Model-based forecasting of powdery scab risk in potato, integrating soil sporosorus inoculum, potato cultivar, and environmental monitoring data

Y. ZENG (1), M. Davidson (2), D. Casey (2), P. O'Neill (3), B. Pandey (4), A. C. Fulladolsa (1), B. K. Chim (5), K. Frost (6), J. Pasche (7), A. O. Charkowski (1), (1) Colorado State University, Fort Collins, CO, USA; (2) Colorado State University, CO, USA; (3) Soil Health Services, Alamosa, CO, USA; (4) Department of Plant Pathology, North Dakota State University, Fargo, ND, USA; (5) University of Maine, Presque Isle, ME, USA; (6) Oregon State University, Hermiston, OR, USA; (7) North Dakota State University,Fargo, ND, USA

Powdery scab, caused by the plasmodiophorid *Spongospora subterranea* (*Ss*),is an increasingly important soilborne disease of potato in most potato growing regions globally. Infection by Ss can also transmit potato mop-top virus, an emerging pathogen that limits sales and export of seed and fresh potato. Management strategies for Ss and the virus are limited due to the lack of effective chemical control and resistant cultivars. To develop a disease forecasting model, we used open-source environmental sensing technology to identify factors that affect powdery scab development. Trials were conducted in 16 naturally Ss-infested fields in Colorado, North Dakota, Minnesota, Oregon, and Maine. Within each field, sensor units that measure on-board temperature and relative humidity as well as soil temperature and moisture were installed in four different locations. Soils were sampled prior to planting and monthly after planting until harvest to determine Sssporosorus density using a quantitative PCR assay. Soil chemical properties, potato cultivar, cropping histories, and chemical applications were recorded for each field location. Roots and tubers were sampled for root gall and powdery scab assessment. Significant variations of sporosorus density and root gall formation were observed within and among fields. These variations were attributed to a combination of differences in initial soil inoculum, soil temperature and volumetric water content, and potato cultivar. Currently, we are constructing spatial and time series models for forecasting sporosorus density and powdery scab risk.