

Assessment of variety resistance to four postharvest diseases of potato in Michigan, 2024

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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 2023-24, 21 chipping lines, 6 russet, and 12 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 three MSU Potato Outreach Program field locations at Walther Farms (St. Joseph County), Hampton Potato Growers (Bay County), and the Montcalm Research Center (Montcalm County). Russet and yellow materials were obtained from two MSU Potato Outreach Program on-farm trials at 4-L Farms (Kalamazoo County) and Kitchen Farms (Otsego County). All materials were tested at two replicate timepoints (5 tubers/location/timepoint/disease).

Asymptomatic tubers were rinsed with tap water and air-dried 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, 100-uL volume). Tubers were inoculated with suspensions of the following: 2×10^4 *Fusarium sambucinum* conidia/mL in potato dextrose broth; 2×10^4 *Phytophthora erythroseptica* zoospores/mL in Petri's solution; 5×10^4 *Pythium ultimum* oogonia/mL in potato dextrose broth; or 8×10^8 *Pectobacterium carotovorum* cfu/mL in LB broth. Two additional *Fusarium* spp., identified during surveys of Michigan storage piles, were also used in dry rot screening. 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 ($\alpha=0.05$).

Overall Summary

Postharvest resistance to four diseases was screened in chipping (Figure 1), russet (Figure 2), and yellow (Figure 3) potato entries using Michigan pathogen isolates. No clear relationship was observed between resistance responses to different diseases; however, several varieties including Dundee (previously MSZ242-13), MSAFB635-15, and Bliss, possessed at least moderate resistance to three or four diseases (see Figure 5 for examples of Bliss symptoms). While dry rot responses to *F. graminearum* and *F. sambucinum* generally followed similar trends, several varieties may have seemed more or less resistant depending on the species used (Figure 4). Ongoing screening will help inform management practices and breeding directions. In 2024-25, screening is in progress for eight chipping lines of interest.

Acknowledgements

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Range of infected area: 6-124 mm²

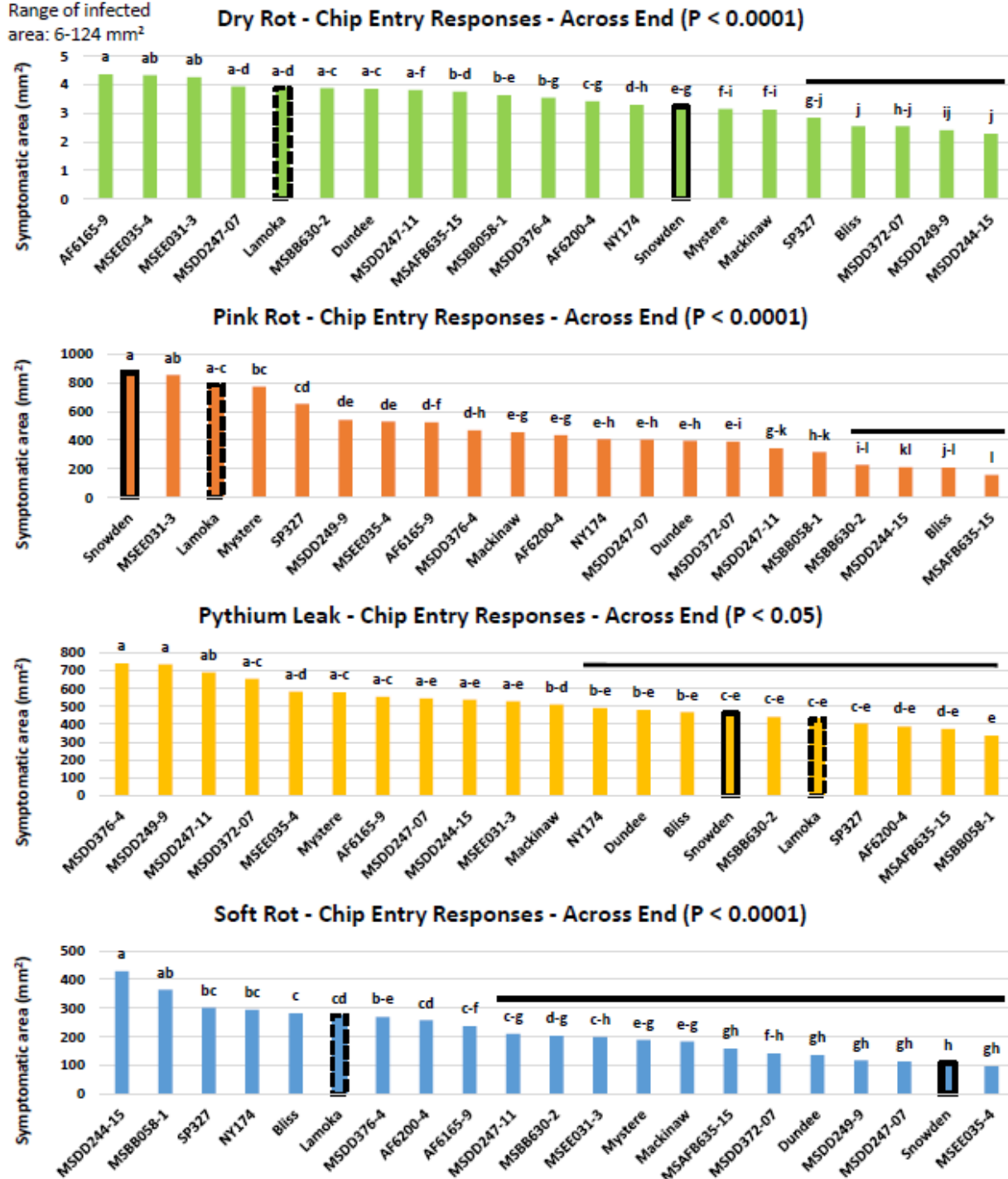


Figure 1. Responses of 21 chipping potato lines to dry rot, pink rot, Pythium leak, and soft rot. Bars with the same letter not significantly different based on Fisher's protected LSD ($\alpha=0.05$). Means are across apical and basal end responses ($P < 0.0001$) for dry rot, pink rot, soft rot, and Pythium leak ($P < 0.05$). Tubers were from three MSU Potato Outreach Program field locations (Walther Farms, Hampton Potato Growers, and the Montcalm Research Center) tested in two replicate timepoints. Lamoka (dotted outline) and Snowden (solid outline) were used as commercial checks.

Range of infected area: 15-64 mm²

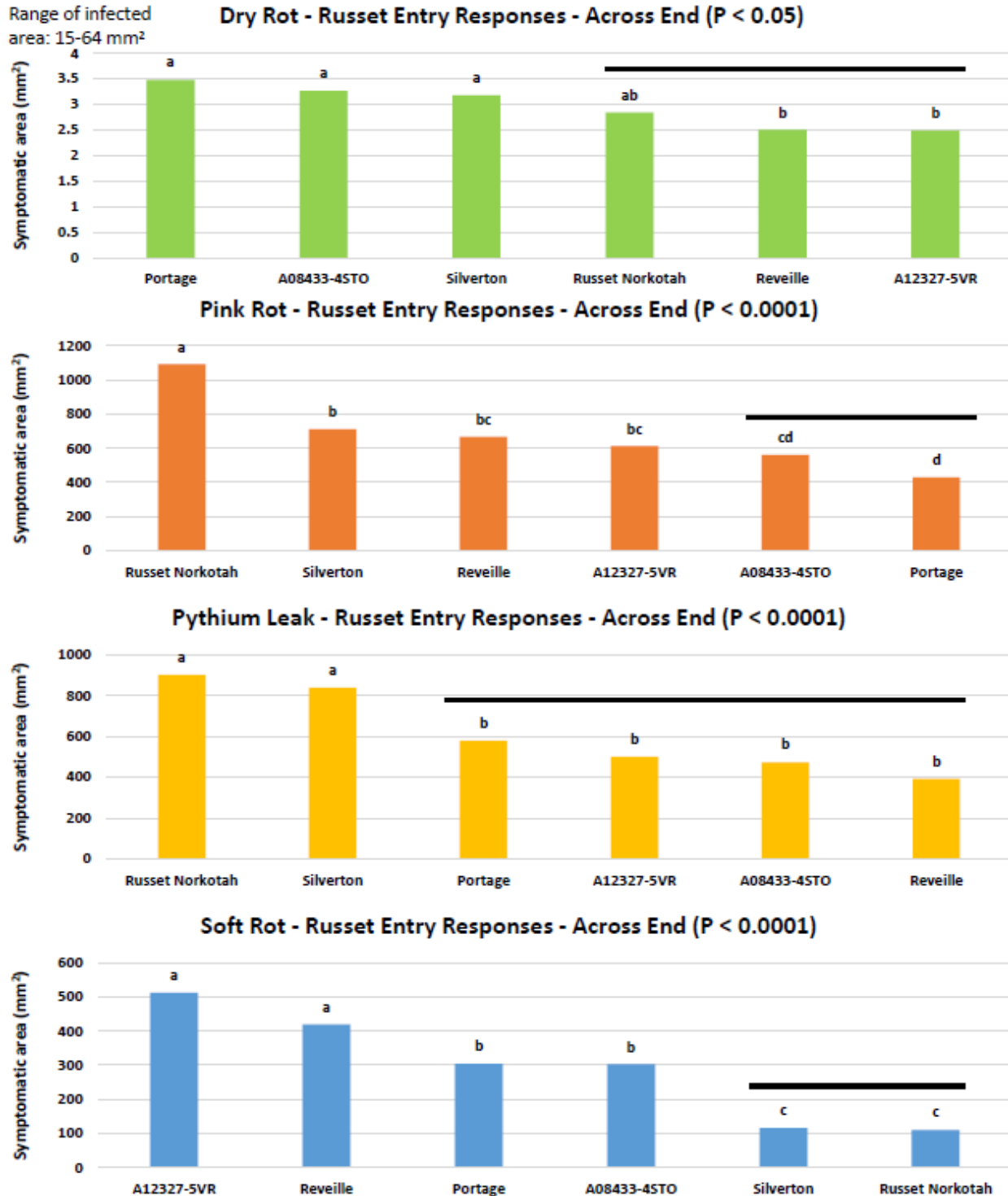


Figure 2. Responses of 6 russet potato lines to dry rot, pink rot, Pythium leak, and soft rot. Bars with the same letter not significantly different based on Fisher's protected LSD ($\alpha=0.05$). Means are across apical and basal end responses ($P < 0.0001$) in tubers from three MSU Potato Outreach Program field locations (4-L Farms and Kitchen Farms) tested in two replicate timepoints.

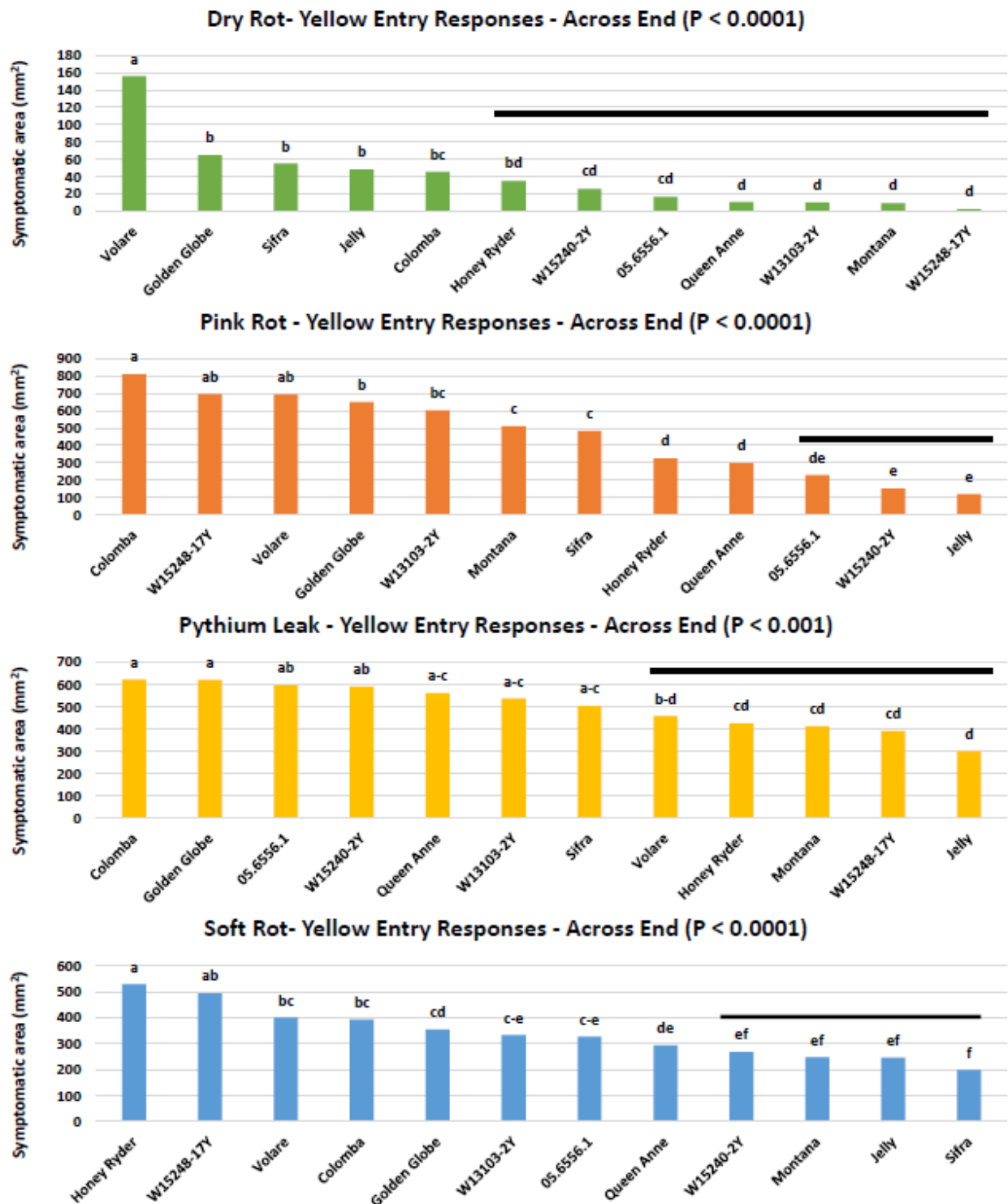


Figure 3. Responses of 12 yellow potato lines to dry rot, pink rot, Pythium leak and soft rot. Bars with the same letter not significantly different based on Fisher's protected LSD ($\alpha=0.05$). Means are across apical and basal end responses ($P < 0.0001$) in tubers from two MSU Potato Outreach Program field locations (4-L Farms and Kitchen Farms) tested in two replicate timepoints.

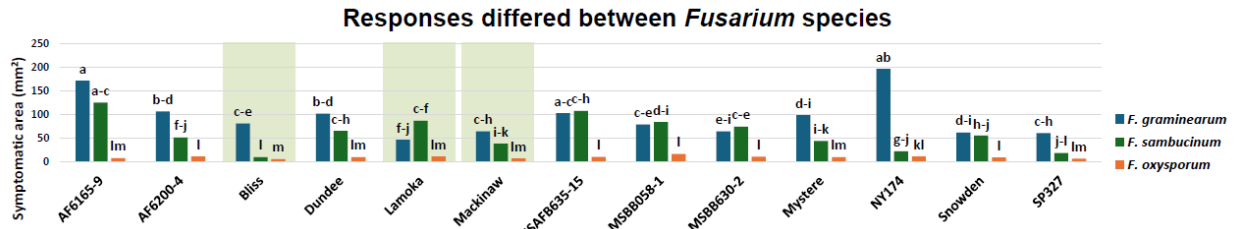


Figure 4. Responses of 13 chipping potato lines to dry rot caused by three species of *Fusarium* prevalent in Michigan potato samples: *F. graminearum* (blue), *F. sambucinum* (green) and *F. oxysporum* (orange). Bars with the same letter not significantly different based on Fisher's protected LSD ($\alpha=0.05$). Significant variable responses were observed across apical and basal end ($P < 0.0001$).



Figure 5. Examples of typical symptoms for each of the four tested postharvest diseases. Bliss had greater resistance to pink rot, Pythium leak and dry rot, while Lamoka tended to be more susceptible, and Mackinaw exhibited moderate resistance to soft rot, dry rot, and leak.