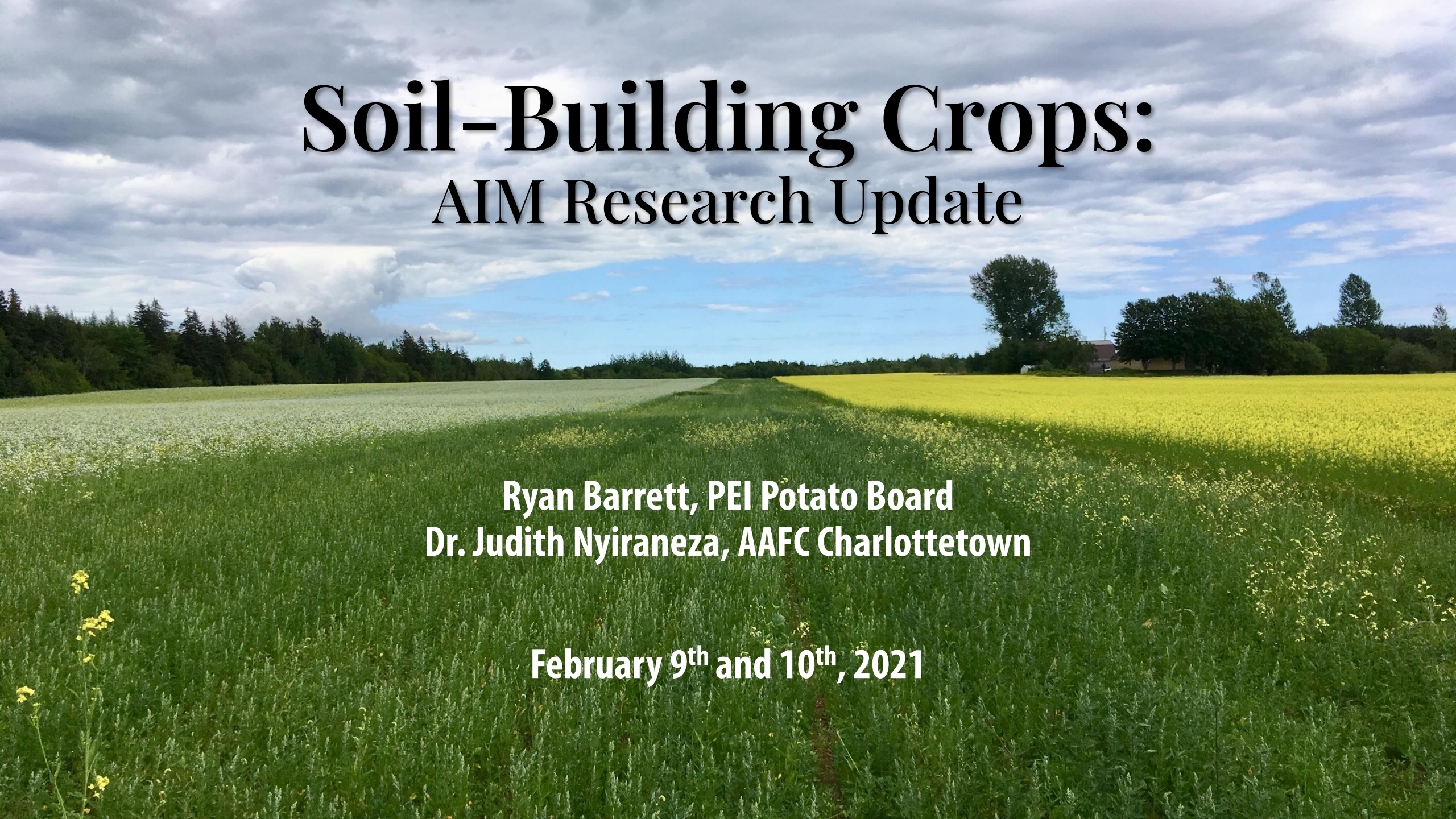

Soil-Building Crops:
AIM Research Update

Ryan Barrett, PEI Potato Board
Dr. Judith Nyiraneza, AAFC Charlottetown

February 9th and 10th, 2021

Improving Soil Health:

- Cycling/providing essential nutrients
- Water holding capacity of soil OM
- Feeding/fostering soil microbes
- Stable aggregates to improve water/air holding capacity
- Protection from erosion
- Outcompeting soil-borne pests & diseases
- Resiliency to buffer effect of climate change

Catherine Ulitsky, USDA/Flickr

How can we improve soil health?

- Reduce tillage/soil disturbance
- Minimize and mitigate soil compaction
- Add manure or compost
- Use cover crops to keep something growing as much as possible
- Choose rotation crops which break disease cycles, combat pests
- Choose rotation crops with dense root systems
- Use perennial crops where possible
- Leave crop residues in the field where possible
- Prevent soil erosion

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Today's Agenda:

- Living Labs: Full Season Soil-Building Crops (Ryan)
- Living Labs: Full Season Soil-Building Crops (Judith)

- Review of Potato Early Dying (PED)
- Survey Results from CanPEDNet Project
- AIM Legume PED Project
- AIM Biofumigation Project
- ECODA Mustard Project

Living Labs: Soil Building Crops

- Comparing full-season soil-building crops planted the year before potatoes versus a "check" crop (what grower would normally plant).
- Established May/June 2019. Potatoes planted in 2020.
- Testing for:
  - Soil Chemistry
  - Soil Health
  - Verticillium & Nematodes
  - Soil Nitrogen Supply
  - Soil Compaction
  - Yield and Quality in the Potato Crop

Living Labs: Soil Building Crops

Treatment Crops:

- Hemp
- Buckwheat
- Sorghum Sudangrass (x2)
- Brown Mustard (x2)
- Sudangrass/Pearl Millet
- Multi-Species Mixes (x3)
- Mustard/Radish
- Mustard/Sudangrass
- Oilseed Radish

Check Crops:

- Red Clover/Timothy (x2)
- Red Clover
- Brown Mustard
- Annual Ryegrass (x3)
- Oats

What did we find?

ONE

YEARS

DATA!

Trials significantly impacted by:

- Drought
- Weeds

What did we find?

In 12 comparisons of alternative crop versus check crop, the average difference was:

- Total Yield: +14.8 cwt/ac
- Marketable Yield: +10.4 cwt/ac
- Crop Value: +$154/ac

- Marketable Yield significantly increased in only 4 out of 12 comparisons
- Marketable Yield did not significantly decrease in any field (p=0.10)

What did we find?

Multi-Species Mixes (8 to 12 species)

- No difference in yield or quality averaged over 3 fields
- Some concerns about weeds
- Only increased yield in one field *

Sorghum Sudangrass

- No difference in yield or quality averaged over 3 fields
- No big negatives or positives

What did we find?

- **In 18 out of 22 treatments, root lesion nematodes (RLN) increased**
- RLN increased most after red clover and annual ryegrass

- **In 13 out of 22 treatments, V. dahliae (Vd) decreased**
- Vd decreased the most following ryegrass. Increased after diverse crop mixes.

MacAulay Farms: Mustard/Radish

- Ikarus radish (left)
- Red clover/Timothy (middle)
- Brown mustard (right)

- Planted early July 2019 to rotation crops
- Planted to Russet Burbanks on May 29, 2020
- Mount Albion (Kings Co.)

MacAulay Farms: Mustard/Radish

- No detectable difference in soil nutrients, soil organic matter or soil health metrics between most treatments.
- Nematodes increased in all treatments, but increased the most in the mustard (which was odd), barely increased in the radish.
- Verticillium decreased around 66% in the radish, increased 50% in the mustard…but levels in the treatments wasn't hugely different across the field before potato planting.

	Spring 2019			Spring 2020		
Measurement	Radish	Timothy/Clover	Brown Mustard	Radish	Timothy/Clover	Brown Mustard
RLN (#/kg soil)	4177	1197	1167	5866	3526	5841
Vd (Cells/g soil)	7890	4997	2782	2745	4065	4396

MacAulay Farms: Mustard/Radish

Treatment	Total Yield (cwt/ac)	Total Defects (%)	% Smalls	Over 10 oz (%)	Specific Gravity	Marketable Yield (cwt/ac)	Crop Value ($/Acre)
Check (Timothy/Clover)	289.9	3.6	10.1	8.6 a	1.084 a	250.7	2955
Radish	300.2	3.6	12.3	1.5 b	1.087 b	253.7	3023
Difference	+10.3	0.0	+2.2	-7.1	+0.0031	+3.0	+68
Check (Timothy/Clover)	289.9 a	3.6	10.1	8.6	1.083	250.7 b	2955 a
Brown Mustard	326.1 b	3.7	9.8	8.1	1.084	282.6 a	3349 b
Difference	+36.2	+0.1	-0.3	-0.5	+0.001	+31.9	+394

MacAulay Farms: Mustard/Radish

- Yield benefit from brown mustard with mowing/incorporation without notable decrease in RLN/Vert.
- Mustard may be having a beneficial effect on the microbial community, decrease in weeds, or other benefit that we could not directly measure.

Oyster Cove: Effect of Compost

- Early 2019: whole field was in fall rye following winter wheat.
- Field planted on June 24th, 2019 with two crops:
  - Sorghum Sudangrass/Pearl Millet/Peas
  - Annual Ryegrass
- Compost was applied in September 2019 on each crop, with an area in both crops where no compost was applied (20 T/ac)
- Dakota Russet planted June 3/2020

Oyster Cove: Effect of Compost

	Spring 2019	Spring 2020	
Measurement	Composite	Ryegrass No Compost	Ryegrass Compost
Soil Organic Matter (%)	3	**3.1**	**3.4**
pH (pH units)	6.1	6	6
P (ppm)	265	**243 M+**	**323 H**
K (ppm)	146	**99 M**	**145 M+**

Oyster Cove: Effect of Compost

- RL Nematodes increased in all treatments year-over-year.
- V. dahliae was a bit more inconsistent but appears to have decreased a bit in the SS/PM/Peas treatment
- Lost the SS/PM/Peas treatment with no compost due to having to plant a different variety in this area, so mostly able to compare effect of compost.
- Soil health metrics didn't change much, though Active C and Respiration was higher in all treatments in 2020.

Oyster Cove: Effect of Compost

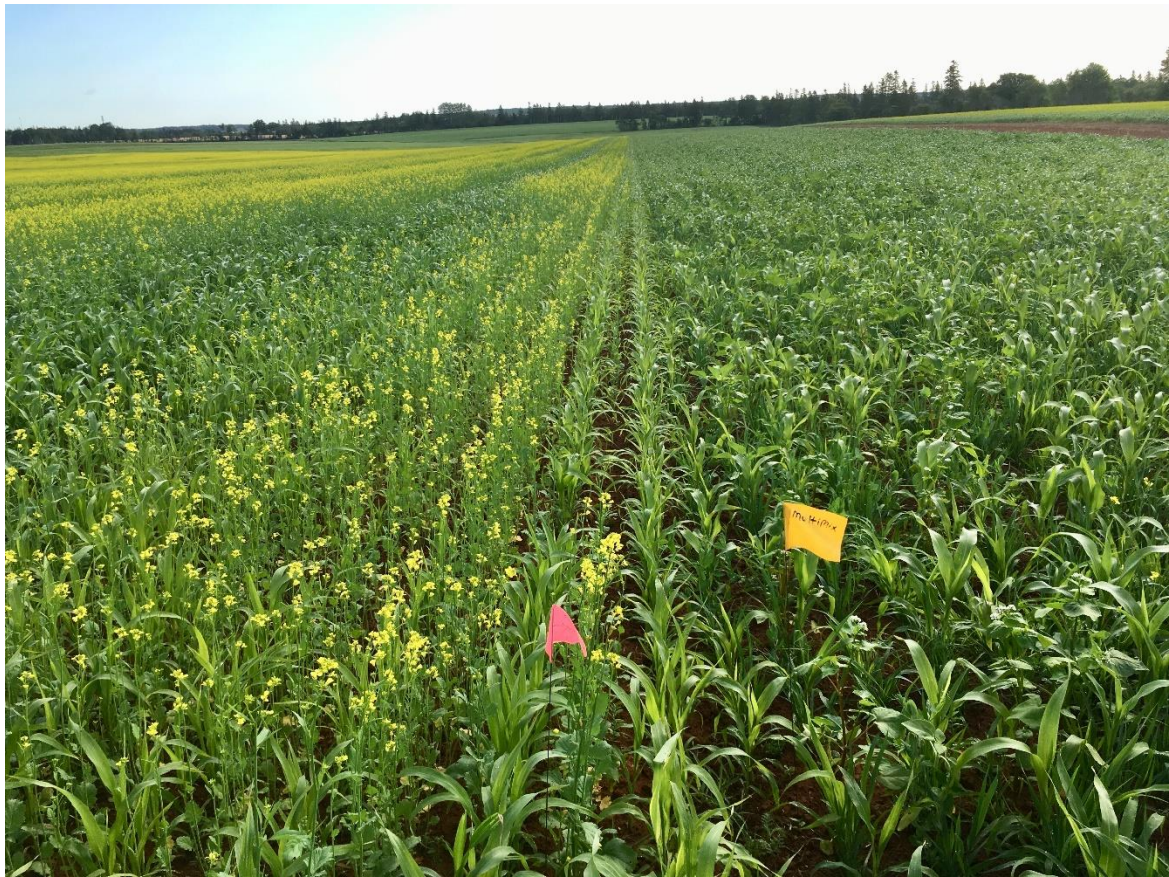
Treatment	Total Yield (cwt/ac)	Total Defects (%)	% Smalls	Over 10 oz (%)	Specific Gravity	Marketable Yield (cwt/ac)	Crop Value ($/Acre)
Check (RyeNoC)	207.4 a	2.4	6.9	3.3 a	1.092 a	188.4 a	2401 a
Rye(C)	255.8 b	1.8	7.6	0.0 b	1.088 b	232.2 b	2960 b
Difference	**+48.4**	**-0.6**	**0.7**	**-3.3**	**-0.004**	**+43.8**	**+559**
Check (RyeNoC)	207.4 a	2.4	6.9	3.3 a	1.092 a	188.4 a	2401 a
SS/PM/P (C)	262.2 b	1.8	7.1	0 b	1.087 b	238.9 b	2967 b
Difference	**+54.8**	**-0.6**	**+0.2**	**-3.3**	**-0.005**	**+50.5**	**+566**

Oyster Cove: Effect of Compost

- Both treatments with addition of compost had significantly higher yield and crop value than ryegrass without compost.
- No difference between ryegrass or SS/PM/Pea mix with compost.
- One large application of compost may have increased soil OM in one year but would require more testing to confirm.
- Compost lowered specific gravity by 4-5 points, but still max value on bonus.
- No evidence of common scab being an issue with the SS/PM/Peas mix.

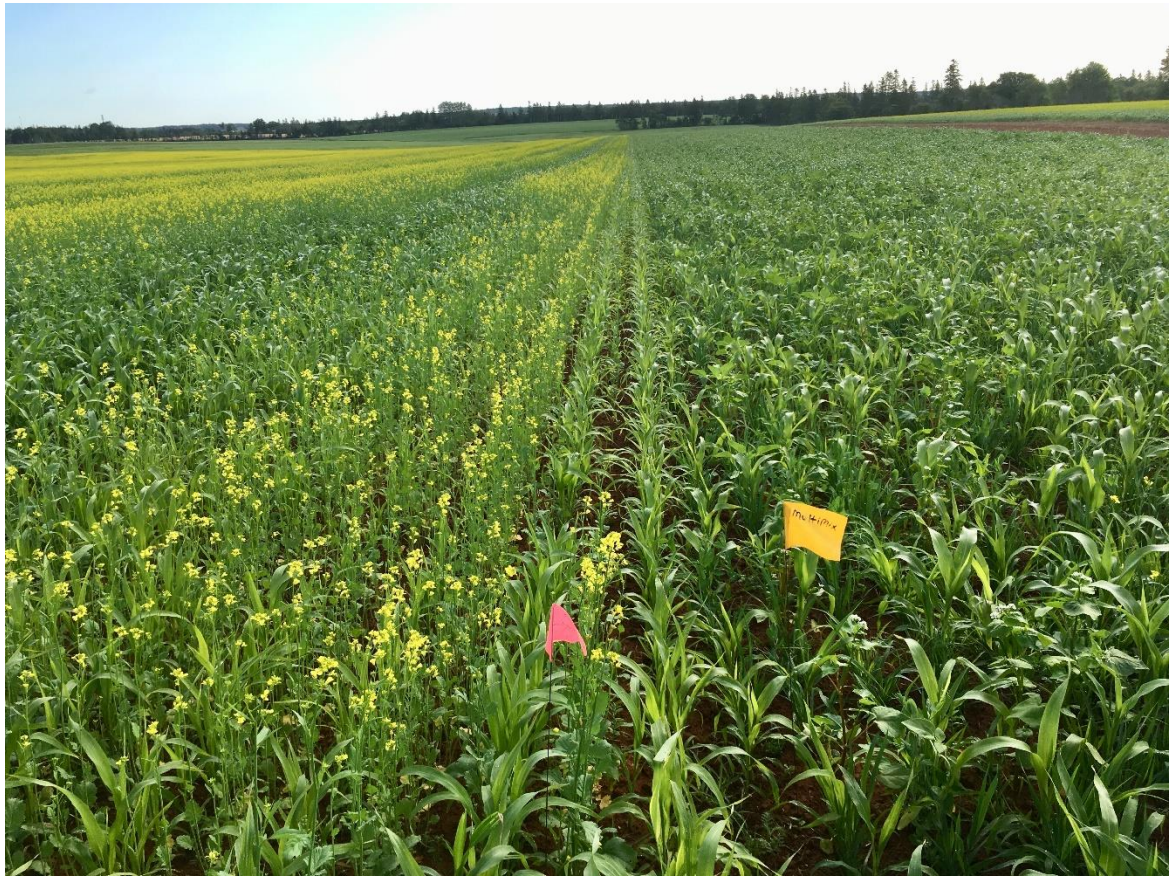
Victoria Potato: Mustard Mixes

- 4 treatments planted in July 2019
  - Brown Mustard (check)
  - Mustard / Sorghum Sudangrass
  - Mustard / Tillage Radish
  - Multi-Species Mix (8 species)
    - Oats, Peas, Sudangrass, Pearl Millet, Tillage Radish, Brown Mustard, Sunflower, Phacelia
- All of these were mowed once.
- Planted to Clearwater Russet on May 16, 2020. Irrigated.



Victoria Potato: Mustard Mixes

- No noticeable difference in soil OM, most soil health metrics between treatments.
- Active C, Respiration, Bio N Fixation all appeared to be slightly higher after the Mustard treatment.
- RLN #s were a bit inconsistent but seemed to go down most in mustard
- Starting values for V. dahliae were very high. Did not change much year-over year.



Victoria Potato: Mustard Mixes

Treatment	Total Yield (cwt/ac)	Total Defects (%)	% Smalls	Over 10 oz (%)	Specific Gravity	Marketable Yield (cwt/ac)	Crop Value ($/Acre)
Check (Mustard)	320.1 a	0.7 b	10.6	5	1.0908	285.7 a	3608 a
Mustard- Radish	360.4 b	3 a	10.1	10.9	1.0929	318.9 b	4067 b
Difference	**+40.3**	**2.3**	**-0.5**	**+5.9**	**+0.002**	**+33.2**	**+459**
Check (Mustard)	320.1	0.7	10.6 a	5 a	1.0908	285.7	3608
Mustard-Sorghum	336.5	2.5	8.6 b	14.5 b	1.0937	302.4	3890
Difference	**+16.4**	**+1.8**	**-2.0**	**+9.5**	**+0.003**	**+16.7**	**+282**
Check (Mustard)	320.1	0.7	10.6	5	1.0908	285.7	3608
Multi-Species Mix	313.2	2.1	11.6	7.5	1.0922	272.3	3481
Difference	**-6.9**	**+1.4**	**+1.0**	**+2.5**	**+0.001**	**-13.4**	**-127**

Victoria Potato: Mustard Mixes

- Significantly higher yield following mustard/radish mix than in mustard alone.
- Other treatments were not significantly different from the check.
- Lowest yield and crop value following the multi-species mix.
- Verticillium was not improved by any of the treatments. Nematode numbers were a bit up and down but not exceptionally high.
- Not a bit yield increase from the mustard/SS treatment, but an increase in crop value.

What's Next?

9 more fields set up in 2020 that will be in potatoes in 2021

- Buckwheat vs Red Clover/Timothy
- SS/PM/Radish vs Ryegrass
- Brown Mustard or Sudangrass vs Barley
- Caliente Mustard or Radish/Mustard vs Ryegrass
- Caliente Mustard or 2 year MSM vs Ryegrass
- Sudangrass or Ikarus Radish vs Ryegrass
- Sudangrass, Oilseed Radish, Alfalfa vs Ryegrass
- Multi-Species Mix vs Ryegrass
- Sudangrass vs Ryegrass

What's Next?

- Morgan and I will be setting up about 10 more fields in 2021.
- Would be particularly interested in finding some growers that would like to compare barley underseeded with forage versus annual crop (like sudangrass, mustard, radish, etc)
- Interested to compare corn ahead of potatoes versus ryegrass or clover
- Open to suggestions and interest in these projects from growers in East Prince group, Kensington North Watershed or Souris Watershed areas.
- Also open to possible on-farm trials from other growers looking at rotation or tillage effects on soil health and marketable potato yield.

LIVING LABORATORIES INITIATIVE

Evaluating the effects of manure and summer cover crops on subsequent potato crop

Nyiraneza and collaborators

AIM local workshop, February 9-10, 2021, Emerald Community Centre, Mill River Resort, Saint Peters Complex

Collaborators

- Tandra Fraser, Bourlaye Fofana, Dahu Chen, Louis-Pierre Comeau, Andrew McKenzie-Gopsill, Rick Peters, Noronha Christine, Yefang Jiang, Chris Kirby and Mohammad Khakbazan
- PEI Potato Board
- Technical support:
  - Danielle Murnaghan
  - Gregory Dorothy
  - Irene Power
  - Barb Enman

Role of manure in potato-based systems

- Amount of residues returned is minimal
- Increased soil compaction (heavy machinery and frequent traffic)
- Maintaining and improving soil quality is challenging
- REVITALIZE THE SOIL WITH MANURE OR COMPOST:

➢ Short-term yield benefits

➢ Long-term soil building benefits (improved water holding capacity, improved soil structure and the soil buffering capacity)

➢ Applying manure on cover crops grown before potato help to minimize manure-associated soil-borne disease

Role of cover crops in potato-based systems

- Benefits on soil health (i.e break the disease cycle)
- Legumes cover crops can decrease our reliance to N fertilizer if their N release is synchronized with subsequent crop N demand
- Grasses can mitigate soil erosion (germinate and cover the ground quickly), scavenge residual soil nitrate
- Mixing grasses with legumes ?

Benefits of mixing legumes and grasses

- Superficial fine roots of grasses mitigate shallow soil compaction
- Tap-rooted legumes reduce deep soil compaction
- Increase nutrient cycling (difference in root architecture and growth pattern)
- Grasses stimulate N fixation by legumes and legumes stimulate N uptake by grasses
- Modified C to N ratio, modified decay rate, better synchrony of soil N released and crop N requirement, less nitrate leaching

Objectives

- **To assess a broad range of cover crops (grasses, legumes and a mixture of legumes and grasses) with and without pen pack cow manure (20 tons/ha)**
- **2 acre field with 4 replicates of each treatment**

Cover crops with and without pen pack cow manure

Alfalfa/Orchardgrass mix	17 kg/ha	17-17-17 @ 200 lbs/ac
Sorghum Sudan Grass	34 kg/ha	17-17-17 @ 400 lbs/ac
Red Clover	22 kg/ha	
Ryegrass	3 kg/ha	17-17-17 @ 200 lbs/ac
Common Vetch	35 kg/ha	
Crimson clover	12 kg/ha	
Forage Pearl Millet (CFPM 101)	34 kg/ha	17-17-17 @ 400 lbs/ac
Sorghum Sudan Grass	19 kg/ha	17-17-17 @ 200 lbs/ac
VR Alfalfa	5.6 kg/ha	
Winter Rye	125 kg/ha	17-17-17 @ 200 lbs/ac
Hairy Vetch	40 kg/ha	
Forage Sorghum (CHSH30) followed by brown-mustard	36 kg/ha	17-17-17 @ 400 lbs/ac

- Plots tilled and rolled before planting cover crops and rolled again after planting. Manure (20 t/ha) applied 5 weeks before planting cover crops. No fertilizer in plot receiving manure. Seeded on June 8th, 2017.
- Two cuts for all cover crops and 3 cuts for red clover. 1st cut 6 weeks after seeding, second cut October 2.
- Fall plowing for all plots

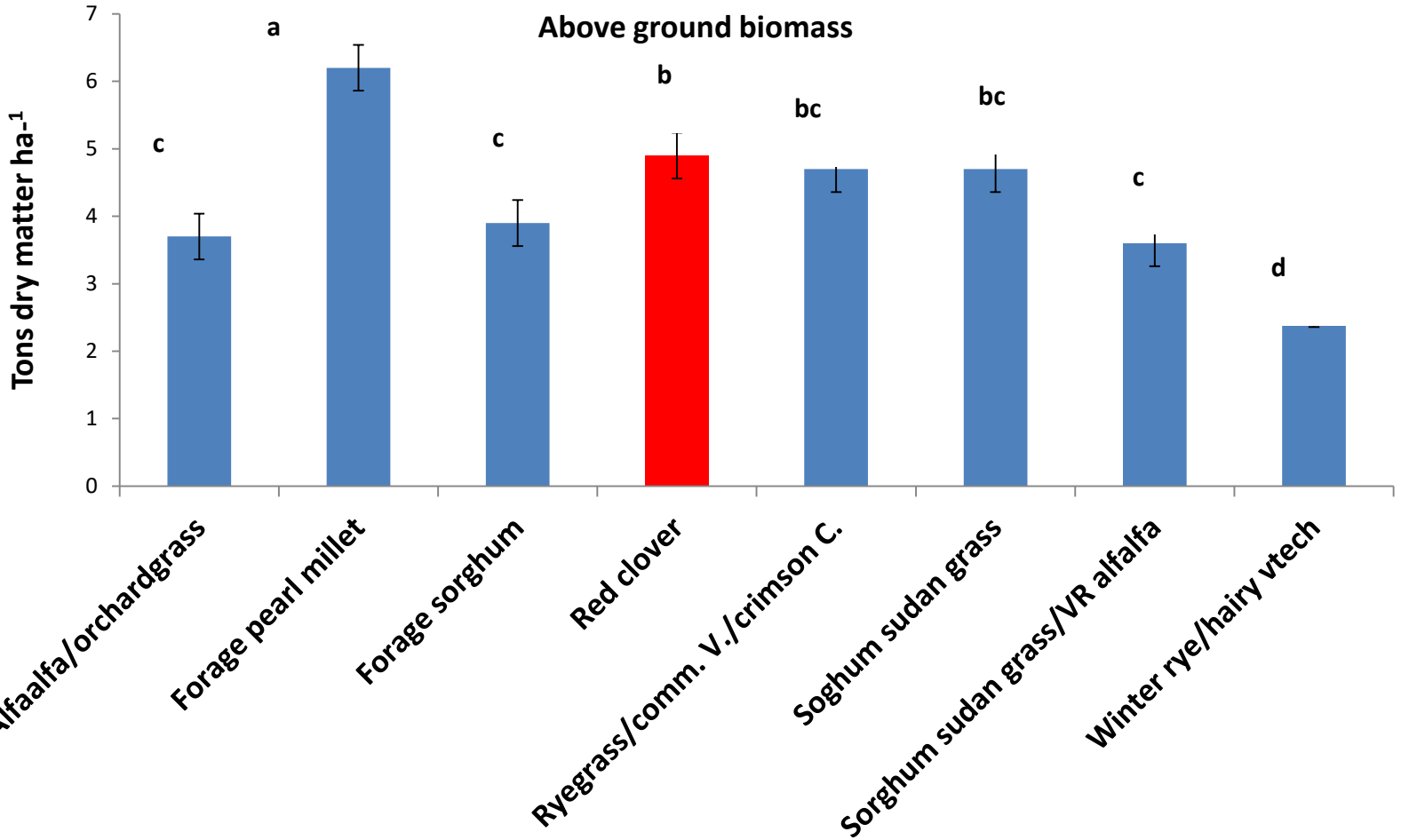
Diversified cover crops with and without manure

2017: cover crops
2018: potato

ANALYZED PARAMETERS

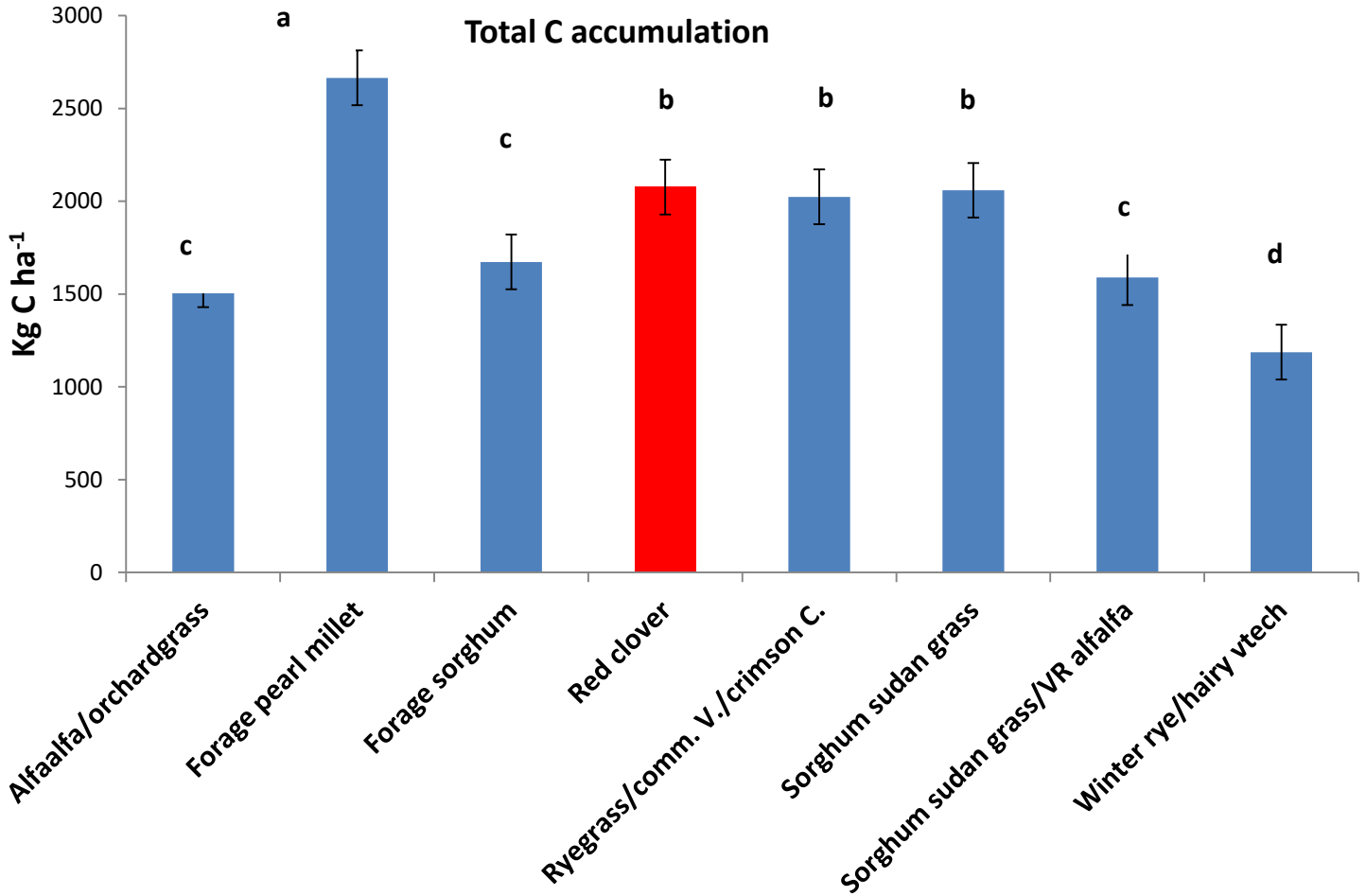
- **Cover crop biomasses, total C and N accumulations**
- **Soil nitrate in fall following cover crop incorporation**
- **Soil nitrate during potato growth (monthly soil sampling (0-15 cm; 15-30 cm depth)**
- **Potato yield**
- **Soil properties**
- **Soil N supply using a plant bioassay approach [(total N accumulation in potato (vine+tuber) under the plot without N fertilizer)]**

Cover crop dry matter biomasses



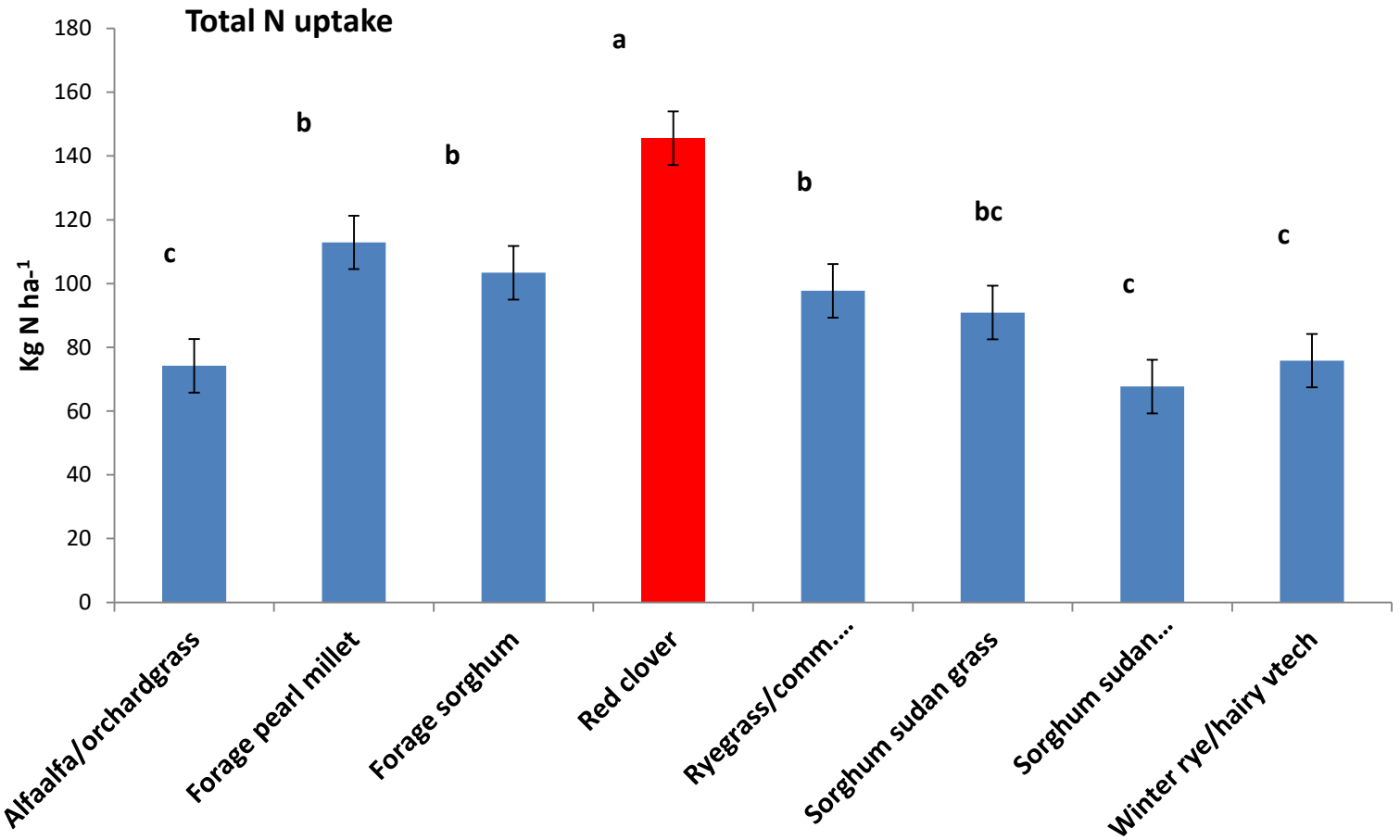
- **Forage pearl millet**, higher dry matter biomass
- Comparable biomass (**red clover, ryegrass-common vetch-crimson clover, sorghum sudangrass**)

Total carbon accumulated in cover crops



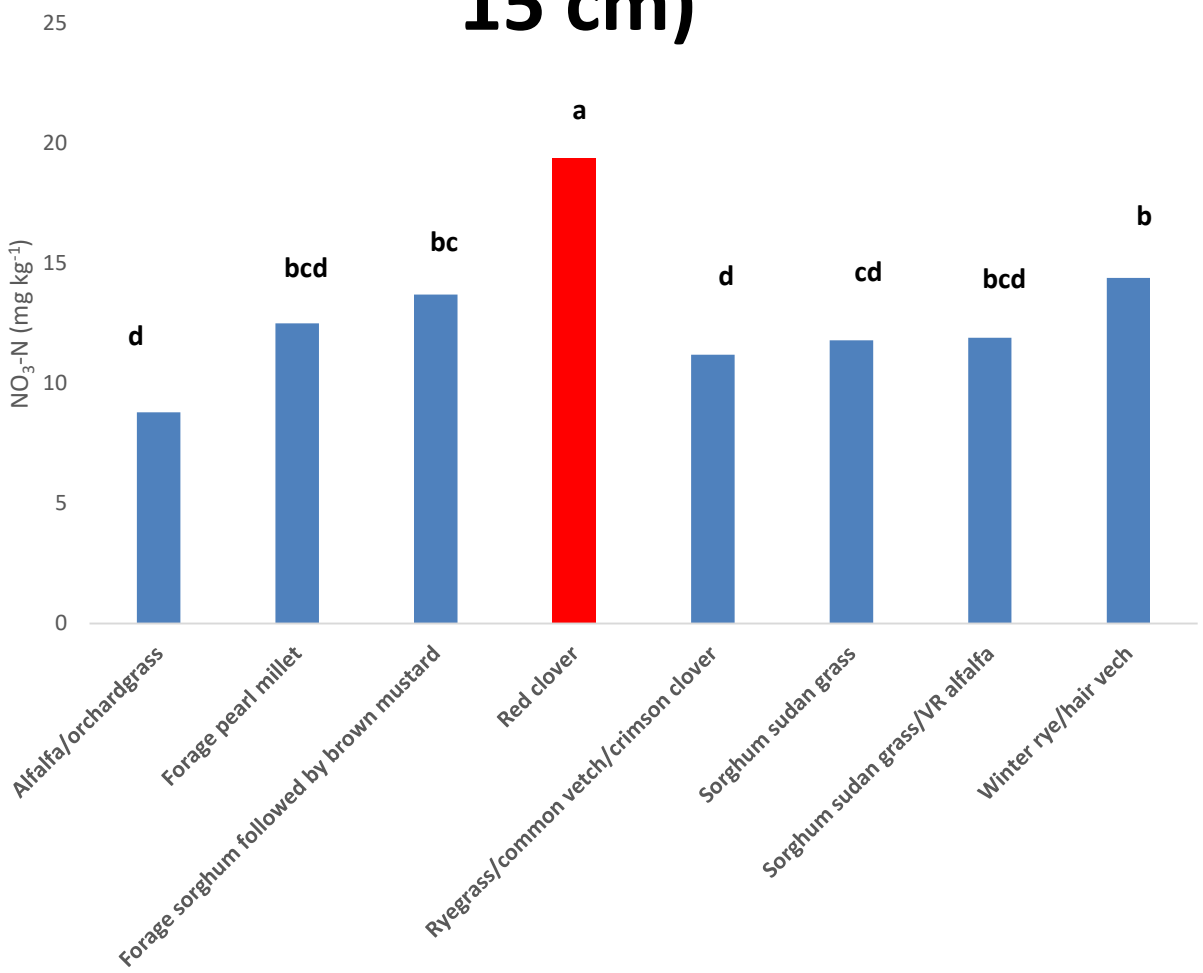
- Similar trend as for dry matter biomass, higher C accumulation with forage pearl millet

Total N accumulated in cover crops



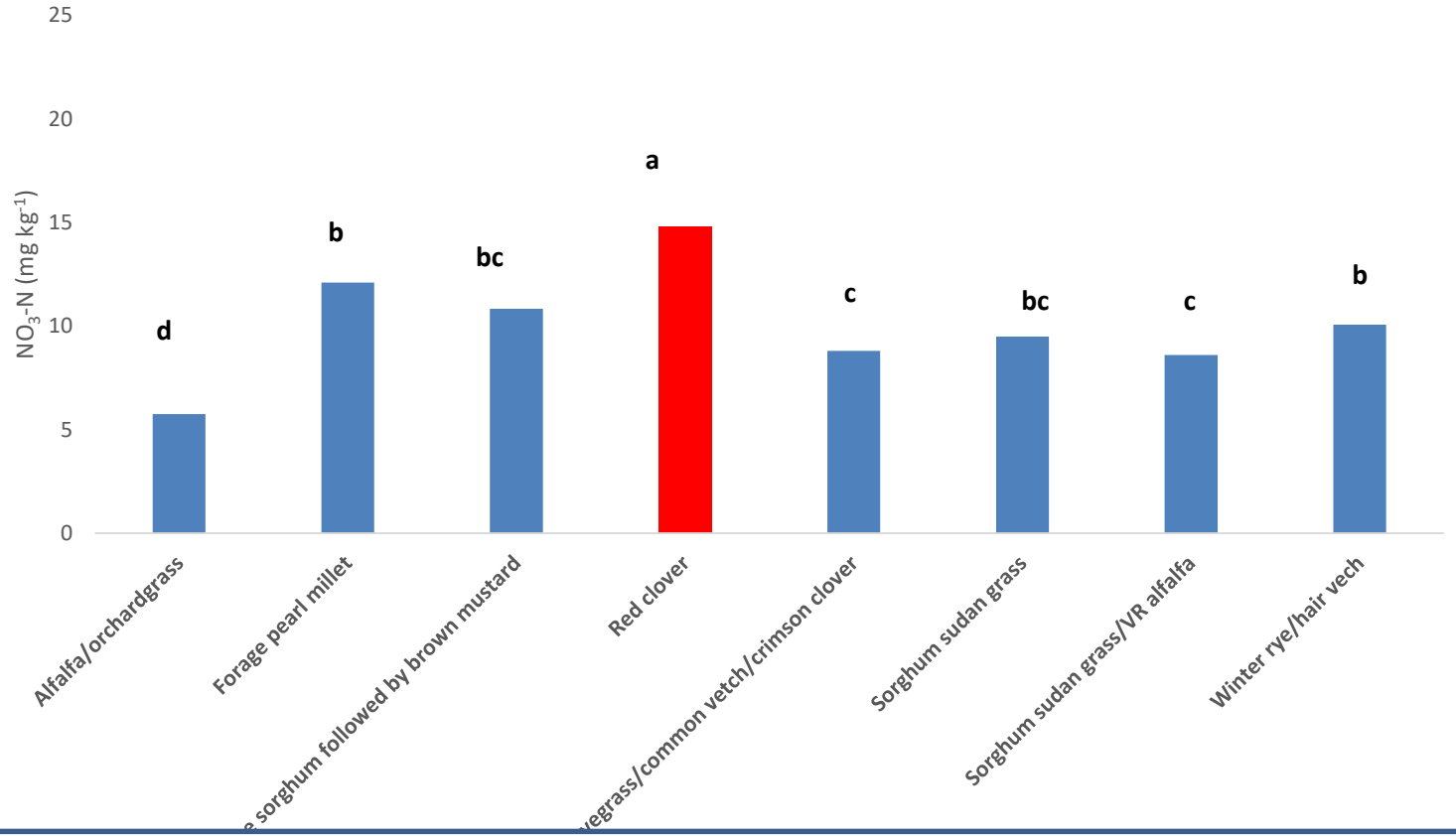
- Higher N accumulated with red clover

Soil nitrate in fall after cover crop incorporation (0-15 cm)



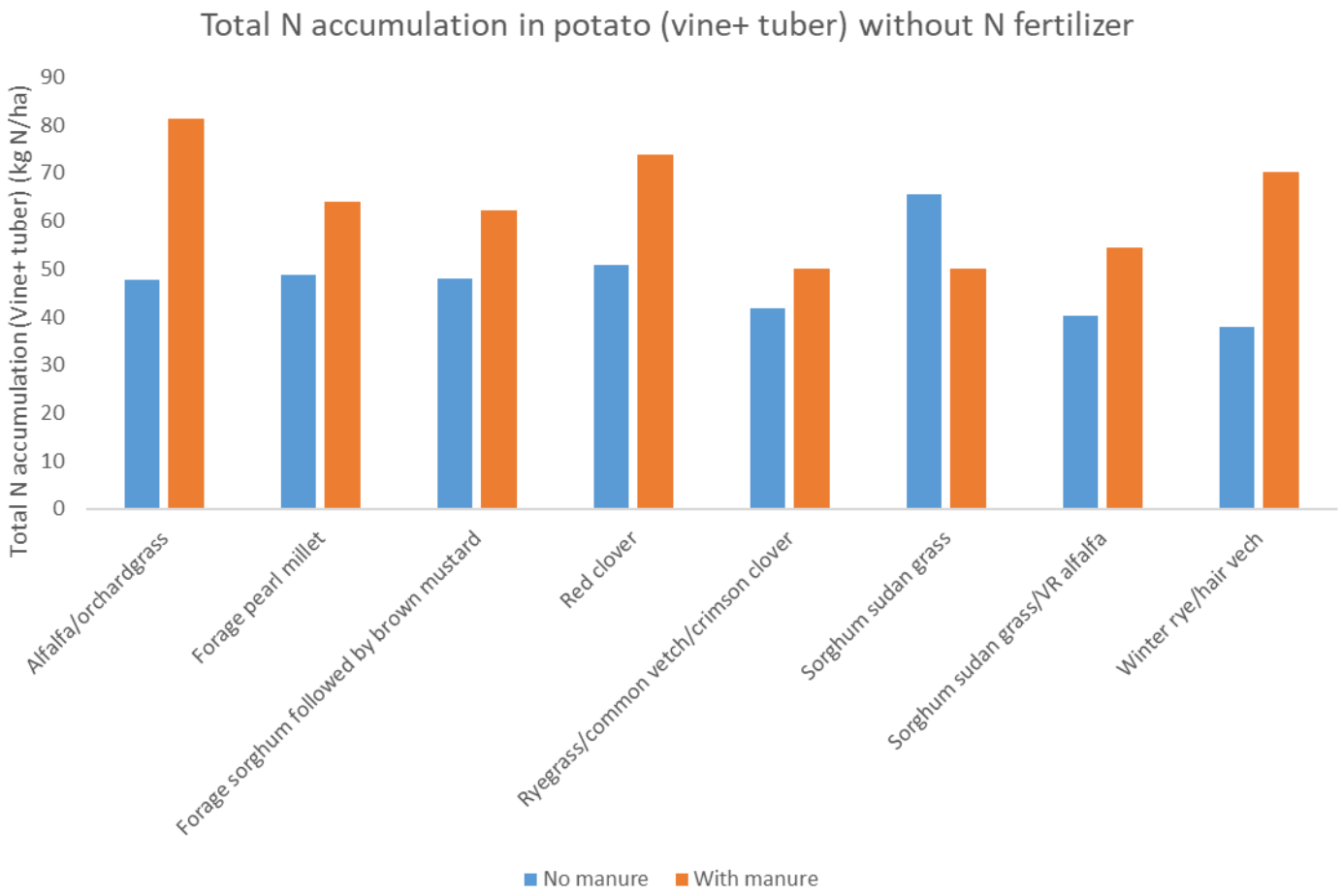
- Higher values with red clover, lower values with alfalfa/orchardgrass mixture

Soil nitrate in fall after cover crop incorporation (15-30 cm)



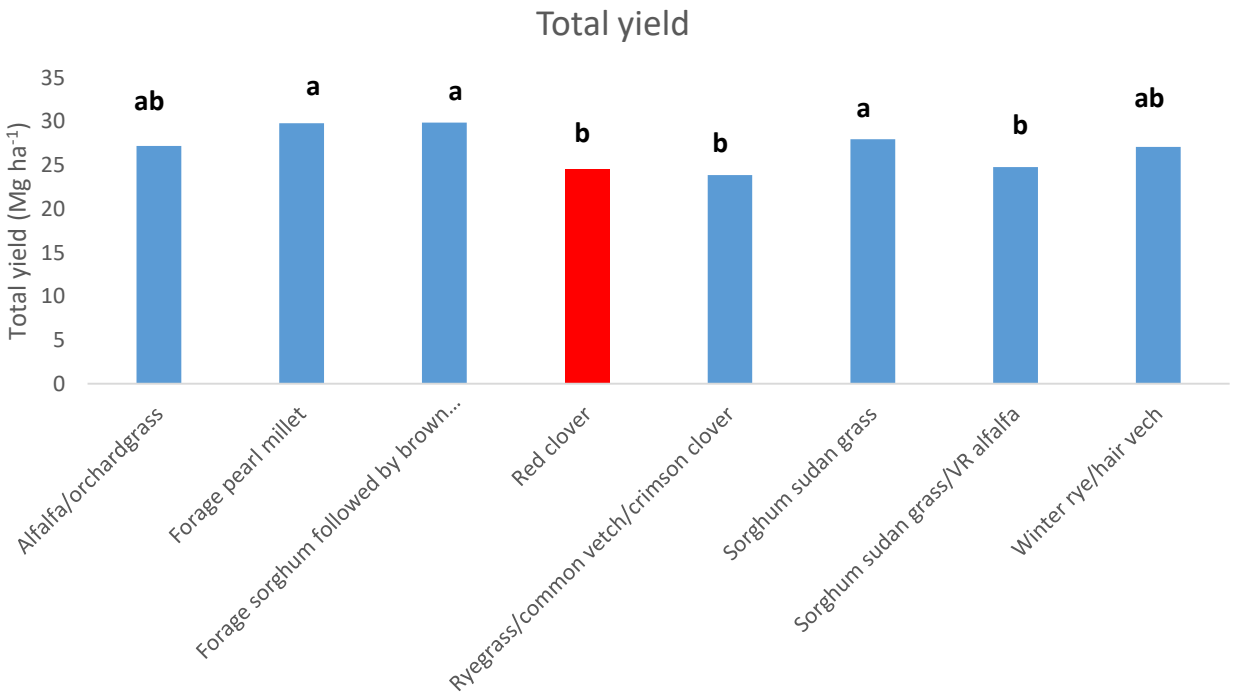
- Higher values with red clover and lower values with alfalfa/orchardgrass mixture

Indirect estimation of soil N supply



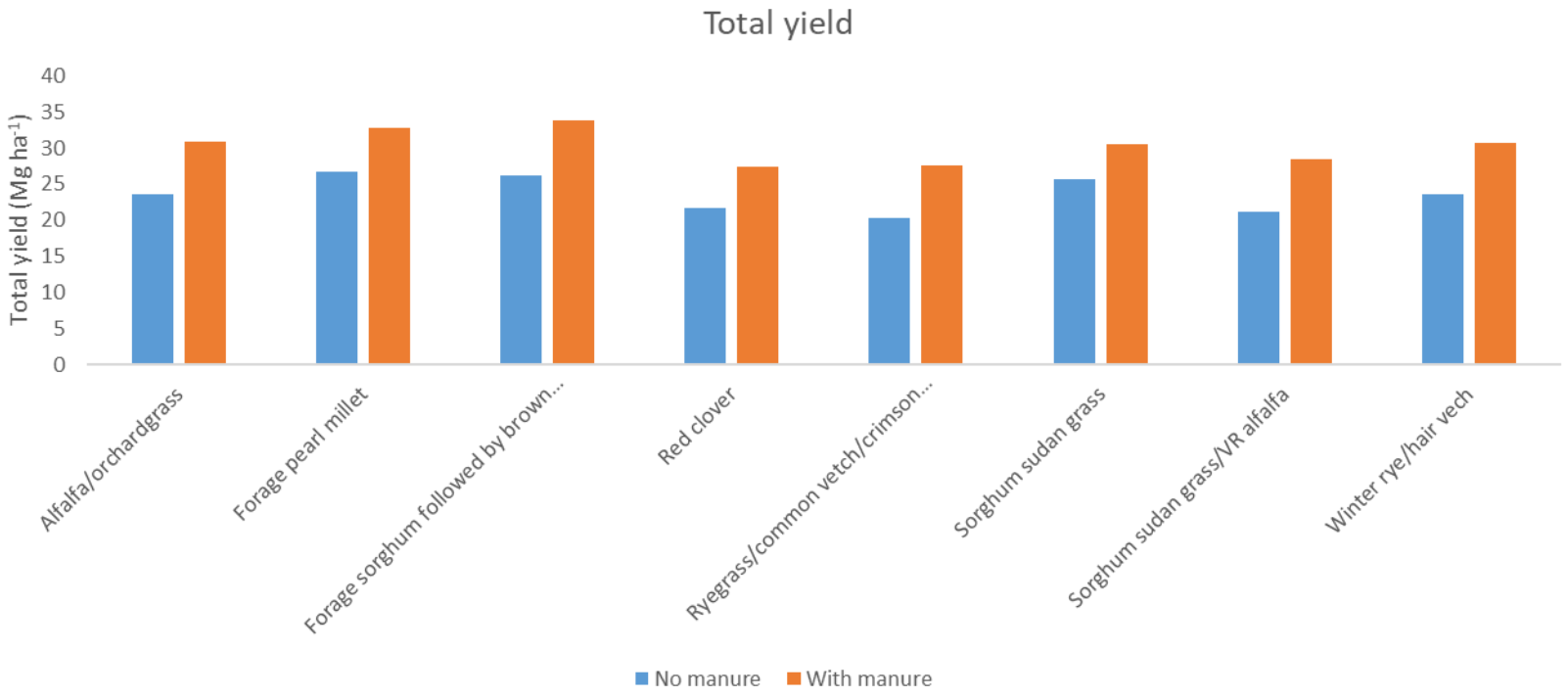
Manure increased soil N supply capacity. Values ranged from 38 to 66 kg N/ha without manure and from 54 to 81 kg N /ha with manure

Total potato yield



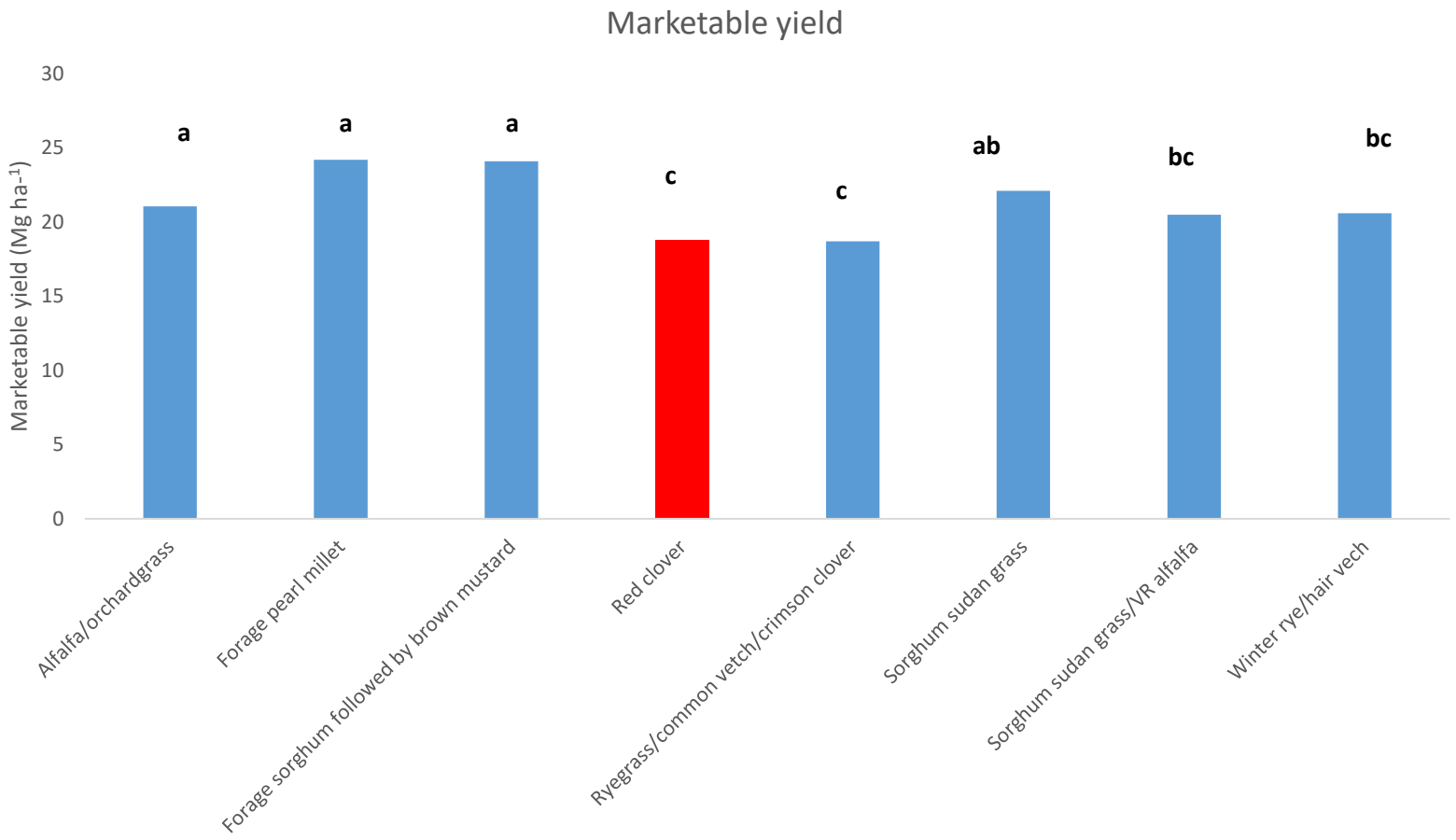
- **Significant effect of manure and cover crops. Higher total yields with forage pearl millet and forage sorghum but comparable with alfalfa-orchardgrass, sorghum sudangrass, and winter rye hairy vetch.**

Manure effects on total yield



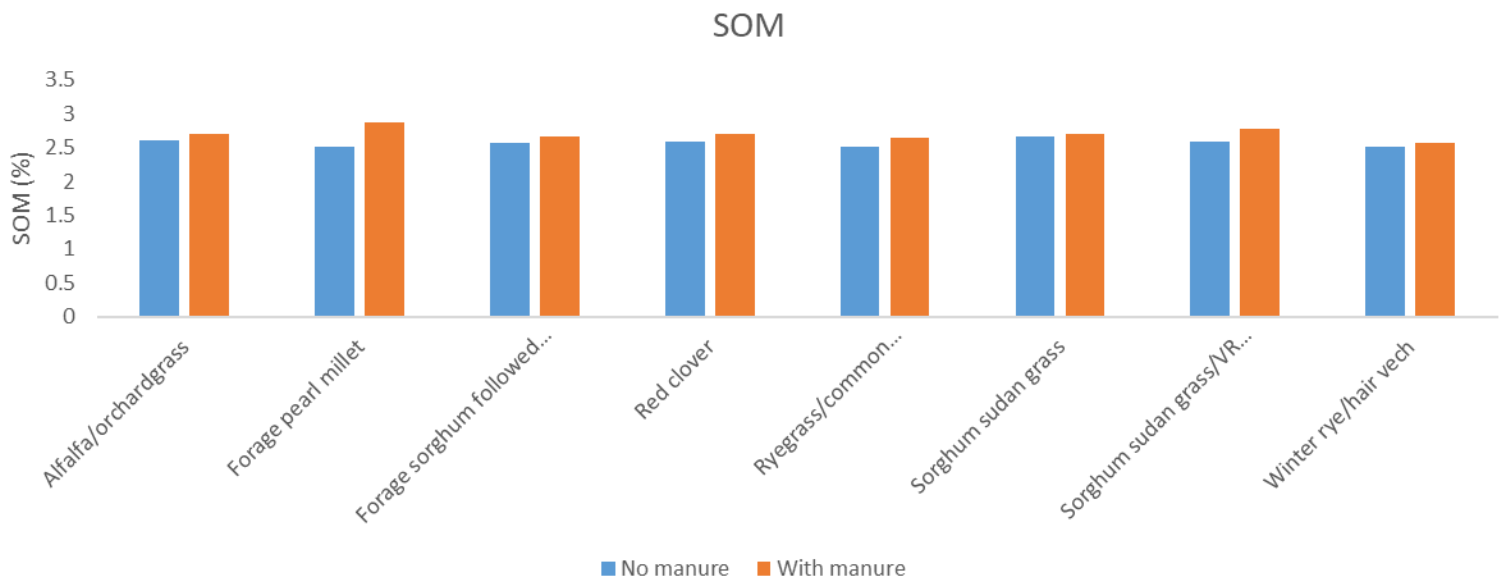
- **Consistent higher total yields with manure applications. 19 to 35% yield increases.**

Marketable yield



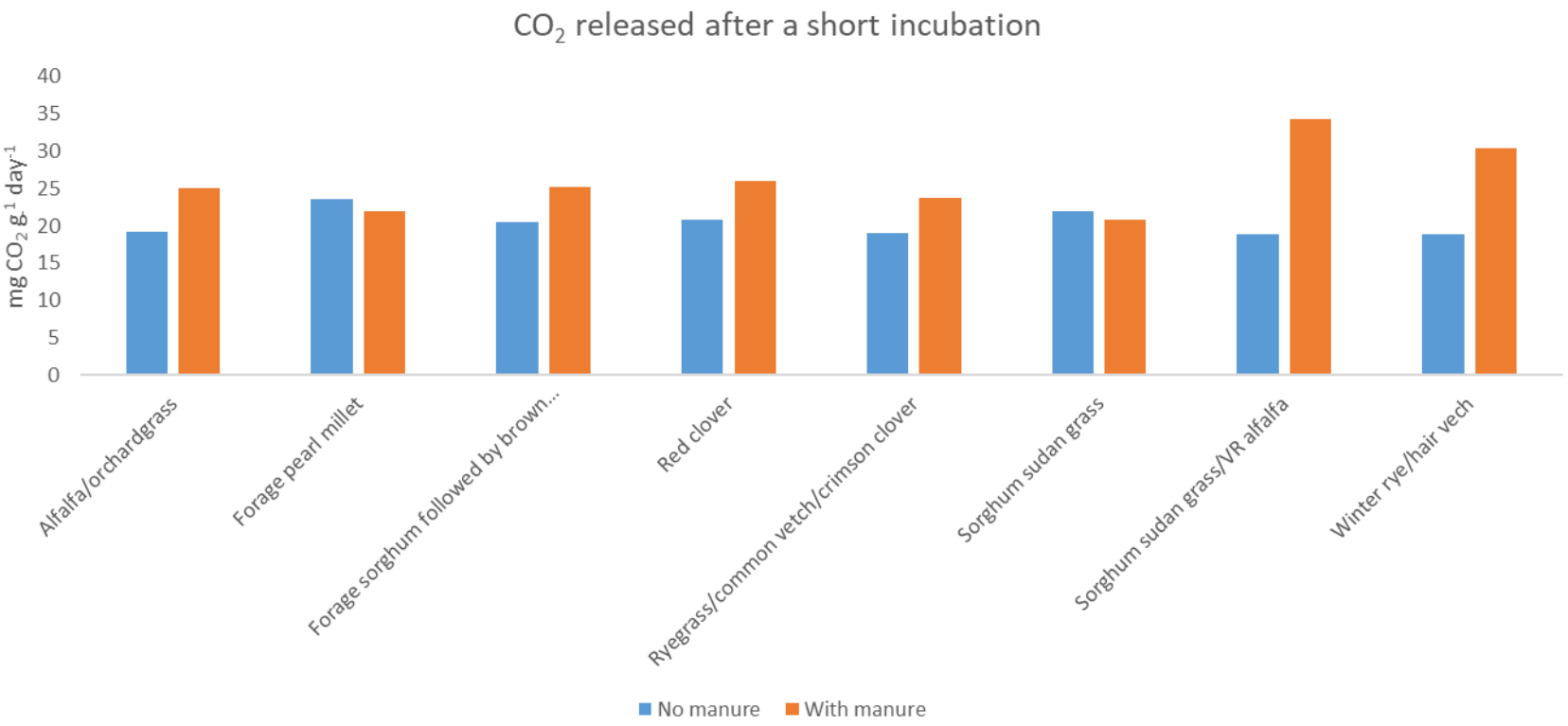
- **Higher marketable yields with forage pearl millet, forage sorghum, sorghum sudan grass, alfalfa/orchardgrass**

Effects on SOM



- **No significant effects of cover crops or manure on SOM**
- **Trends towards higher nominal values with manure**

Soil respiration (CO_2 after 24h of soil incubation)



- **No differences between cover crops but significant higher values with manure application**

Conclusions

- **Manure increased potato yield and soil N supply capacity**
- **There were trends toward increased CO_2 release and SOM with manure application**
- **Pearl millet and sorghum sudan grass were associated with higher marketable yields and lower soil nitrate than red clover**
- **Higher total N accumulated in red clover was associated with higher soil nitrate in fall but was not translated in increased yield**

Conclusions (continued)

- **Total N accumulation in red clover and soil nitrate in fall was higher than treatments where grasses and legumes were mixed**
- **Cover crops returning high residues and manure, effective means to boost potato yield**

What is next?)

Study continues under the living laboratory initiative (3 yr rotation)		
2019	**2020**	**2021**
Alfalfa/orhardgrass	Forage regrowth	Potato
Barley underseeded with ryegrass	Forage pearl millet	Potato
Barley underseeded with ryegrass	Forage sorghum	Potato
Barley underseeded with red clover	Red clover	Potato
Ryegrass/common vetch/crimson clover	Forage regrowth	Potato
Barley underseeded with ryegrass	Sorghum sudan grass	Potato
Sorghum sudan grass/ VR alfalfa	Forage regrowth	Potato
Winter rye/hairy vetch	Forage regrowth	Potato

Additional parameters: soil microbial diversity, scab incidence, early dying complex, weed pressure, net revenue

Thank you for your attention

judith.nyiraneza@canada.ca

So…what should I be planting?

It depends on what your biggest issue is! Tackle the biggest problem first, try not to make other issues worse.

- **Wireworm:** Brown mustard, buckwheat
- **Early Dying:** Forage Pearl Millet, biofumigant mustard, Sorghum Sudangrass
- **Improving Organic Matter:** perennial grasses/legumes (but possibly reduce red clover, annual ryegrass due to nematodes)
- **Soil Compaction:** Alfalfa, Sorghum Sudangrass, Forage Pearl Millet

If your field has a history of strong yields, no early dying…consider maximizing cash crops that can be followed by cover crops to still help maintain soil health.

Additional Resources

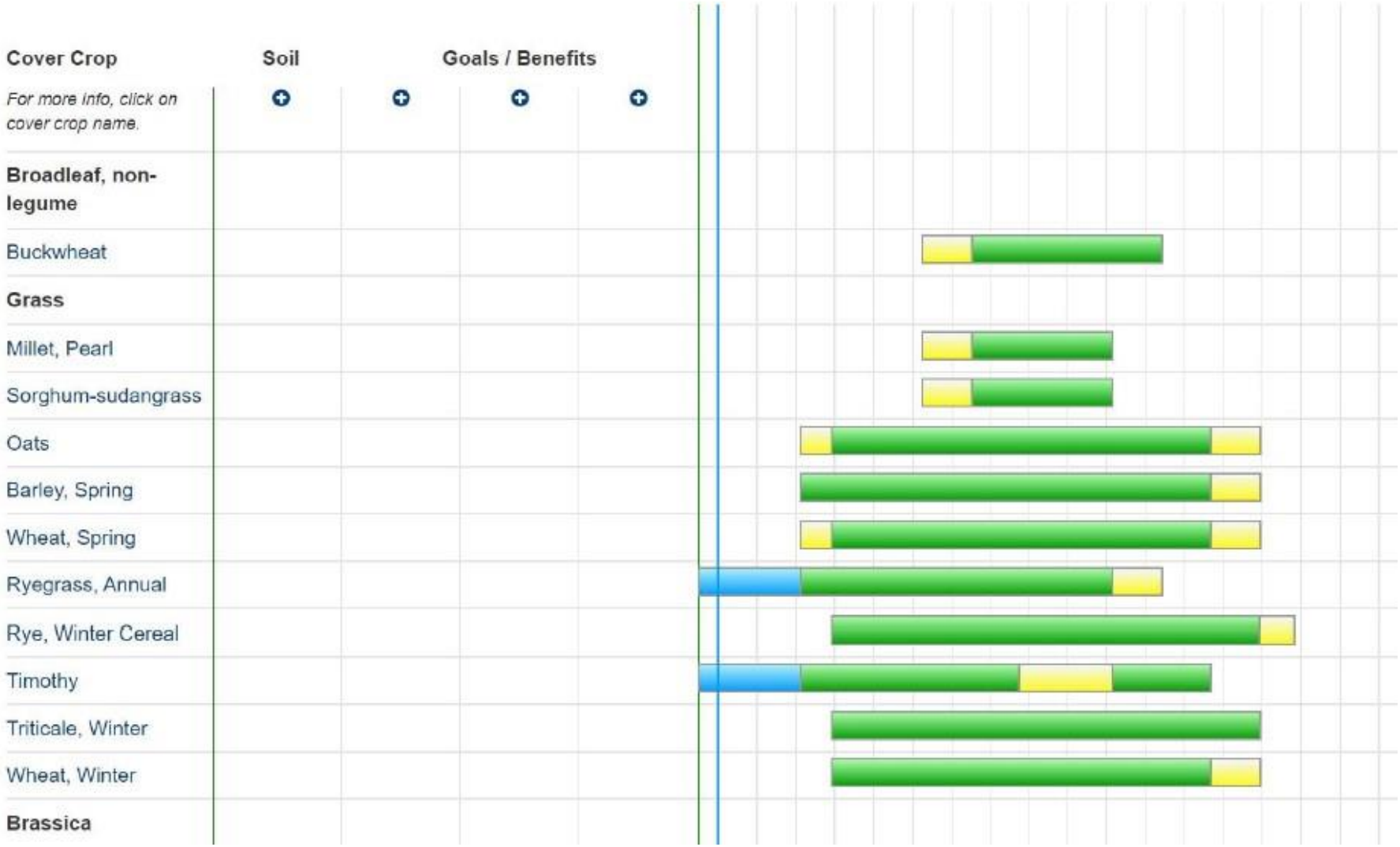
- **Choosing the Right Rotation Crop** – AIM Presentation (Jan'20)
- **Rotation Crops Quick Reference Table** – Updated Dec'20
- **Tools for Soil Building in PEI** – AIM Presentation (Mar'17)

www.peipotatoagronomy.com

Additional Resources

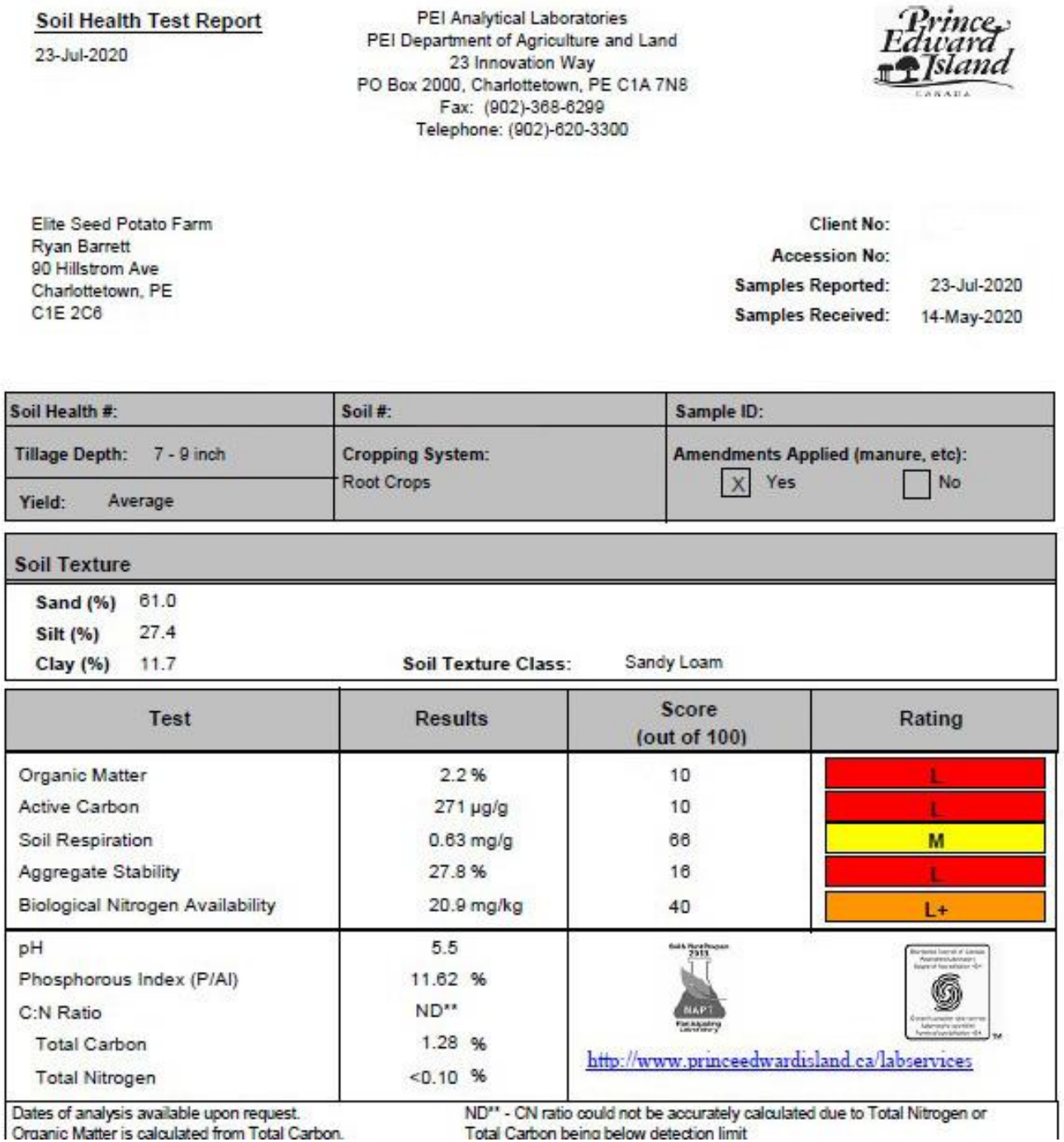
- [Eastern Canadian Cover Crop Decision Tool]

decision-tool.incovercrops.ca



Additional Resources

- **PEI Soil Health Test: How to Interpret Your Results**



Soil Health Test Report
23-Jul-2020

PEI Analytical Laboratories
PEI Department of Agriculture and Land
23 Innovation Way
PO Box 2000, Charlottetown, PE C1A 7N8
Fax: (902)-368-6299
Telephone: (902)-620-3300

Prince Edward Island CANADA

Elite Seed Potato Farm
Ryan Barrett
90 Hillstrom Ave
Charlottetown, PE
C1E 2C6

Client No:
Accession No:
Samples Reported: 23-Jul-2020
Samples Received: 14-May-2020

Soil Health #:	**Soil #:**	**Sample ID:**
Tillage Depth: 7 - 9 inch	**Cropping System:** Root Crops	**Amendments Applied (manure, etc):** [X] Yes [ ] No
Yield: Average		

Soil Texture

Sand (%)	61.0		
Silt (%)	27.4		
Clay (%)	11.7	**Soil Texture Class:**	Sandy Loam

Test	Results	Score (out of 100)	Rating
Organic Matter	2.2 %	10	L
Active Carbon	271 µg/g	10	L
Soil Respiration	0.63 mg/g	66	M
Aggregate Stability	27.8 %	16	L
Biological Nitrogen Availability	20.9 mg/kg	40	L+
pH	5.5		
Phosphorous Index (P/Al)	11.62 %		
C:N Ratio	ND**		
Total Carbon	1.28 %		
Total Nitrogen	<0.10 %		

http://www.princeedwardisland.ca/labservices

Dates of analysis available upon request.
Organic Matter is calculated from Total Carbon.

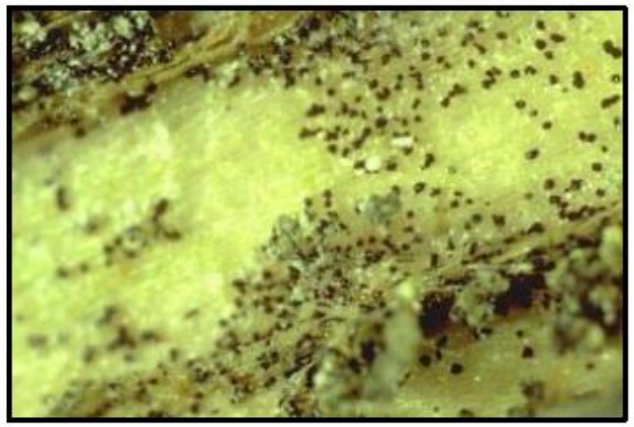
ND** - CN ratio could not be accurately calculated due to Total Nitrogen or Total Carbon being below detection limit

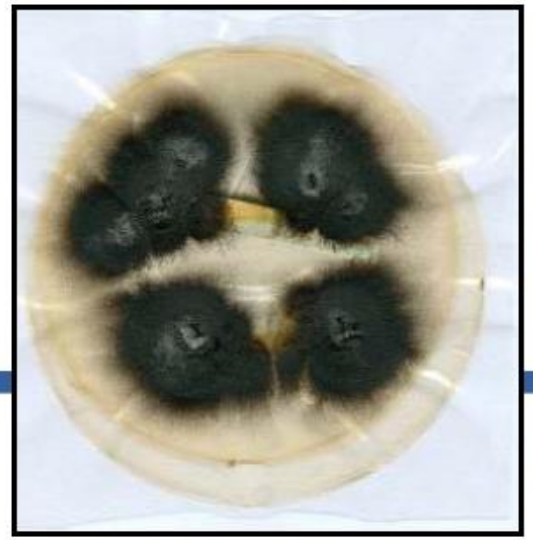
Potato Early Dying

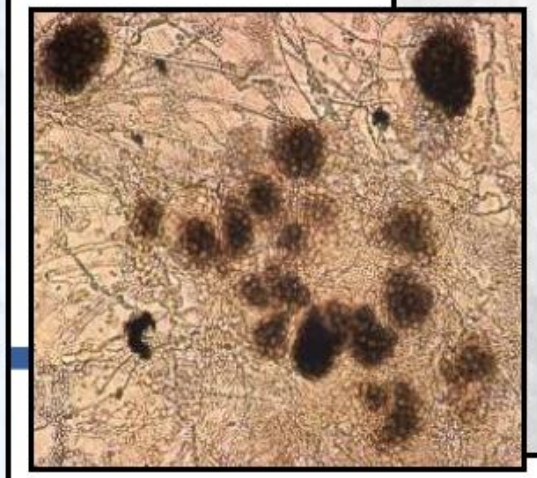
- Complex of ***Verticillium dahliae*** (fungi) and **root lesion nematodes** (*Pratylenchus penetrans*)
- *V. dahliae* microsclerotia enter the plant through the roots and clog up the water transportation tissues of the plant (block the plumbing)
- RL nematodes feed on plant roots, increasing entry points for Vert. Recent research from the UK indicates that nematodes may increase blackleg.
- High populations of *V. dahliae* alone can cause early dying, but presence of nematodes makes it much worse.

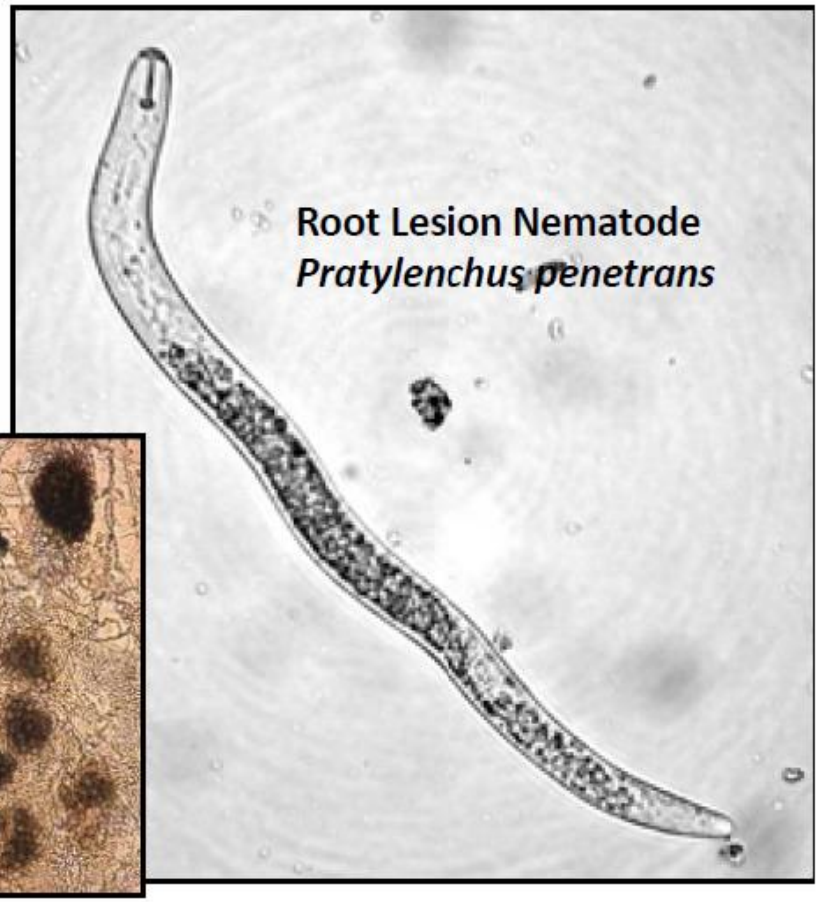
Causal Pathogen and Pest

Verticillium dahliae









Slide courtesy Dr. Mario Tenuta

Potato Early Dying

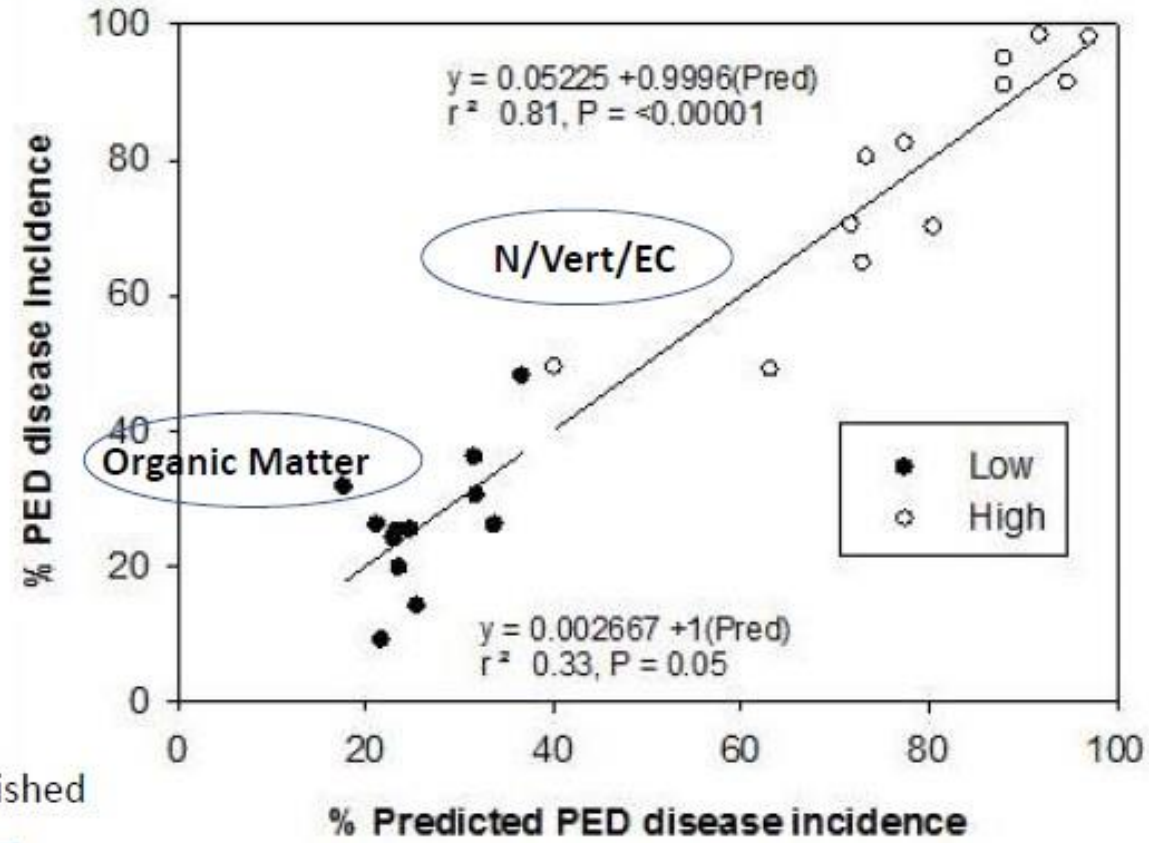
- Most broadleaf plant species can be a host for Verticillium.
  Preferred hosts: potato, mint, pepper, soybean, forage legumes.

  It appears that **grass species do not host Verticillium**

- Almost all crop species can be a host for root lesion nematodes, but some more than others.

  Preferred hosts: potatoes, corn, red clover, soybeans, annual ryegrass (?)
  Not a host: forage pearl millet
  Not as bad: grains (barley, oats, wheat)

Field Variation in Disease and Soil Properties



Tenuta, unpublished

4R Senior Industrial Research Chair

University of Manitoba

CanPEDNet Survey: Fall 2019

Root Lesion Nematodes (# per kg of soil):

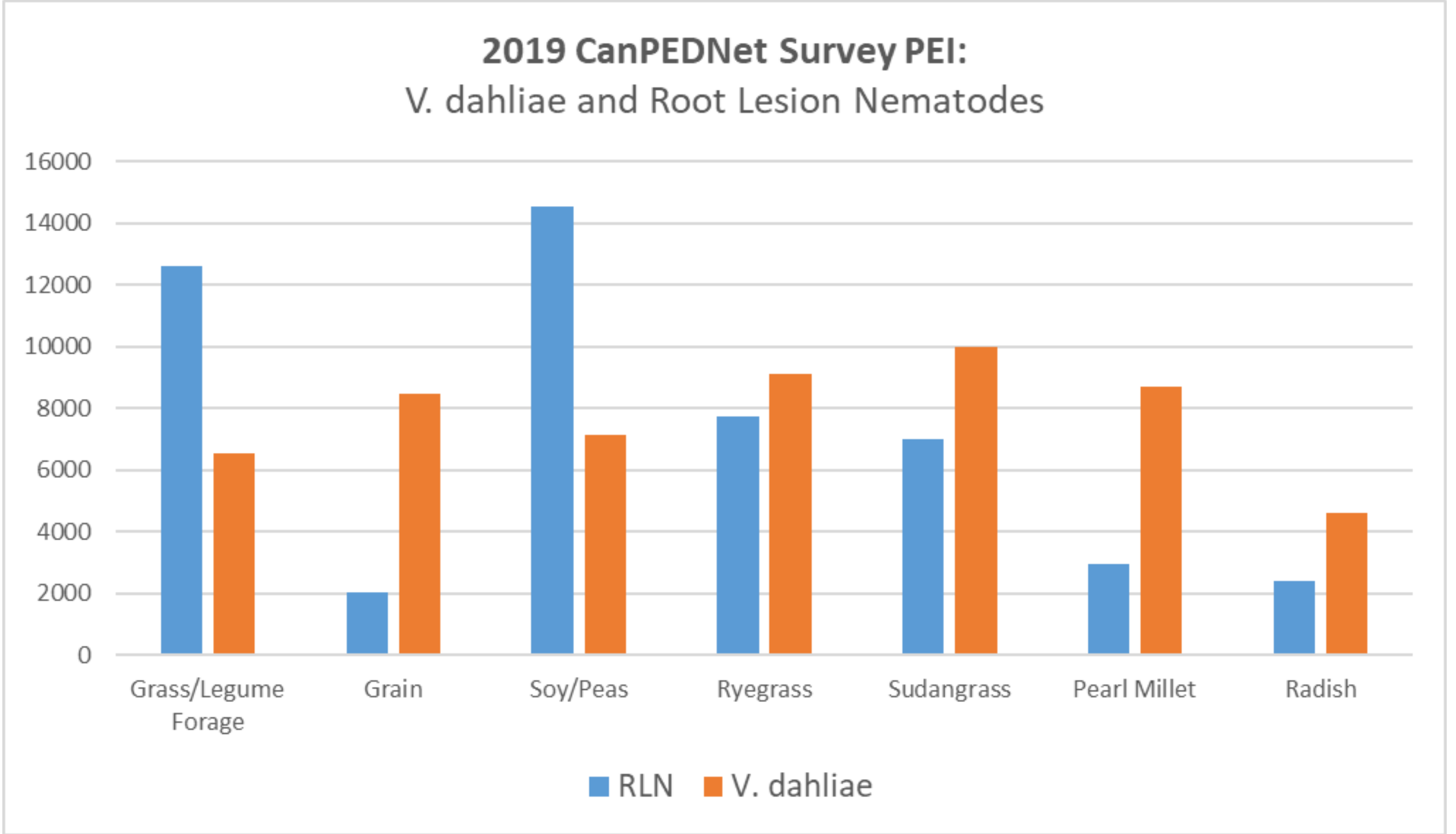
Low: 1,775 High: 27,743 Average: 10,019

Number of fields higher than 5000/kg of soil: 19 out of 30

***Verticillium dahliae* (cells per g of soil):**

Low: 234 High: 13,505 Average: 7,338

Number of fields higher than 3000 per gram of soil: 26 out of 30


2019 CanPEDNet Survey PEI:
V. dahliae and Root Lesion Nematodes
16000
14000
12000
10000
8000
6000
4000
2000
0
Grass/Legume Forage
Grain
Soy/Peas
Ryegrass
Sudangrass
Pearl Millet
Radish
RLN
V. dahliae

2020 Follow up in 8 fields

High Inoculum Fields

Field	Rotation Length	Total Yield cwt/acre	Market. Yield cwt/acre	RLN #/kg	V. dahliae cells/g
Kings 1	3	224.7	196.1	2748	3994
Kings 2	3	303.7	284.1	9934	4669
East Prince 1§	2	113.9	67.8	2049	3101
Kings 3*	3	281.8	263.8	8476	2838

* = Dakota Russet
§ = Extreme Drought

2020 Follow up in 8 fields

Low Inoculum Fields

Field	Rotation Length	Total Yield cwt/acre	Market. Yield cwt/acre	RLN #/kg	V. dahliae cells/g
East Prince 2 *	3	345.4	324.6	2354	2761
Queens 1 §	5+	247.5	180.2	4097	70
Kings 4	3	378.7	357.9	599	1604
West Prince 1 §	5+	313.4	266.7	3450	68

* = Irrigated
§ = Extreme Drought

2020 Follow up in 8 fields

Comparing High and Low Inoculum Fields

Field	Total Yield cwt/acre	Market. Yield cwt/acre	RLN #/kg	V. dahliae cells/g
High Inoculum	231.0	203.0	5802	3651
Low Inoculum	321.3	282.4	2625	1126

PED – Legume Trial

- Lots of questions about comparative effect of red clover versus other legumes or grasses at multiplying Verticillium and nematodes.
- Are there forage options that are better than red clover at not making populations worse?

- Planted two fields in West Prince in 2019. Two years of forage, potatoes in 2021.
  - Double cut red clover
  - Alfalfa/Timothy (80:20)
  - White Clover/Festolium (50:50)
  - Birdsfoot Trefoil/Festolium (50:50)
  - Festolium or Italian Ryegrass

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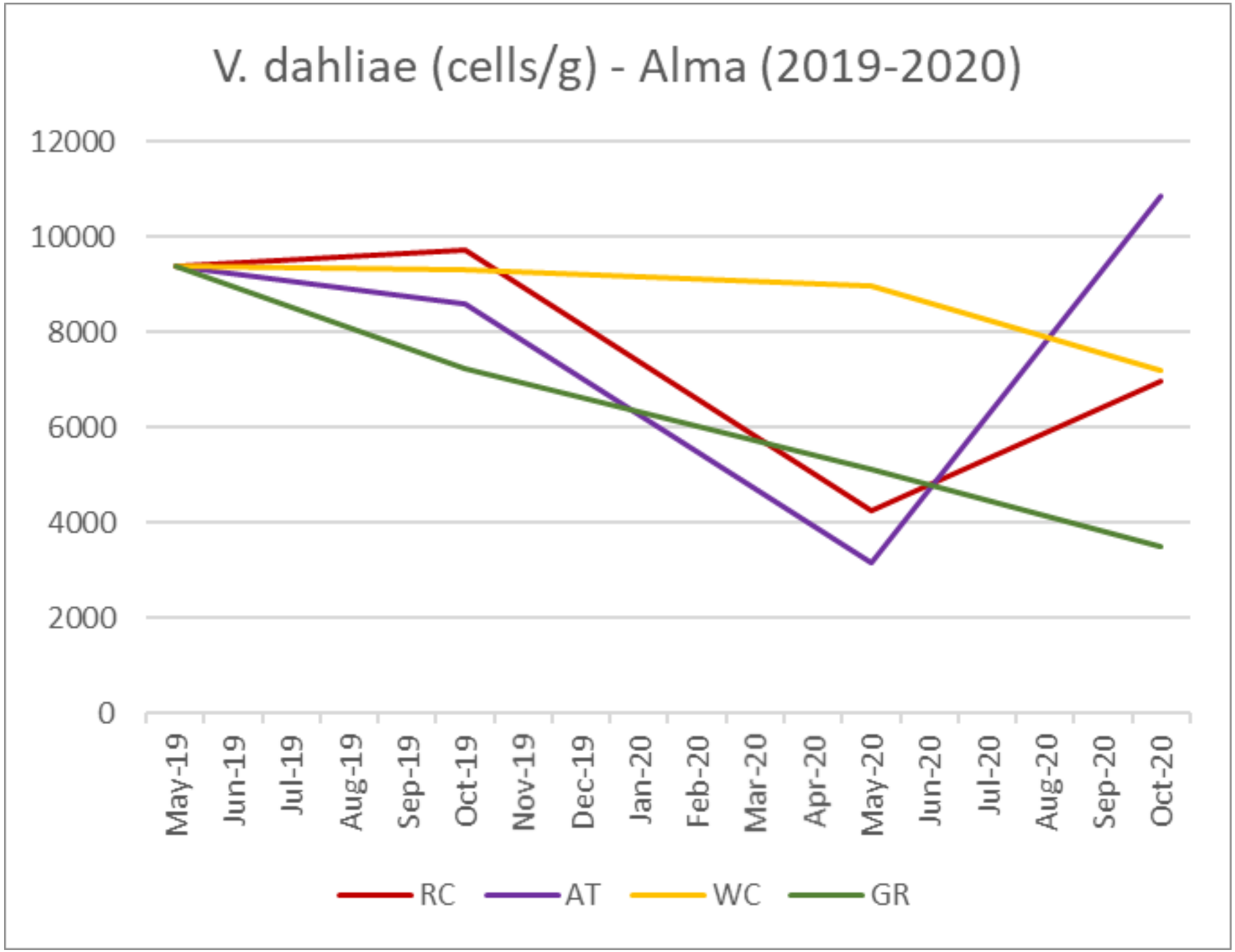
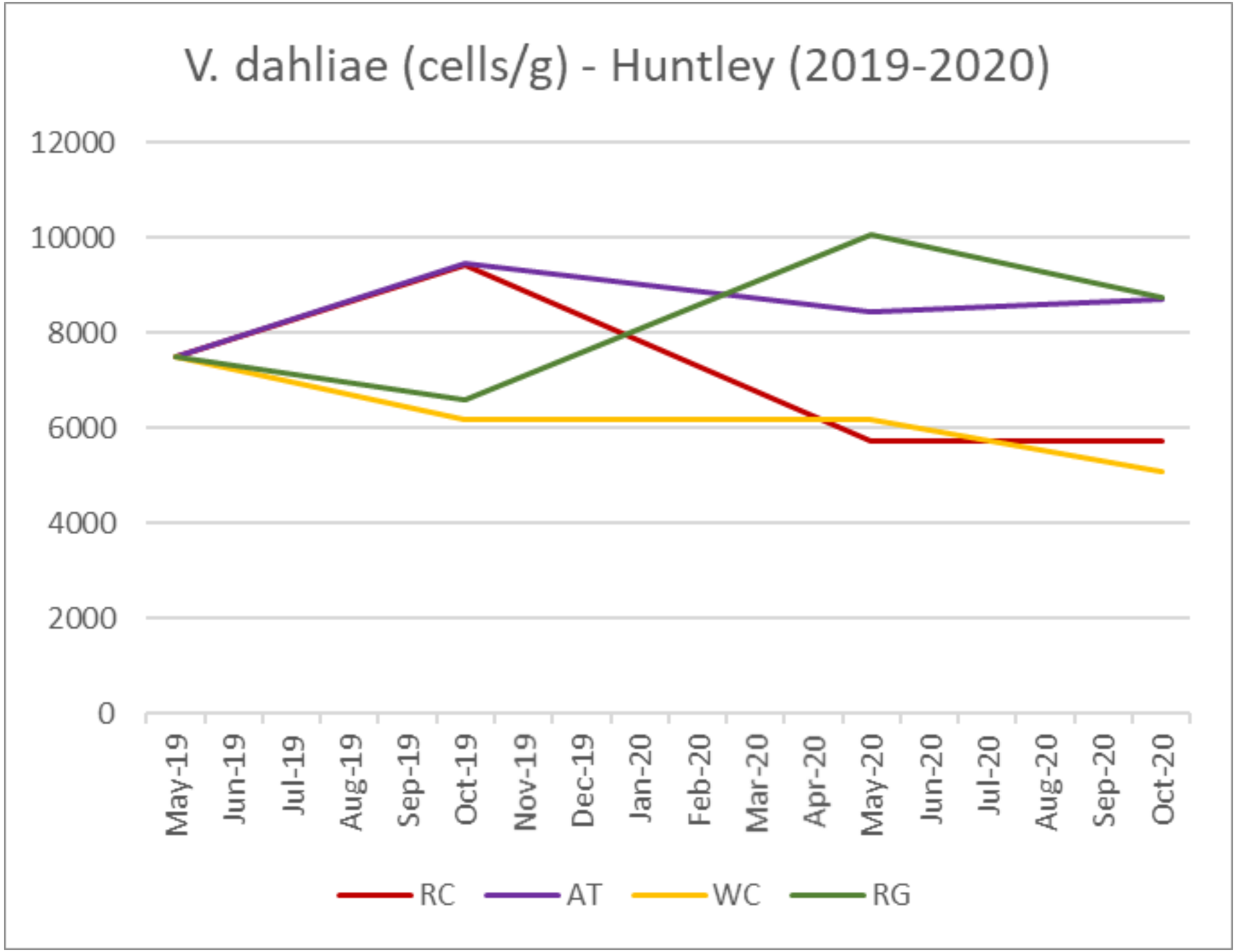
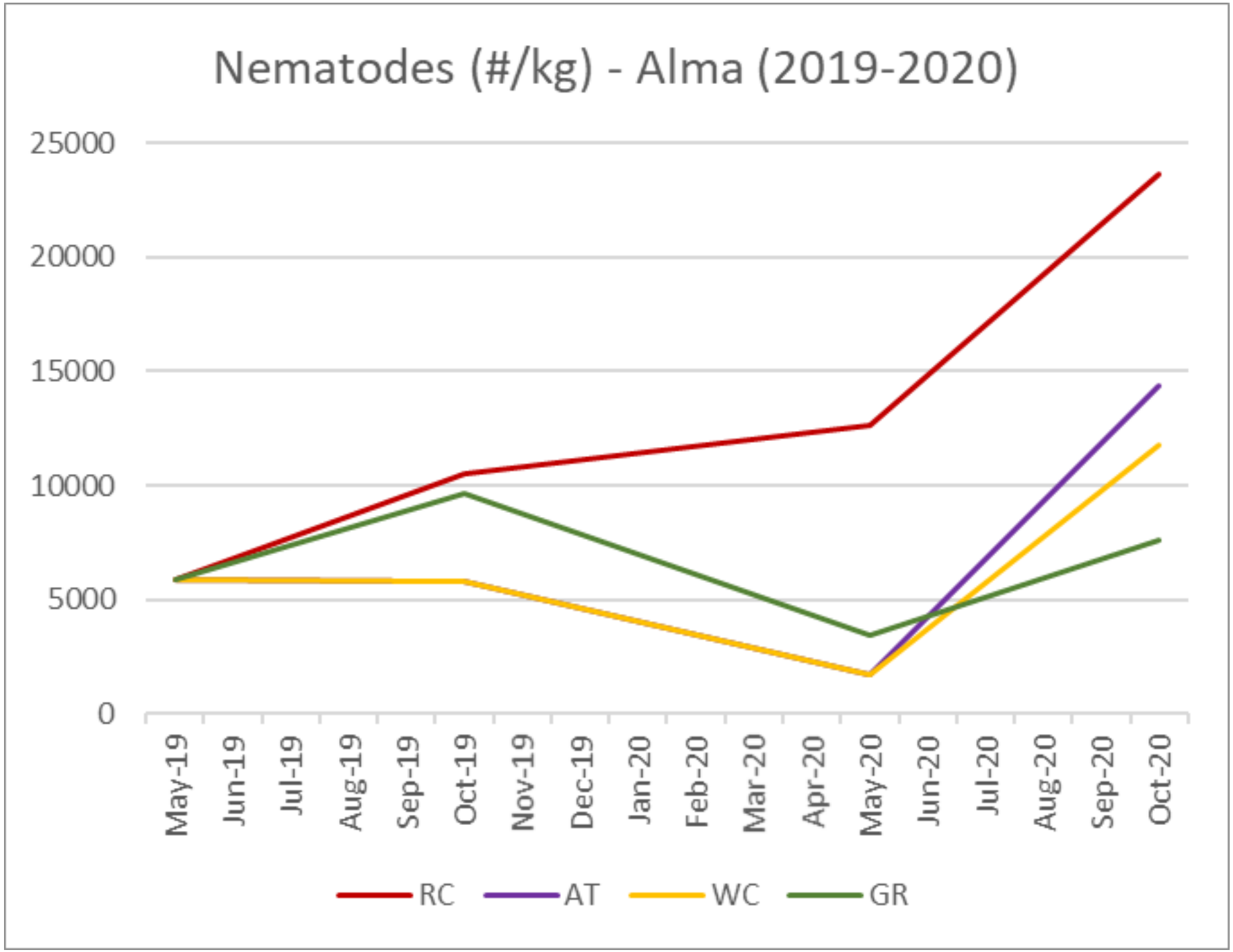
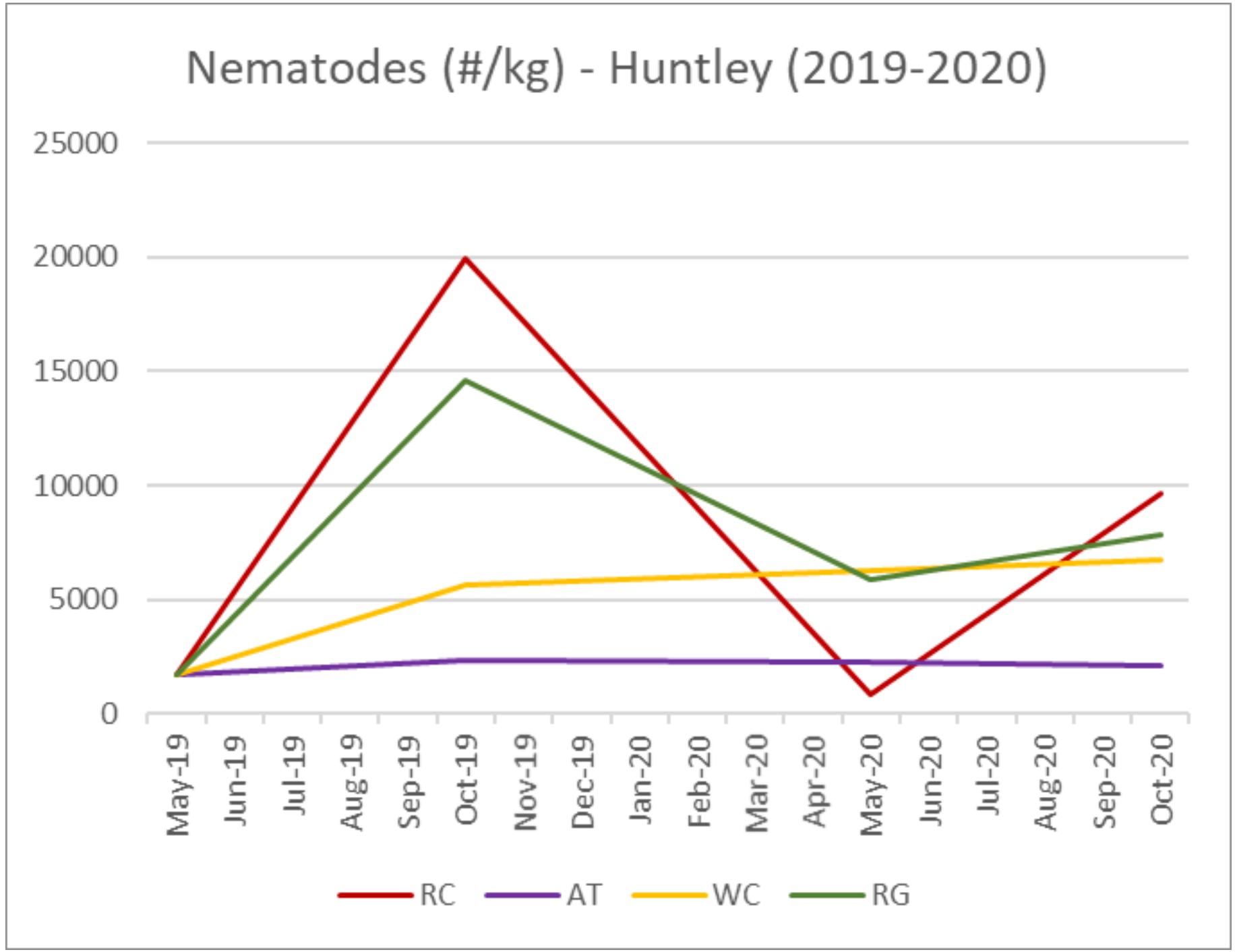

V. dahliae (cells/g) - Alma (2019-2020)
12000
10000
8000
6000
4000
2000
0
May-19
Jun-19
Jul-19
Aug-19
Sep-19
Oct-19
Nov-19
Dec-19
Jan-20
Feb-20
Mar-20
Apr-20
May-20
Jun-20
Jul-20
Aug-20
Sep-20
Oct-20
RC
AT
WC
GR


V. dahliae (cells/g) - Huntley (2019-2020)
12000
10000
8000
6000
4000
2000
0
May-19
Jun-19
Jul-19
Aug-19
Sep-19
Oct-19
Nov-19
Dec-19
Jan-20
Feb-20
Mar-20
Apr-20
May-20
Jun-20
Jul-20
Aug-20
Sep-20
Oct-20
RC
AT
WC
RG


Nematodes (#/kg) - Alma (2019-2020)
25000
20000
15000
10000
5000
0
May-19
Jun-19
Jul-19
Aug-19
Sep-19
Oct-19
Nov-19
Dec-19
Jan-20
Feb-20
Mar-20
Apr-20
May-20
Jun-20
Jul-20
Aug-20
Sep-20
Oct-20
RC
AT
WC
GR


Nematodes (#/kg) - Huntley (2019-2020)
25000
20000
15000
10000
5000
0
May-19
Jun-19
Jul-19
Aug-19
Sep-19
Oct-19
Nov-19
Dec-19
Jan-20
Feb-20
Mar-20
Apr-20
May-20
Jun-20
Jul-20
Aug-20
Sep-20
Oct-20
RC
AT
WC
RG

PED – Legume Trial

- Appears that **red clover multiplies nematodes faster than other legumes.**
- RLN in Alfalfa/Timothy very low in one field, moderate high in other (but lower than RC)
- Grass can still multiply RLN

- **No definite trend in V. dahliae.** Most changes within margin of error.
- Grass was highest in Huntley field…likely due to volunteer clover from other strips.
- All will be tested again in May 2021, then potatoes.

Above: Birdsfoot Trefoil/Festolium

AIM Biofumigation Trial

- 3 fields with Genesis Crop Systems
  - Planted late May / early June
  - Comparing Caliente Rojo Mustard/Arugula Mix,
    Centennial Brown Mustard
    Sorghum Sudangrass
    Annual Ryegrass (check)
  - 100-125 lbs/acre N and 20-25 lbs/acre S on mustard treatments
  - Mustard treatments incorporated in July (approx. 50-60 days after planting).
  - Sorghum sudangrass planted following mustard as cover crop, left to winter kill
  - Soil chemical, Vd and RLN testing done at planting.

AIM Biofumigation Trial

AIM Biofumigation Trial

- 2 more fields with same Caliente Rojo/Arugula mix in Living Labs BMP3 project, for total of 5 fields in 2020. All going into potatoes in 2021.
- Will measure soil chemical/health/Vert/RLN again before potato planting to compare
- Setting up at least 5 more fields this spring (planted a bit earlier)

ECODA Mustard Trial

- Working with GCS and ECODA to assess agronomic and economic value of Centennial mustard as a harvested crop versus a green manure.
- 3 sites in 2020, potatoes in 2021
- Treatments at each site:
  - Centennial brown mustard incorporated
  - Centennial brown mustard harvested
  - Barley (check)
- At two sites, also compared with sorghum sudangrass plus above treatments
- Stay tuned for data. **If interested, looking for more sites for spring 2021.**

Thank You!

Living Labs Partners

AIM Funding Partners

Ryan Barrett

Research & Agronomy Specalist

PEI Potato Board

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Email: ryan@peipotato.org

@rbarrettPEI

Operation Pollinator

Creating multifunctional landscapes on farms across Canada

2021 On-farm Program in Prince Edward Island with the PEI Potato Board

OperationPollinator
Multifunctional Landscapes

syngenta

About Operation Pollinator

Focused on creating natural habitats for bees and other pollinating insects, Operation Pollinator offers a practical and meaningful way to increase and improve biodiversity on the farm.

Successful implementation
More than 8 million hectares of farmland in 41 countries worldwide have benefited from enhanced biodiversity through Operation Pollinator and The Good Growth Plan commitment to “help biodiversity flourish” (as of end of 2019).

Benefits of Operation Pollinator

- Farms provide great potential to create essential habitat and food sources for a range of native bees and pollinating insects.
- Independent research trials have shown creation of even small areas of dedicated habitat can significantly increase the numbers of pollinating insects.
- The Operation Pollinator seed mix provides a succession of flowering plants to deliver a continuous source of pollen and nectar for pollinators.

2021 PEI Potato Board Program

- Interested producers agree to convert one-to-two acres of lower-productivity land to establish a dedicated Operation Pollinator site.
- Enrolled participants receive a provision of high-quality, commercial seed, agronomic advice, and assistance to help offset site establishment costs.
- Participants will inform the PEI Potato Board once planting is complete to allow for tracking of planting date and to arrange for a site visit.

What's in the mix?

Alsike clover

Alsike clover, a perennial, features pink and white flowers that appear similar to white clover. This flower provides abundant nectar and pollen and is attractive to a variety of bee species. Honey bees, bumble bees, and solitary bees are known to visit alsike clover for its nectar and pollen.

Birdsfoot trefoil

Birdsfoot trefoil is a perennial with vibrant yellow flowers. Honey bees and bumble bees are the most common foragers on birdsfoot trefoil. Birdsfoot trefoil requires well-drained soils to thrive. It can be slow to establish, so controlling weed pressure through the introduction of a grass species, such as timothy, can be beneficial to fill in the seedbed instead of alternative weeds.

Phacelia

Phacelia is an annual that features purple-blue flowers. It is well-known for being attractive to bees and provides both nectar and pollen. Phacelia blooms for a lengthy period during the summer, providing abundant forage. The pollen of phacelia is an excellent source of protein, which can benefit developing bee larvae.

Red clover

Red clover, a perennial, is particularly attractive to bumble bees due to its nectar quality. By incorporating timely mowing, red clover can bloom multiple times throughout the season, supporting bumble bee colonies as they grow and develop.

Timothy

Timothy is a fast-growing grass that provides quick ground cover to discourage weed establishment, while slower-growing plants, such as legumes, establish. Timothy also creates shelter and habitat for other beneficial insects, including predatory ground beetles, and ladybird beetles.

Yellow and white sweet clover *

Yellow and white sweet clover are attractive to a variety of bees. Mowing sweet clover after flowering has ended encourages re-growth, providing additional forage for pollinators later in the season.

*Yellow and/or white sweet clover

How to register

For more information on the 2021 Operation Pollinator program in Prince Edward Island or if you are interested in enrolling in the program, please contact Ryan Barrett at the PEI Potato Board.

Register Now

Prince Edward Island PEI POTATOES