Irrigation as a potato IPM component – balancing in-field observations and soil water metrics

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Background

- Water scarcity and quality are increasing issues for U.S. potato growers
- Potato processors are increasing on-farm water stewardship requirements
- Digital technology is a critical component in addressing grower & processor water concerns
- Technology implemented with water budget in mind
- Ramifications to IPM often overlooked

Organizational Challenges

- Farm size is increasing
- Employees expected to manage more acres in same amount of time
- Irrigation and disease management commonly delegated to different roles in large operations
  - Disconnect between managing soil moisture status and canopy disease development
- Soil moisture probes viewed as opportunity to remotely manage acres
  - Irrigators can manage more acres in turn

Soil Moisture Probes

- Embedded in representative areas or areas prone to moisture extremes
  - Failsafe against permanent wilting point
- Point measurement with small sphere of influence
- Many measure moisture at multiple depths
  - Reveals moisture accumulation, depletion, and effective rooting depth
  - Important for late season tuber health
- Regular calibration needed as canopy develops

Irrigation's potential as a tool in the IPM toolbox remains largely untapped. Division of labor in disease and water management is partially responsible in large-scale potato operations. Digital technologies for irrigation management can foster a hands-off approach furthering the risk of mismanagement.

Figure 1. A center pivot irrigates potatoes in Lamb County, TX (June 2021)

Figure 2. Wet canopy conditions led to *Botrytis cinerea* in Hartley County, TX (August 2021)

Figure 3. Aboveground telemetry attached to a soil moisture probe (not shown)

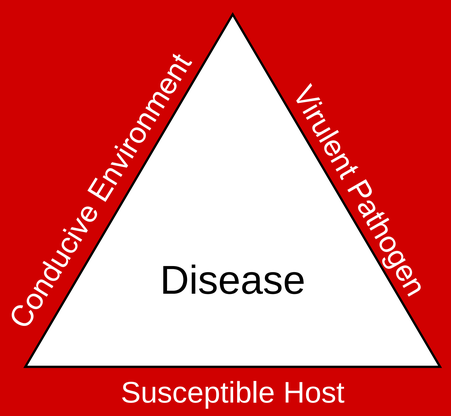

Figure 4. Proper irrigation disrupts conducive disease conditions and mitigates plant stress/susceptibility

Digital irrigation management technologies can augment field checks by quantifying moisture distribution in the field. These technologies should complement, not replace, routine in-field observations. Cross-training agronomists and irrigators could lead to early disease detection, irrigation adjustments, and improved outcomes. Producers should capitalize on irrigation as a tool in their IPM toolbox.

Limitations

- Probes and telemetry are expensive
- Power sources and connectivity concerns compromise dependability
- Point measurement
  - Limits insight into whole field soil moisture status
- Accuracy influenced by canopy development and soil disturbance
- Most do not measure soil water potential
  - Important to understanding water availability for hosts and pathogens
- Currently, do not provide insight into canopy free moisture
- Limited pathogen specific research on using soil moisture data to irrigate for disease management

Opportunities

- Soil moisture probe data can reveal concerns that may be overlooked in-field
  - Complement in-field checks
  - Should not increase acreage responsibilities
- Establish probe networks within fields for site-specific disease management
- Augment probe networks with canopy moisture sensors
- Cross-train agronomists and irrigators on utilizing probe data to manage for disease
- Processors should formally recognize how probe data contributions to IPM could further sustainability initiatives
- Develop research backed information for pathogen specific management via irrigation

References

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