Spider mite resistant maize lines, B75 and B96, maintain resistance under water-stress

Author(s)

Gunbharpur S. Gill[1, †], Huyen Bui[2, ††], Richard M. Clark[2,3], Ricardo A. Ramirez[1*]

[1]Department of Biology, Utah State University, Logan, Utah 84322, USA.

[2]School of Biological Sciences, University of Utah, Salt Lake City, Utah 84112, USA.

[3]Henry Eyring Center for Cell and Genome Science, University of Utah, Salt Lake City, Utah 84112, USA.

[†]Present Address: 955 Terminal Way, San Carlos, California 94070, USA

[††]Present Address: Center for Biofilm Engineering, Montana State University, Bozeman, Montana 59717, USA.

File list

B73-B75-B96_MiteNumbers_Greenhouse.xlsx

B73-B75-B96_MiteNumbers_FieldTrials.xlsx

B73-B75-B96_Phenotypic_Measurements_Greenhouse.xlsx

B73-B75-B96_Phenotypic_Measurements_FieldTrials.xlsx

B73-B75-B96_Proteins_Greenhouse.xlsx

B73-B75-B96_Proteins_FieldTrials.xlsx

File descriptions

B73-B75-B96_MiteNumbers_Greenhouse.xlsx

B73-B75-B96_MiteNumbers_FieldTrials.xlsx

These two data sets highlight the spider mite responses of twospotted spider mite and Banks grass mite to varying water stress and maize inbred line in greenhouse trials and field trials.

B73-B75-B96_Phenotypic_Measurements_Greenhouse.xlsx

B73-B75-B96_Phenotypic_Measurements_FieldTrials.xlsx

These two data sets highlight the plant phenotypic/physiological responses of each maize inbred line to varying water stress in greenhouse trials and field trials.

B73-B75-B96_Proteins_Greenhouse.xlsx

B73-B75-B96_Proteins_FieldTrials.xlsx

These two data sets highlight the plant defense protein responses of chitinase, trypsin inhibitor, peroxidase, and polyphenyl oxidase to varying water stress, mite herbivory, and maize lines in greenhouse trials and field trials.

Methods

Water-stress or optimal irrigation levels were quantified by measuring stomatal conductance ($mmolm^{-2}s^{-1}$) and leaf temperature (°C) using a leaf porometer (Model SC-1, Meter Group, WA, USA), leaf water potential (bar) using a pressure chamber (Model 615, PMS Instrument Company, OR, USA), and stem height (cm) by using a ruler. Leaf temperature, stomatal conductance and stem height were measured at 3 and 7 days post mite introduction, while leaf water potential was measured after sample collection at 7 days post mite introduction.

At 1, 3, and 7 days post mite introduction, leaf samples (leaf areas inside Tanglefoot arenas) from eight plants of four randomly selected replicates (2 plants/replicate) were collected, flash-frozen using liquid nitrogen and stored in a freezer (-20 °C) until processing. Each sample was processed by counting the number of eggs and all mite stages and by performing defense protein bioassays.

The activities of POD, PPO, and CHI were analyzed using a microplate reader (Biotek, EPOCH, VT, USA), while the activity of TI was analyzed by using radial diffusion techniques.

Analyses

Mite (TSM and BGM) population sizes, assessed as the sum of eggs, nymphs and adults, and plant physiological measurements, and defense protein activity measurements from trials were analyzed using a general linear model (Proc Glimmix; SAS 9.4 M4 University edition). Square-root transformation was used for both mite population growth, plant physiological responses, and defensive protein activities (POD, PPO, CHI and TI) data to conform to the assumption of normality and heteroscedasticity. Data presented here are the non-transformed data.