LIVING LAB - ATLANTIC

Potato early dying responses to residue tillage

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Introduction

- Potato production requires intensive tillage during field preparation, planting, hilling, pesticide application, and harvesting. Tillage practices have multi-faceted effects on potato production and environment.
- Conventional tillage such as fall moldboard plowing (MP): almost residue free on soil surface, declining soil organic matter, reducing productivity, increasing soil erosion, and soil borne disease pressure.
- Conservational tillage like residue tillage (RT): leave more crop residues on soil surface, minimizing soil erosion, increasing soil organic matter. Disease responses to residue tillage is varied.
- Potato early dying (PED) is a main potato yield limiting factor, the effect of residue tillage on PED is unknown.
- The objective of this study is to assess the effect of RT and MP on PED in commercial fields under commercial operation in PEI.

Methods

- **Commercial fields selected**

2019: 4 fields
2020: 3 fields
2021: 3 fields
2022: 4 fields

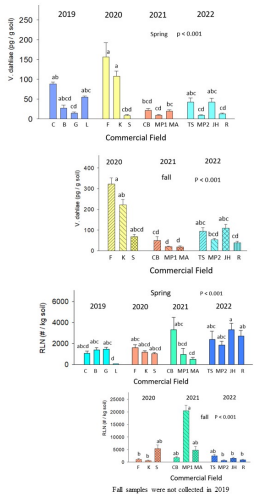
-Each field splitted into two sections with 4 plots each

- **Tillage treatments in fall prior to potato season**
  - Moldboard plowing
  - Residue tillage

- **Data collection**
  - Root lesion nematodes (RLN) counted using modified Baermann techniques
  - *Verticillium* spp quantified using qPCR
  - PED disease severity rated using 0-100% severity scale

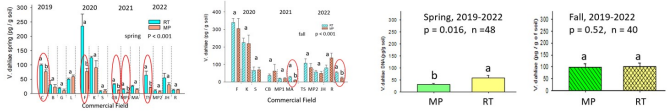
Results

- ***Verticillium* spp. population density in 2019-2022**
  - *V. dahliae* was present in all fields and there was a significant variation among fields in each year
  - *V. albo-atrum* was present in 10% fields at low level (results not shown)
  - *V. tricorpus* was not detected
  - In general, fall inoculum density was higher than spring inoculum
- **RLN population density in 2019-2022**
  - RLN was detected in all fields and varied among the fields
  - Fall RLN population density was higher than spring density in 3 fields, lower in 4 fields and neutral in 3 fields, this could be due to different composition of RLN species in different fields

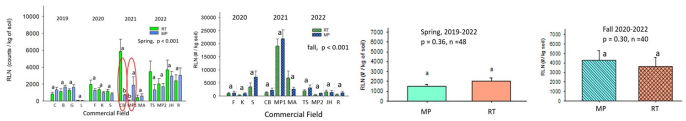


Results

- **Effect of RT and MP on population density of *V. dahliae***
  - In spring, 5 out of 14 fields had significantly higher *V. dahliae* density in RT plot compared to MP plot
  - In fall after potato, 2 fields had higher *V. dahliae* density in RT plots than MP
  - When data were combined from all fields and years, population density of *V. dahliae* was significantly higher in RT than in MP plots in spring, but no differences were observed in fall after potato harvest



- **Effect of RT and MP on population density of RLN**
  - In spring, there was no difference in RLN population density in 12 out of 14 fields between RT and MP plots
  - In fall after potato, no difference was detected between RT and MP plots When data were combined from all fields and all years, no difference was detected on RLN population between RT and MP plots in either spring or fall



- **Effect of RT and MP on PED disease severity**
  - No significant PED disease severity were observed in 9 out of 13 fields among RT and MP plots
  - Three fields had higher PED disease severity in RT plots

	2019 (rAUDPC)			2020 (% foliar wilt)			2021 (% foliar wilt)			2022 (rAUDPC)			
Treatment	C	G	L	F	K	S	CB	MP1	MA	T	MP2	H	R
RT	35.3 a	4.4 a	1.7 a	50.0 a	70.5 a	6.1 a	32.9 a	56.0 a	5.0 a	32.0 a	59.7 a	37.7 a	32.6 b
MP	26.4 b	4.7 a	1.3 a	39.5 b	71.4 a	7.0 a	36.0 a	60.1 a	4.5 a	29.5 a	56.2 a	35.8 b	35.2 a
Significance of ANOVA	*	NS	NS	*	NS	NS	NS	NS	NS	NS	NS	**	*

Conclusion and Future work

- RT increased inoculum density of *V. dahliae* in top 0-20 cM soil compared to MP in spring after fall plowing in the previous year, but the difference disappeared in fall after potato season
- RT had no significant effect on population density of RLN, and had no significant effect on PED disease severity
- It is necessary to evaluate the long term effect of RT in the same fields on potato diseases and other soil health indicators

Acknowledgment

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