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Optimizing Fertilization for Organic Tomatoes and Peppers Grown in High Tunnels

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Introduction

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- In Quebec, fertilization practices are very different for field-grown and for greenhouse-grown organic tomatoes
  (2 to 6 times field N rates of 135 kg/ha)
- High tunnel production is intermediate between field and greenhouse context : partial env. control, determinate cvs.
- Which approach to use in high tunnels?

Previous work

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- Most organic research projects compare field grown and high tunnel grown crops (effect on quality of produce) with similar rates of fertilization.
- Jett (2006) in Missouri recommends greenhouse N rates for determinate or indeterminate conv. tomatoes grown in high tunnels, based on foliar analysis. Fertilization should be adjusted to plant density (based on bedsize areas).

Previous work

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- Most conv. fertilization research in high tunnels is done using fertigation.
- Nennich (2009) in Minnesota observed yield improvement for organic tomatoes grown with high fertilization in high tunnels + fertigating with fish emulsion (no stats, no economic evaluation).

Methodology

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- Two on-farm research sites : Ripon (Ottawa region) and Wickham (central Quebec). Similar soil tests except K.
- Two projects:
  - 3 N rates (135, 155, 175 kg/ha) on tomatoes and peppers (NSERC funding)
  - 3 N rates (135, 195, 270 kg/ha) on tomatoes (MAPAQ funding)
  - Basic fertilization + supplementary fert. with granulated chicken manure (GCM) 4-1-8

Methodology

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- Randomized complete block design
- 3 reps, plots of 1,5 m x 5 m
- Ripon :
  - basic fert. = compost in fall (80) + GCM (55) in May;
  - suppl. fert. = GCM in mid June, July and August
- Wickham :
  - basic fert. = GCM (140) in May
  - suppl. Fert. = GCM in mid June, July and August

Methodology

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- Tomato cvs. “Mountain Fresh” and “Oregon” planted in mid-May
- Pepper cvs. “Ace” and “Carmen” planted in mid-May
- Parameters :
  - Yield and marketable yield;
  - SSE analysis and field testing of pH and salinity (JJAS);
  - Chlorophyll and foliar analysis (JAS);
  - Standard soil analysis (October);

Effect on tomato yields

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Treatment (kg N/ha)	Total yield (kg/m2)	Marketable yield (kg/m2)
	WICKHAM	
135	4,1 a	3,2 a
195	5,6 b	4,6 b
270	5,5 b	4,9 b
	RIPON	
135	6,9	5,0
195	6,7	5,1
270	7,0	5,3

Effect on tomato yields

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Treatment (kg N/ha)	Total yield (kg/m2)	Marketable yield (kg/m2)
	WICKHAM	
135	3,9	3,3
155	3,8	2,9
175	3,9	2,8
	RIPON	
135	7,1 a	5,5
155	6,0 b	4,6
175	6,6 ab	5,2

Effect on pepper yields

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Treatment (kg N/ha)	Total yield (kg/m2)	Marketable yield (kg/m2)	% of marketable fruits
	WICKHAM		
135	1,1	0,6	60 a
155	1,7	1,3	77 ab
175	1,8	1,5	84 b
	RIPON		
135	3,9	3,6	93
155	4,1	3,9	93
175	3,8	3,5	91

Effect on SSE analysis

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- At Wickham, effect on K (in JAS), on NO_3 (in Aug.) and on P, Mg and Ca (in Sept.)
- At Ripon, effect on NO_3, K, Ca, and Mg in August
- Despite low SSE analysis values, yields were good at Ripon site
- NO_3 levels increased with time at Ripon but decreased with time at Wickham

  -> Different N dynamics : compost?

Effect on Foliar analysis

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- At Wickham, foliar N and K increased with higher fertilization
- At Ripon, no effect of treatments on foliar analysis except K in August
- No correlation between N, P and K from SSE and from foliar analysis

Lab vs field testing of salinity

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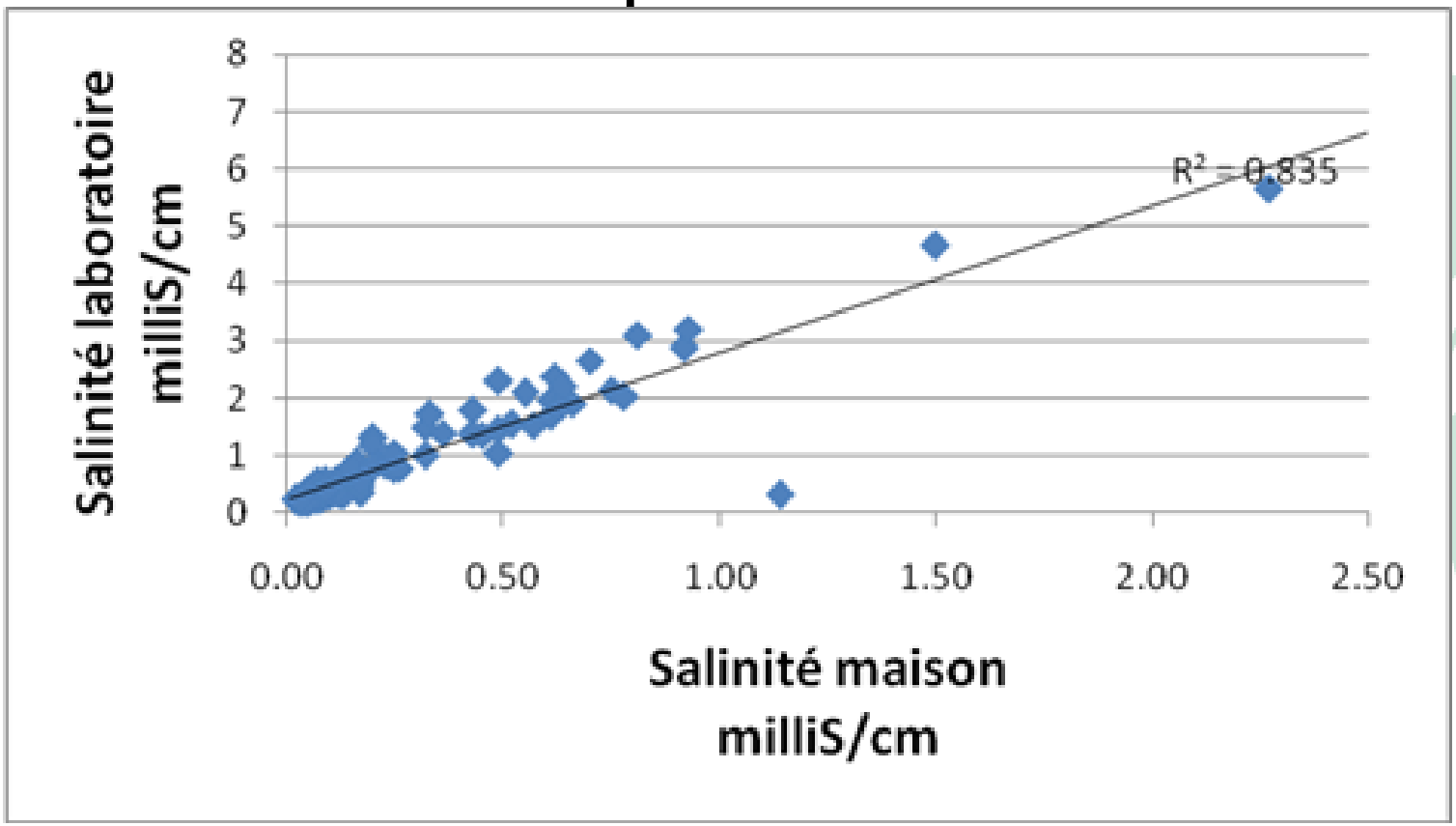
- Correlation at Ripon



Lab vs field testing of salinity

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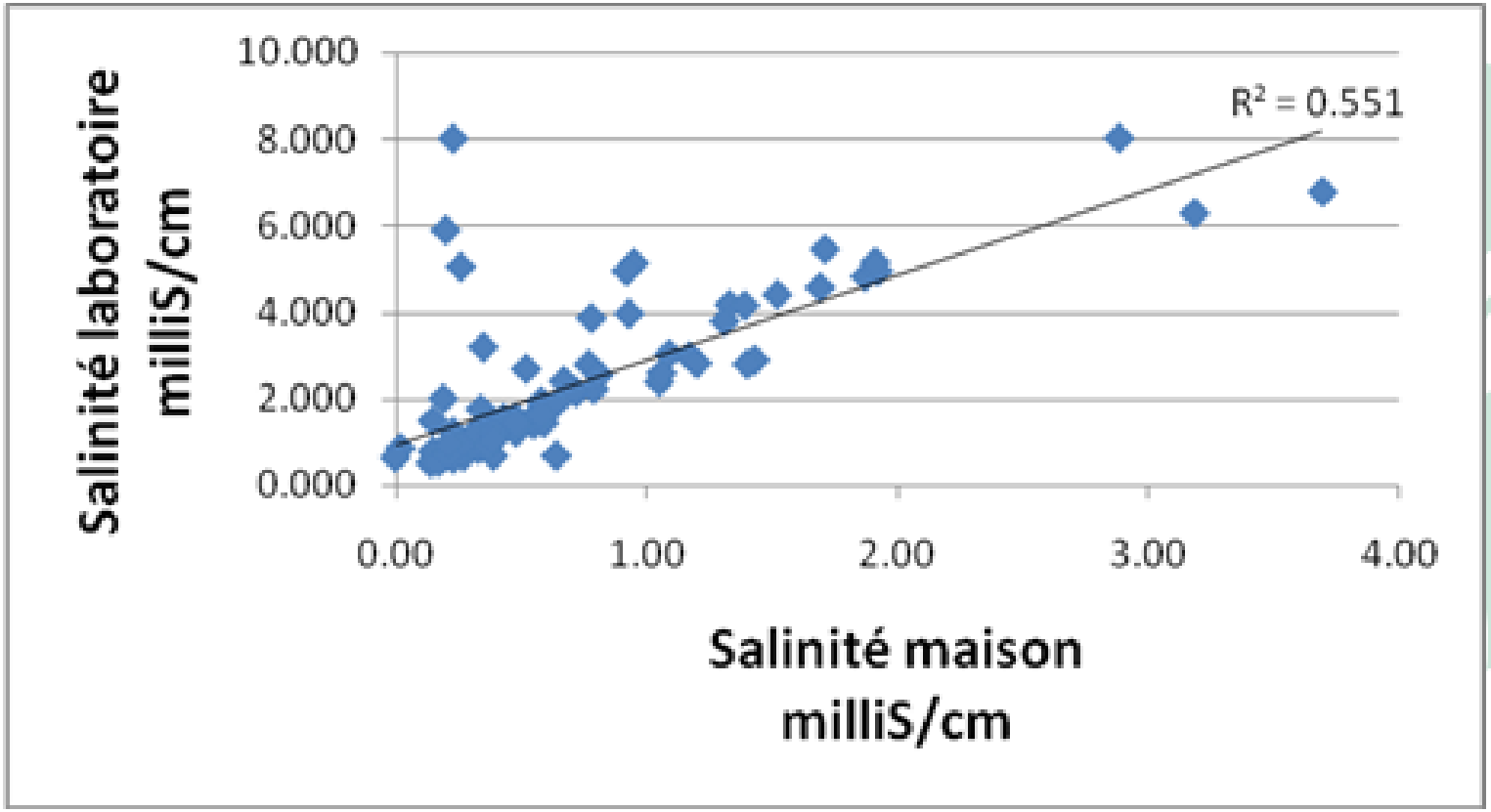
- Correlation at Wickham



NO_3 vs field test of salinity

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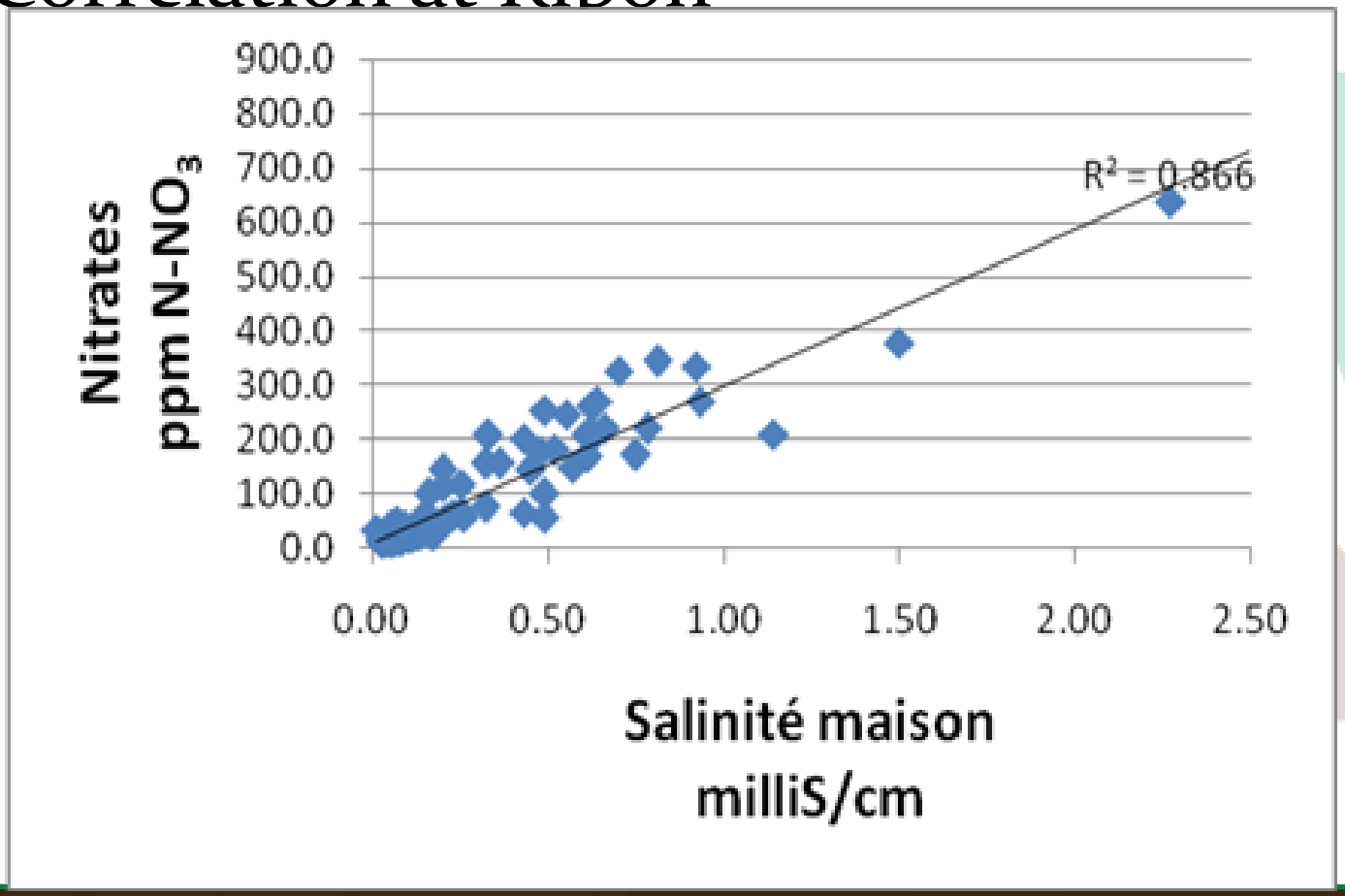
- Correlation at Ripon



Conclusions

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- There was no yield response to increase in fertilization above field rate for tomatoes and peppers grown in high tunnels except for 195 kg N/ha at Wickham for tomatoes.
  - Represents 4,50$/m2 of additional revenue
- SSE and foliar analysis usefulness is questionable in this context
- Site specific recommendations?
- More data in 2012! Testing of N mineralization potential from org. matter

THANKS

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- Ferme La Berceuse (Wickham)
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- NSERC (ICC program)