Assessment of variety resistance to four postharvest diseases of potato in Michigan, 2023

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Cultivars with postharvest disease resistance can provide economical and effective management. However, robust phenotyping of variety responses is needed. In this study, commercial lines and germplasm from chipping, yellow and red market classes were assessed for resistance to four major postharvest diseases: Fusarium dry rot, bacterial soft rot, pink rot, and Pythium leak.

Materials and Methods

During 2022-23, 10 chipping lines, 6 red, and 16 yellow lines comprising commercial varieties and research germplasm were assessed for resistance response to dry rot, soft rot, pink rot, and leak. Chipping lines were obtained from the Potatoes USA-SNAC International Trial (Montcalm County) and were tested at three replicate timepoints (4 tubers/timepoint). Red and yellow lines were collected from the Potato Outreach Program on-farm trials at 4-L Farms (Kalamazoo County), Styma Potato Farms (Presque Isle County), and Walther Farms (St. Joseph County) and were tested at two replicate timepoints (5 tubers/location/timepoint).

Asymptomatic tubers were rinsed with tap water, surface disinfested with 10% bleach solution for 30 seconds, and rinsed with deionized water, before air-drying overnight at ambient conditions. For all pathogens, 10uL of inoculum was injected to a 1 cm depth at the apical and basal ends of each tuber using a Hamilton® syringe (710 series, 100uL volume). Tubers were inoculated with suspensions of the following: 2 x 10^4 *Fusarium sambucinum* conidia/mL in potato dextrose broth; 2 x 10^4 *Phytophthora erythroseptica* zoospores/mL in Petri's solution; 5 x 10^4 *Pythium ultimum* oogonia/mL in potato dextrose broth; or 8 x 10^8 *Pectobacterium carotovorum* cfu/mL in LB broth. Tests for dry rot and pink rot were incubated in paper bags under ambient conditions for 28 or 6 days, respectively. Pythium leak and soft rot tests were incubated in plastic bags with moist paper towels at room temperature for 6 days. After incubation, tubers were sliced longitudinally through inoculation sites and internal symptom width and depth were measured using digital calipers. Data was analyzed using an analysis of variance (ANOVA) conducted with the generalized linear mixed model (GLIMMIX) procedure in SAS v. 9.4, and means were compared using Fisher's protected LSD (α=0.05).

Overall Summary

Experimental methods were optimized for screening postharvest disease resistance in chipping, red, and yellow potato entries using Michigan pathogen isolates. No relationship was observed between resistance responses to different diseases; however, several varieties, including MSZ242-13 (now Dundee) and MSAFB635-15, possessed at least moderate resistance to all four diseases. Ongoing screening will help to inform growing operations, management practices, and breeding directions. In 2023-24, screening is in progress and will be expanded to include additional *Fusarium* sp., identified during surveys of Michigan storage piles.

Acknowledgements

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Figure 1. Responses of 10 chipping potato lines to dry rot, pink rot, Pythium leak, and soft rot. Bars with the same letter not significantly different based on Fisher's protected LSD (α=0.05). Means are across apical and basal end responses ($P < 0.0001$) for dry rot, pink rot, and soft rot; means for apical end for Pythium leak ($P < 0.05$). Tubers were from the Potatoes USA-SNAC International Trial location in Montcalm County, tested in three replicate timepoints. Lamoka and Snowden (solid outline) were used as commercial checks.

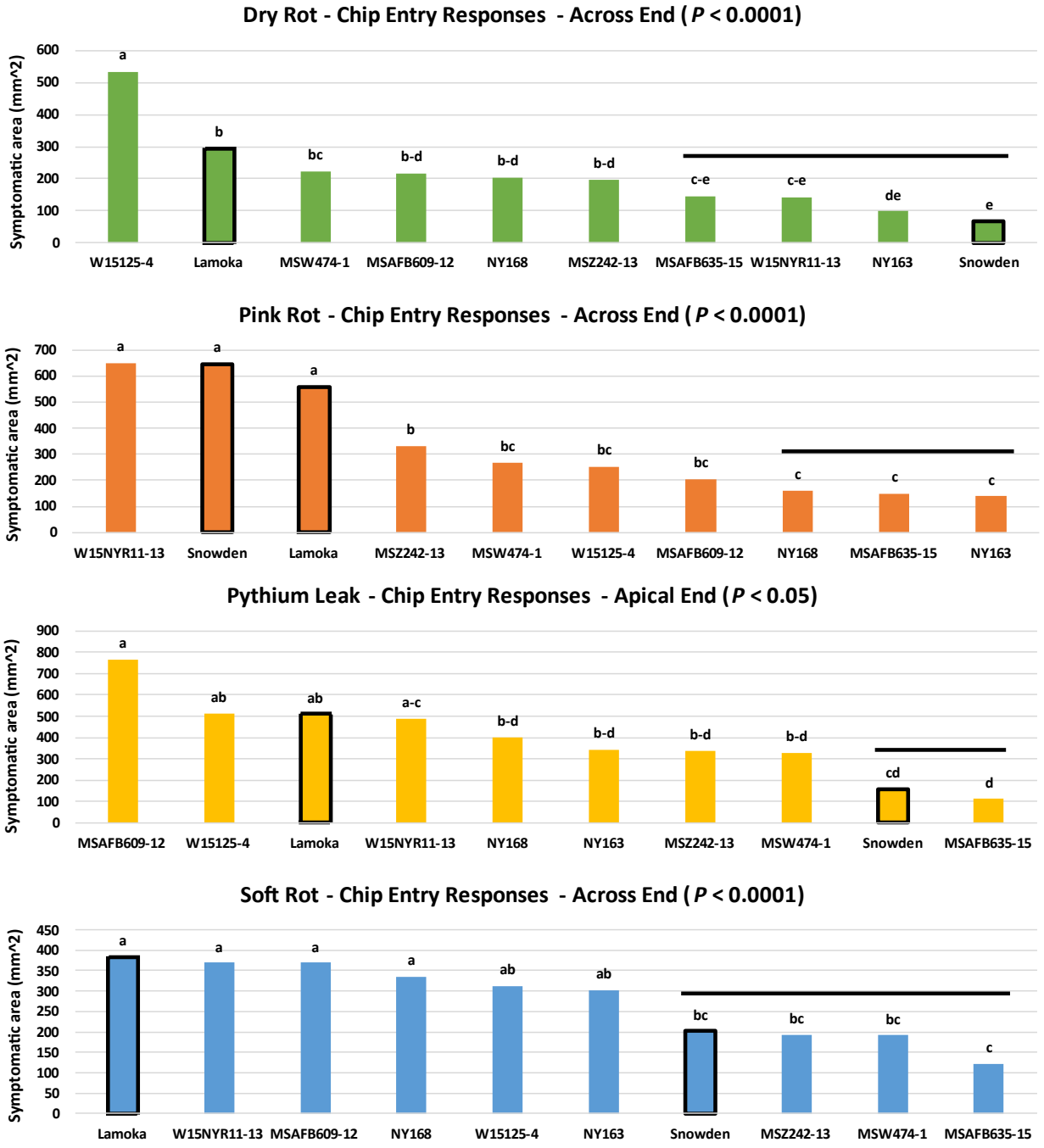
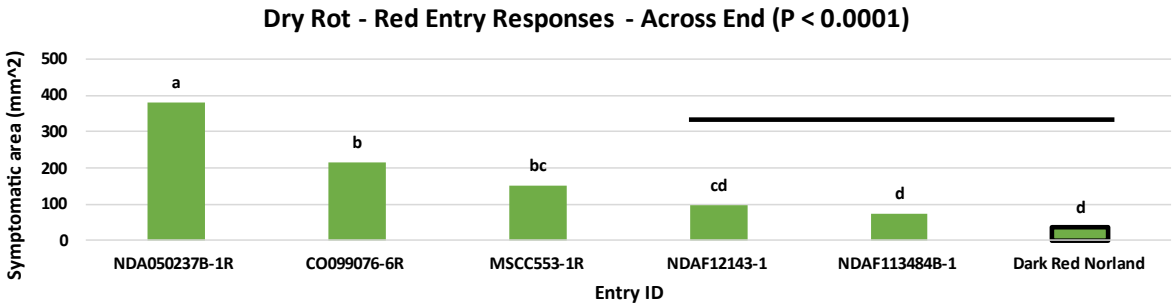
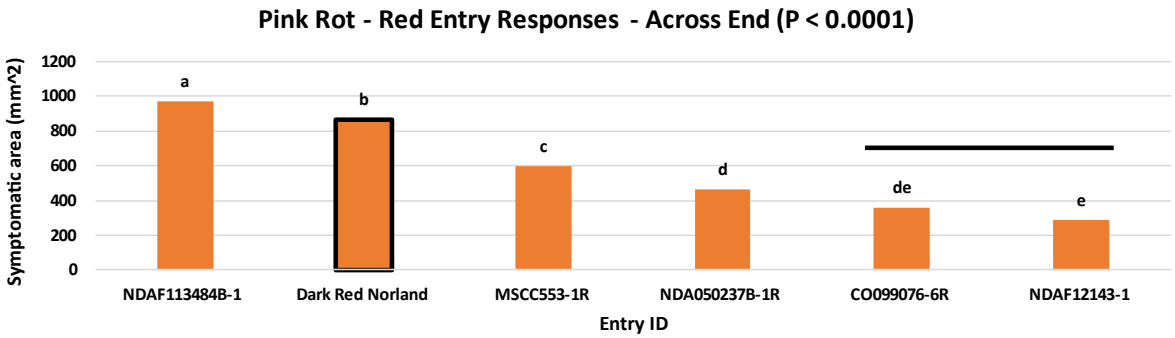
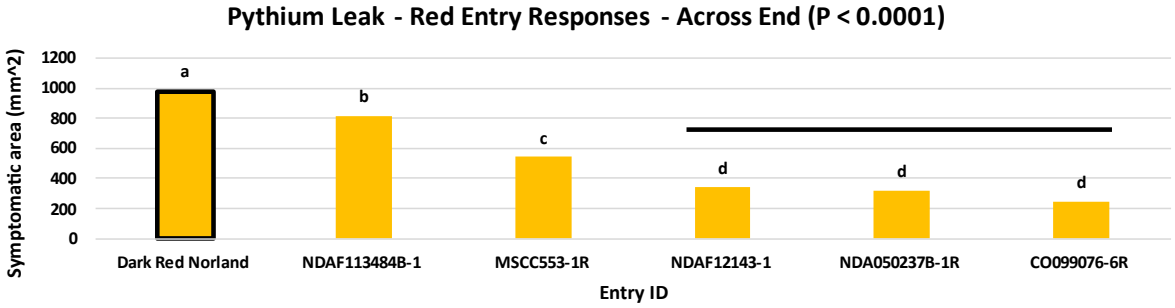


Figure 2. Responses of 6 red potato lines to dry rot, pink rot, Pythium leak, and soft rot. Bars with the same letter not significantly different based on Fisher's protected LSD (α=0.05). Means are across apical and basal end responses ($P < 0.0001$) in tubers from three MSU Potato Outreach Program field locations (4-L Farms, Styma, and Walther's Cass City) tested in two replicate timepoints. Dark Red Norland (outlined in black) was used as a commercial check.







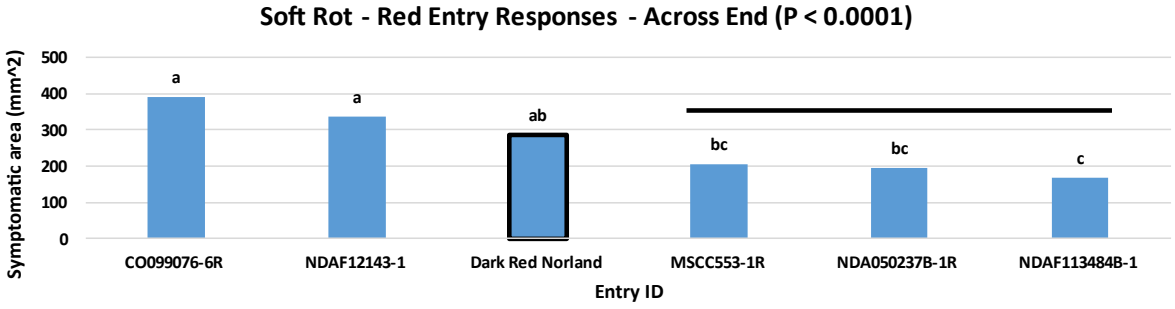


Figure 3. Responses of 16 yellow potato lines to dry rot, pink rot, Pythium leak and soft rot. Bars with the same letter not significantly different based on Fisher's protected LSD (α=0.05). Means are across apical and basal end responses ($P < 0.0001$) in tubers from three MSU Potato Outreach Program field locations (4-L Farms, Styma, and Walther's Cass City) tested in two replicate timepoints.