BETA VULGARIS GROWN UNDER DIFFERENT EVAPOTRANSPIRATION LEVELS AND THE EFFECTS ON THREE *RHIZOCTONIA SOLANI* AG 2-2 IIIB ISOLATES AND *PEGOMYA BETAE*

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ABSTRACT

Excessive irrigation can lead to soil erosion and can increase the potential for soil-borne diseases. The widespread use of sprinkler or surface irrigation in Idaho in combination with irrigation mismanagement can potentially predispose local growers to disease problems including Rhizoctonia root rot (RRR, *Rhizoctonia solani*) and Rhizomania caused by Beet Necrotic Yellow Vein Virus (BNYVV). A three year study investigating the interactions between irrigation levels and different *R. solani* isolates was initiated in 2012 at the University of Idaho, Kimberly Research and Extension Center, Kimberly, ID, with silt loam as the predominant soil type. The study design was a 3 by 4 factorial experiment with four irrigation levels (Irrigation levels: 40%, 70%, 100% and 130% evapotranspiration (ET)) and three different *R. solani* AG 2-2 IIIB isolates (isolates F521 – closely related to the widely used *R. solani* isolate R9, F551 – isolate found in the southern production area of Idaho and F517 – isolate from the western production area) and was repeated six times. Each irrigation level consisted of 16-row plots, 25-ft long and individual blocks were separated by a 5-ft alley. Irrigation was facilitated using drip irrigation to ensure consistent and precise water delivery. Each 16-row plot contained two rows per previously mentioned pathogens and two rows as an untreated control. Inoculated and untreated rows were separated by one buffer row from each other. Before planting, pathogen rows were inoculated by spreading 38 lb/A of *R. solani* inoculum, produced on sterilized, whole barley kernels. The infection with BNYVV was facilitated by spreading soil infested with viruliferous *Polymyxa betae*. In both instances, the inoculum was subsequently incorporated to a depth of 1.5 to 2 inches using a rototiller. Rows inoculated with individual *R. solani* isolates and the untreated control and border rows were planted with BTS 27RR20, whereas rows inoculated with *P. betae* infested soil were planted with BTS 4G 20. Effects of damping-off, stand establishment and loss were evaluated by stand counts starting at 50% emergence and continued until harvest in a seven day interval. Two ratings were conducted to determine disease severity of Rhizomania. Four randomly chosen beets were removed from the plot area and serologically examined (ELISA) for the presences of BNYVV. At harvest, plots were mechanically defoliated, the two center rows of each plot were harvested with a small plot harvester, and root yields were determined. Approximately 8 to 10 beets were sampled from each plot and percent sugar content was determined by The Amalgamated Sugar Company, LLC Tare Laboratory in Paul, ID using a polarimeter. In addition, individual roots were rated for RRR by estimating the rotten surface area (1-9 IfZ disease classes, 1 = healthy, 9 = completely rotten, Plant Breeding 123:158-166). Data were analyzed by ANOVA using the general linear models (Proc GLM) procedure of SAS, and treatment means were separated using Fisher's protected least significant difference (LSD) test ($P \leq 0.05$). Statistical analysis for RRR disease index (DI, based on a 1-9 rating scale with 1 = no disease observed on beet root, 9 = root completely dead)

showed significant differences for different ET levels (Pr>F 0.0025), *R. solani* isolates (Pr>F <0.0001) and for the interaction between ET and *R. solani* isolates (Pr>F 0.0201). Comparing Rhizoctonia isolates across ET levels showed a 6.4-fold increase in DI for F521, a 3-fold and 2-fold for F551 and F517 respectively when compared to the non-inoculated control.