:00 p.m. ..... Poster authors present
3:00 – 3:30 p.m. ..... Break and poster viewing

Wednesday, March 9

7:00 – 8:00 a.m. ..... Poster Viewing
9:40 – 10:00 a.m. ..... Break and poster viewing
10:00 a.m. ..... Poster take-down

Presented by

The American Phytopathological Society

3340 Pilot Knob Road, St. Paul, MN 55121 U.S.A.

PROCEEDING'S ABSTRACTS
(abstracts are printed as submitted by the author or presenter)

SESSION ABSTRACTS:

General Session I

■ **The coffee rust crisis in Central America.**

Presenting Author: Jacques Avelino
Affiliation: CIRAD-CATIE-IICA/PROMECARE, San Jose, Costa Rica

Coffee rust was considered in Latin America, and particularly in Central America as a manageable disease. Most producers did not fear the disease. However, Colombia, from 2008 to 2011, Central America, Mexico and the Caribbean, from 2012 to 2013, and Peru and Ecuador in 2013 have been affected by coffee rust epidemics of an intensity never seen before. Coffee losses were difficult to establish in Central America. In the first months of 2013 for instance, Honduras reported a reduction in production of 31% during the 2012-13 harvest, assuming this reduction was caused by coffee rust, although 60% of the Honduran coffee area is planted using resistant varieties. Coffee losses were then probably overestimated. In fact, the reduction in production, compared with previous years, is not an exact reflection of the losses caused by the disease due to the natural productivity fluctuations among years. Honduras declared a state of emergency and funds were made available to fight the disease. On the opposite, Nicaragua declared only 3% of coffee losses during the 2012-13 harvest, considering production forecasts. However, severe rust impacts were observed and mentioned by Nicaraguan producers. Nicaragua did not declare a state of emergency, despite the apparent severity of the situation, possibly because there were no available funds to alleviate the crisis. A similar situation occurred in El Salvador. Last official data published by the International Coffee Organization showed that Central American productions were very similar during the 2011-12 harvest (before the epidemic) and during the 2012-13 harvest (year of the epidemic). However, a 17% reduction in production occurred during the following harvest, possibly related to the epidemic. The most impacted countries were El Salvador and Guatemala with 57% and 16% reduction respectively. Coffee production started to recover during the 2014-15 harvest. However, productivity reductions associated with the epidemic have had direct impacts on the livelihood of thousands of smallholders and harvesters. Furthermore, for smallholders and harvesters coffee represents the only source of income which is generally used to purchase food and needed supplies for basic grain agriculture, transforming the coffee rust epidemic in a food security issue. Drivers of these particular epidemics appeared to be mainly economic and meteorological. In Central America and Colombia, all severe epidemics in the last 38 years, were concurrent with low or even negative coffee profitability periods. Low profitability being caused by decreases in coffee prices, as in the case of the 2012-13 Central American epidemics, or due to increases in input prices, as in the case of the 2008-11 Colombian epidemics. Low profitability, in countries where no subsidies are available, has led to suboptimal management of coffee plots which then became more vulnerable to rust. As a result of these trends, it can be stated that Central American coffee rusts epidemics were "economic epidemics". We have verified, through surveys conducted in Nicaragua during 2013-14, that farmers knew how to fight the disease, particularly by spraying fungicides, but most of them could not apply the control recommendations due to economic limitations. Those that were able to apply the recommendations were not severely impacted by the epidemic. When farmers' difficult economic situations are combined with meteorological conditions favourable to coffee rust development, the result is a very intense epidemic. In Guatemala, we observed a reduction of the diurnal thermal amplitude, with higher/lower minimum/maximum temperatures than expected: +0.9 °C/-1.2 °C on average in 2012 when compared to a 30-year period (1981-2010) average. This conditions likely decreased the latency period of the disease. In addition, precipitation anomalies (in 2012) were identified in Central America when compared to the same 30-year period, with higher amounts of rainfall in the first half of the year (>200 mm in many cases), when dry season occurs and normally disrupts coffee rust spread. We hypothesized that this condition promoted the growth and sporulation of latent and necrotic lesions earlier in the year leading to an earlier onset of the epidemic. Both effects of temperature and rainfall could explain the intensity of the 2012 coffee rust epidemic, especially if no control activities were conducted in the stands. Finally, weather conditions experienced in Central America throughout 2012 share common characteristics with climate change forecasts.

The epidemics observed might therefore be considered a warning as similar conditions may replicate in the future. Appropriate actions need to be taken in the near future to face this issue: development and establishment of resistant cultivars, building of an early warning system, development of management systems to cope with climate change and pest and disease threats, training and local organisations strengthening.

■ **Rusts on vegetable crops: Occurrence and challenges.**

Presenting Author: Steven T. Koike
Affiliation: University of California Cooperative Extension-Monterey County, Salinas, CA, U.S.A.

As commercial agricultural commodities, vegetables are a diverse group that is composed of plants in a dozen families and made up of innumerable types and cultivars. Vegetables are generally considered minor or specialty crops because of the modest acres planted to such commodities. However, vegetables are notable for their high value on a gross dollar per acre basis. Good documentation is found for rust pathogens infecting vegetables in the *Alliaceae, Apiaceae, Asteraceae, Chenopodiaceae, Convolvulaceae, Fabaceae, Lamiaceae,* and *Lilaceae.* The value of these commodities is dependent on very high quality; therefore, vegetables are subject to significant market losses if infected with rust. Because of the classification of vegetables as minor crops, research is limited on the development of rust resistant cultivars and registration of rust controlling fungicides. The damaging outbreak of *Puccinia allii* on garlic and other alliums in California serves as a case study on the significance of rust on a vegetable crop and the etiology, epidemiology, and disease management aspects of a rust problem on vegetables.

Concurrent Sessions 1A: Genetics and Genomics I

■ **Towards identifying the physical and molecular components involved in resistance to the wheat leaf rust pathogen *Puccinia triticina*.**

Presenting Author: S. DUGYALA (1)
Coauthors: P. Borowicz (1), M. Acevedo (1)
Affiliation: (1) North Dakota State University, Fargo, ND, U.S.A.

Use of genetic resistance is the preferred method to reduce yield losses caused by many diseases including wheat leaf rust. For decades, scientists have tried and continue trying to understand the genetics and physical mechanisms involved in durable host resistance. Wheat-*Puccinia triticina* (Pt) incompatible interactions can be classified into pre-haustorial and post-haustorial. Post-haustorial resistance tends to be involved in race specific resistance and is commonly characterized by presence of hypersensitive reaction (HR) while, pre-haustorial resistance do not generally involve an HR response. Histochemical and gene expression studies were used to determine if necrosis associated with pre- and post-haustorial resistance was the product of H2O2 accumulation. Susceptible cultivar Thatcher near isogenic lines (NILs) carrying different Lr genes were evaluated in a time course experiment. Pt inoculated leaf tissue was collected at 0, 6, 12, 18, 24, 48, 72, 96 hpi and 7 dpi. In Both NILs Tc-Lr9 and Tc-Lr21 HR was observed before (6hpi) and after (24hpi) haustoria formation and involved H2O2 accumulation. In the Tc-Lr9 NIL, upregulation of hypersensitive induced resistance genes TaHIR 1 and TaHIR 2 was observed before and after haustoria formation. However, upregulation of these two genes was also observed in susceptible cv. Thatcher. In the Tc-Lr21 NIL, Lr21 gene was only upregulated after haustoria formation. The data obtained from this study provide opportunities to assess components of different resistance mechanisms and suggest that some previous assumptions about plant-pathogen interaction in host and non-host systems involving pre-haustorial resistance should be revisited.