WEBB, KIMBERLY M.[1]* and FRANCISCO CALDERON[2], [1]USDA-ARS, Sugar Beet Research Unit, 1701 Centre Ave., Fort Collins, CO 80526 and [2] USDA-ARS, Central Great Plains Resources Management Research, 40335 COUNTY RD GG, Akron, CO, 80720. **Mid-infrared and Near-infrared detection of *Rhizoctonia solani* AG 2-2 IIIB on barley based artificial inoculum.**

ABSTRACT

The amount of *Rhizoctonia solani* in the soil and how much is needed to cause disease in sugar beet (*Beta vulgaris* L.) is relatively unknown. This is mostly because of the usually low inoculum densities natually found in soil, and the low sensitivity of traditional serial dilution assays. We investigated the usefullness of using mid-infrared (MidIR) and near-infrared (NIR) spectroscopic properties to identify the artificial colonization of barley grains with *R. solani* AG 2-2 IIIB to detect *R. solani* populations in plant tissues and inoculants. The objectives of this study were to compare the ability of traditional plating assays to NIR and/or MidIR to identify *R. solani* from different sized fractions of colonized ground barley that is being used as an artifical inoculum from un-inoculated barley.

Two pathogenic *R. solani* AG2-2 IIIB isolates (R-9 and R-1) were allowed to colonize hull-less barley which was then dried, ground, and then passed through multiple soil sieves separating the inoculum into different sized fractions (>2 mm, 1-2 mm, 0.5-1 mm, 0.25-0.5 mm, and <0.25 mm). For each fraction 0.1g of ground inoculum was removed for each isolate (R-9, R-1, and Non-inoculated control) and evenly spread onto 4 plates of modified Ko and Hora's media and incubated at 25C. The number of *R. solani* growing from each of the artificial inoculum particles was counted at 48 hours after plating and these counts were used to calculate the number of infective particles per gram of ground inoculum based on the dilution of the ground inoculum placed on the plate. For each of the sieved fractions, an additional three 1 g samples were removed for MidIR and NIR testing and ground to a fine powder using a mortar and pestle prior to scanning. All samples were analyzed with a Fourier transform spectrometer. Spectral data were collected as 64 co-added scans per spectrum at 4 cm^{-1} resolution from 4000 to 400 cm^{-1} for the MidIR, and 10000 cm^{-1} to 4000 cm^{-1} for the NIR.

NIR and MidIR were sensitive in resolving different barley particle sizes, with the <0.25 mm and 0.25-0.5 mm particles having different spectral properties relative to the more coarse particles. We found that barley colonized with *R. solani* had diffent MidIR spectral properties than un-inoculated samples for the larger fractions (0.5-1.0 mm, 1.0-2.0 mm and >2.0 mm) of the ground barley. This colonization was confirmed by traditional plating assays. Comparison with the spectra from pure fungal cultures and un-inoculated barley suggests that the colonized barley MidIR is different because of consumption of C substrates by the fungus, rather than by the presence of fungal bands in the colonized samples. MidIR was better than NIR in resolving colonized from control samples.