
The effect of low levels of CIPC on Seed Potato Performance

John Walsh

Associate Principal Scientist,
Potato Storage

McCain Foods Limited



Introduction

**Is it OK to cut seed in a storage
that has been treated with CIPC?**

Common grower question

Introduction

I don't recommend it ...

... BUT

Introduction

DO NOT BRING SEED INTO A STORAGE AREA which has been treated until four to six months have passed and the building as been cleaned, disinfected and continuously aired for that period. If seed is stored after these conditions have been met, do not seal the storage or apply heat, but keep well aired and at as low a temperature as possible during the period seed is stored there.

Introduction

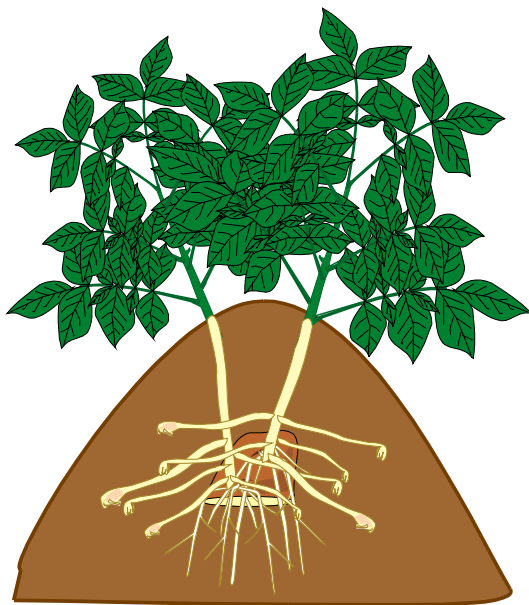
**But we kept seeing things that
concerned us, especially since
2000**

Grower samples: From field in 2014

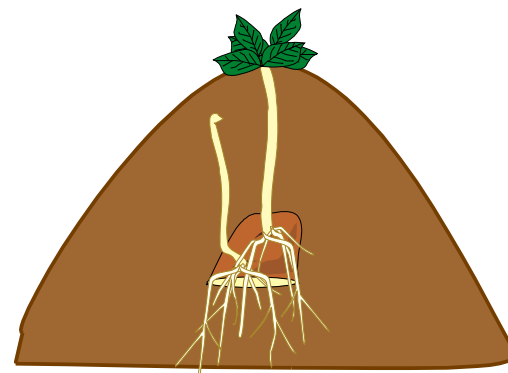
- 🕒 We've always been concerned about the effect on seed performance



And when we checked CIPC residues?



< 0.005 ppm



~ 0.100 ppm or more

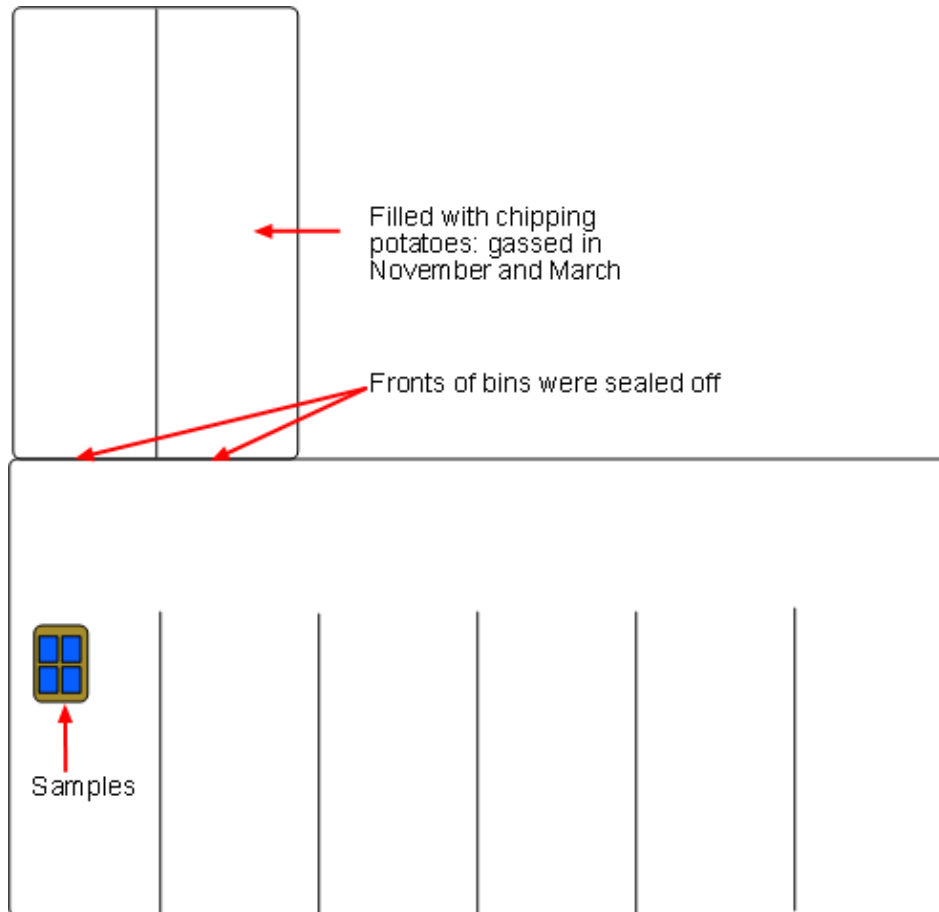
What we did...

**A 3-year study looking at the
effect of low levels of CIPC on
seed performance...**

Trial Setup: 2014



Trial Setup: 2014



Storage was steam cleaned and disinfected before being used to cut seed. Chipping bins were sealed off to prevent contamination

Trial Setup: 2014

- 3 Storages
 - No CIPC:**
Wicklow res. storage
 - Exposed but clean:** Treated storage washed and disinfected
 - Exposed but dirty:**
Treated storage with potatoes still in it, not cleaned



Trial Setup: 2014

- **Two varieties:**
Russet Burbank
Innovator
- **Four exposure times**
1, 2, 3, & 4 weeks

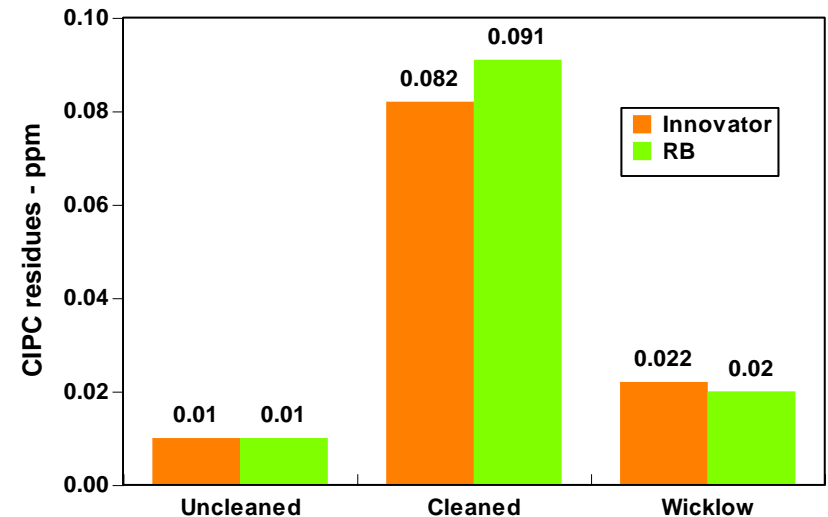


Residue Results: 2014



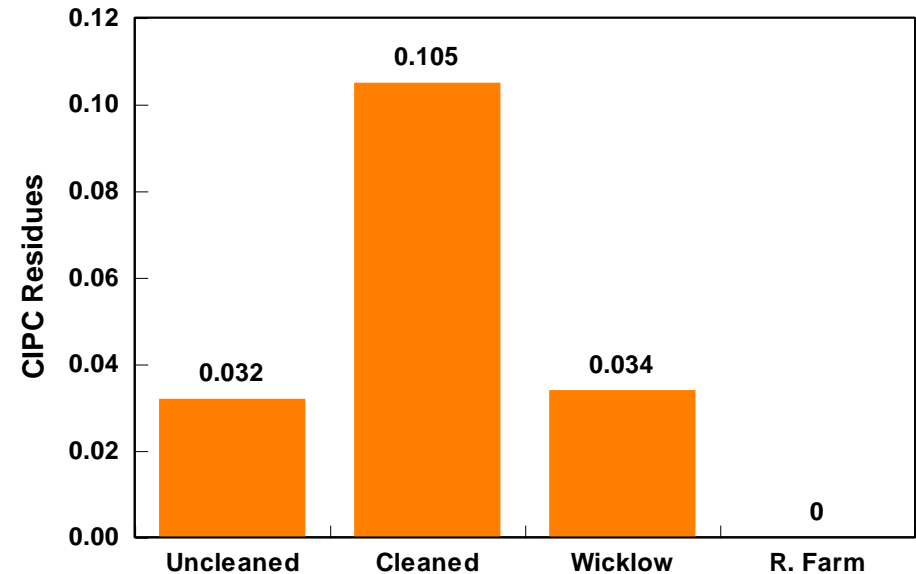
Residue Results: 2014

- Could detect low levels
 - But treatment results were unexpected
- Note: couldn't detect it in the air



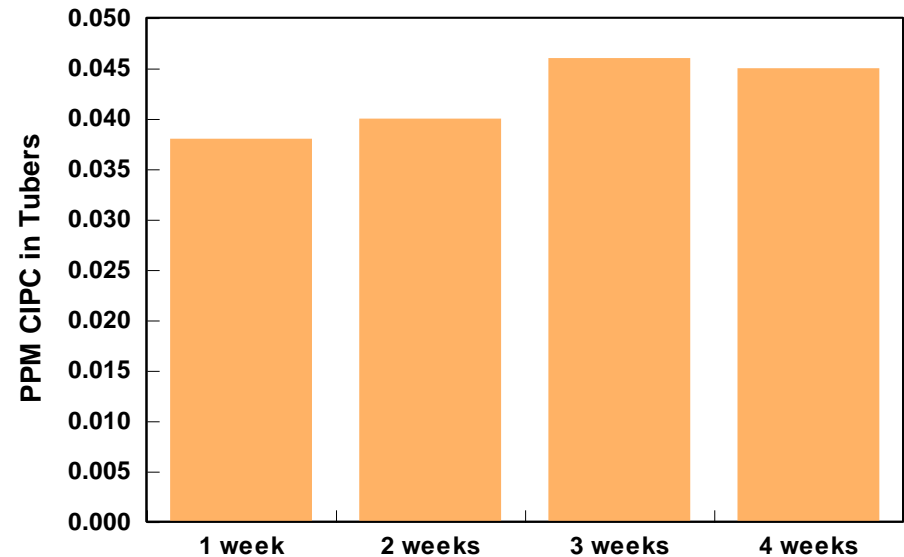
Residue Results: 2014

- Went back and re-tested results
 - Samples in storages 1 week
- Results confirmed!



Residue Results: 2014

- Exposure time
 - Relatively little effect
 - CIPC there from the beginning



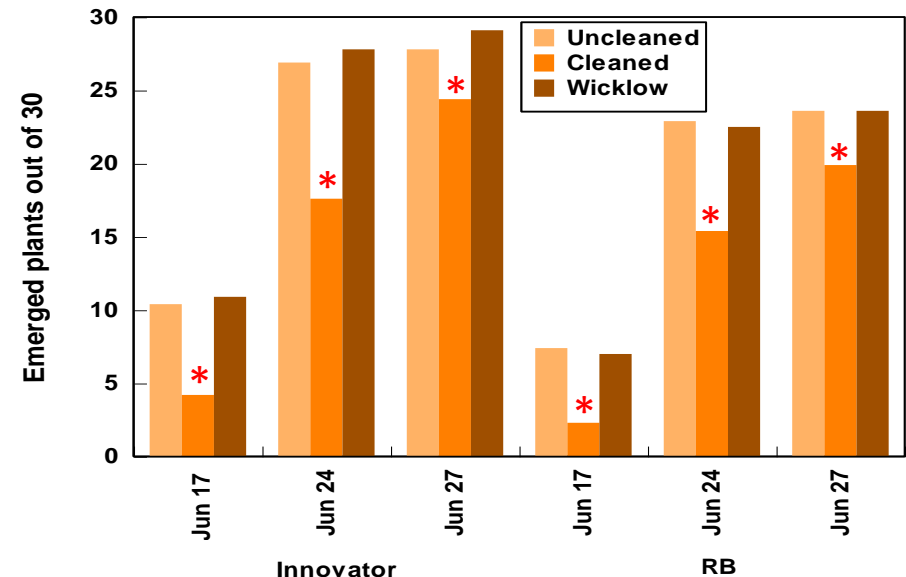
Field Results: 2014



Field Results: 2014

Emergence

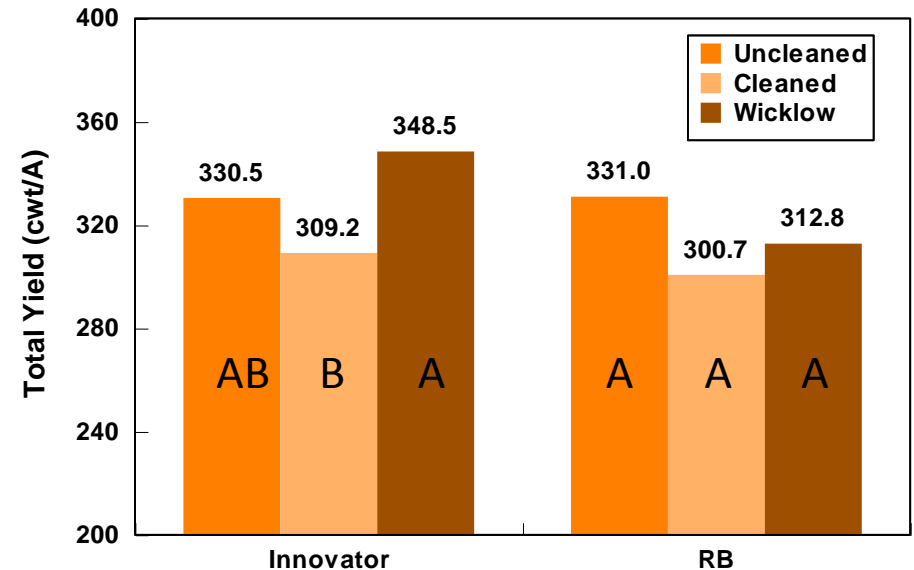
- Was delayed by higher levels of CIPC
- Counted all plants in plots
- Note: final emergence was not significantly different



Field Results: 2014

Yield

- Also affected!!!
- 8% yield loss
- Statistically significant
 - Cleaned storage from other two storages
 - Averaged over both varieties



For 2015 Season



2015 Trial

- Two-step approach:
 - Dip seed tubers in CIPC to achieve 0 - .4 ppm in residues



2015 Trial

- Two-step approach:
 - Dip seed tubers in CIPC to achieve 0 - .4 ppm in residues
 - Measure seed tuber levels in grower storages.



Trial Setup in 2015

Trial Setup in 2015

- Two varieties: RB & Innovator
 - But Innovator results discarded
- 6 Target rates:
 - 0, 0.025, 0.050, 0.100, 0.200, & 0.400 ppm
 - Control tubers were left at McCain research farm
 - Rest were sent to RPC in Fredericton for dipping



Intended vs. Actual Rates

Intended Rate	Actual Rates	
	RB	Innovator
0.000	0.000	0.000
0.025	0.021	0.022
0.050	0.033	0.039
0.100	0.043	0.070
0.200	0.065	0.120
0.400	0.135	0.188

Emergence and early growth

Emergence and early growth

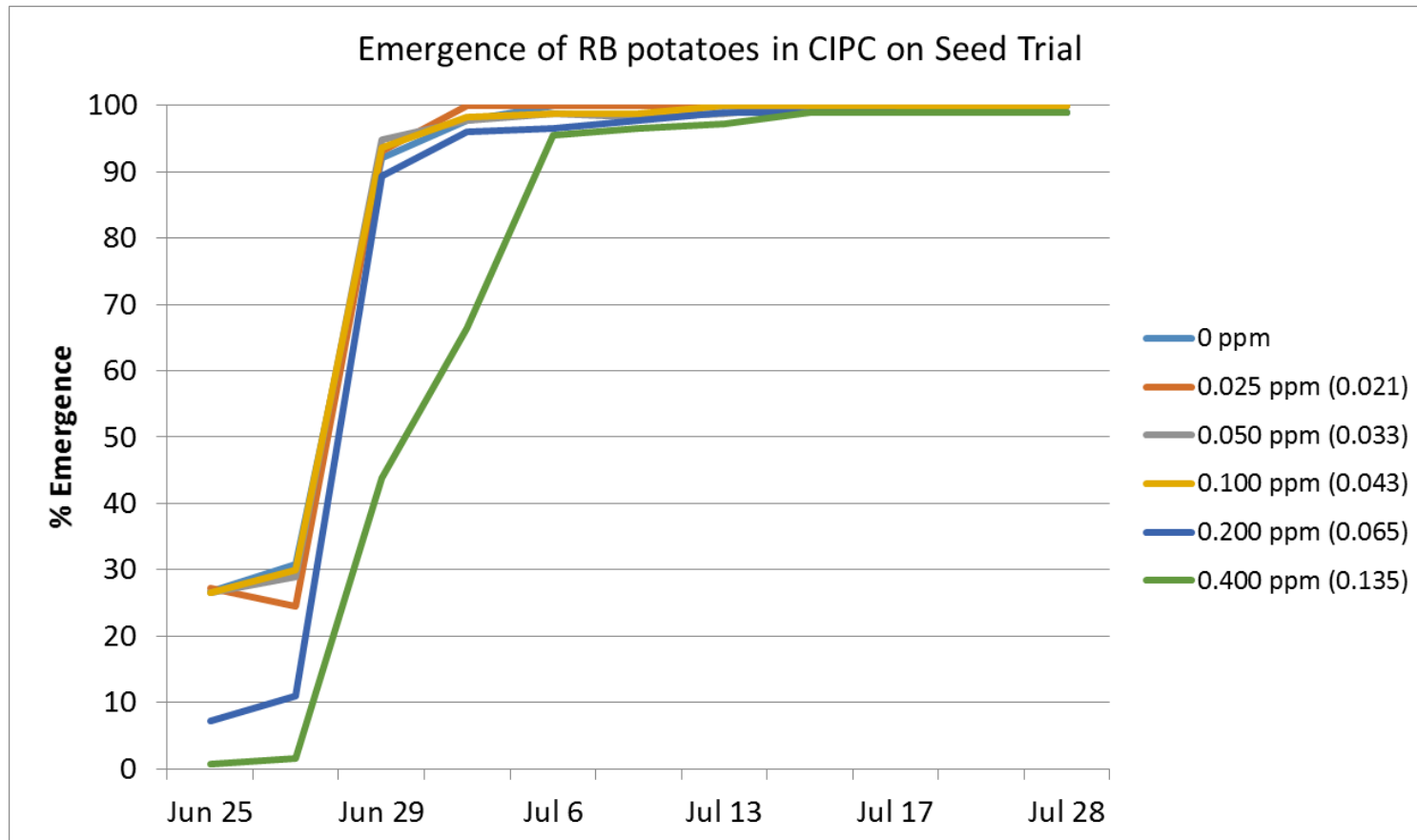
RB "0"



RB "400"

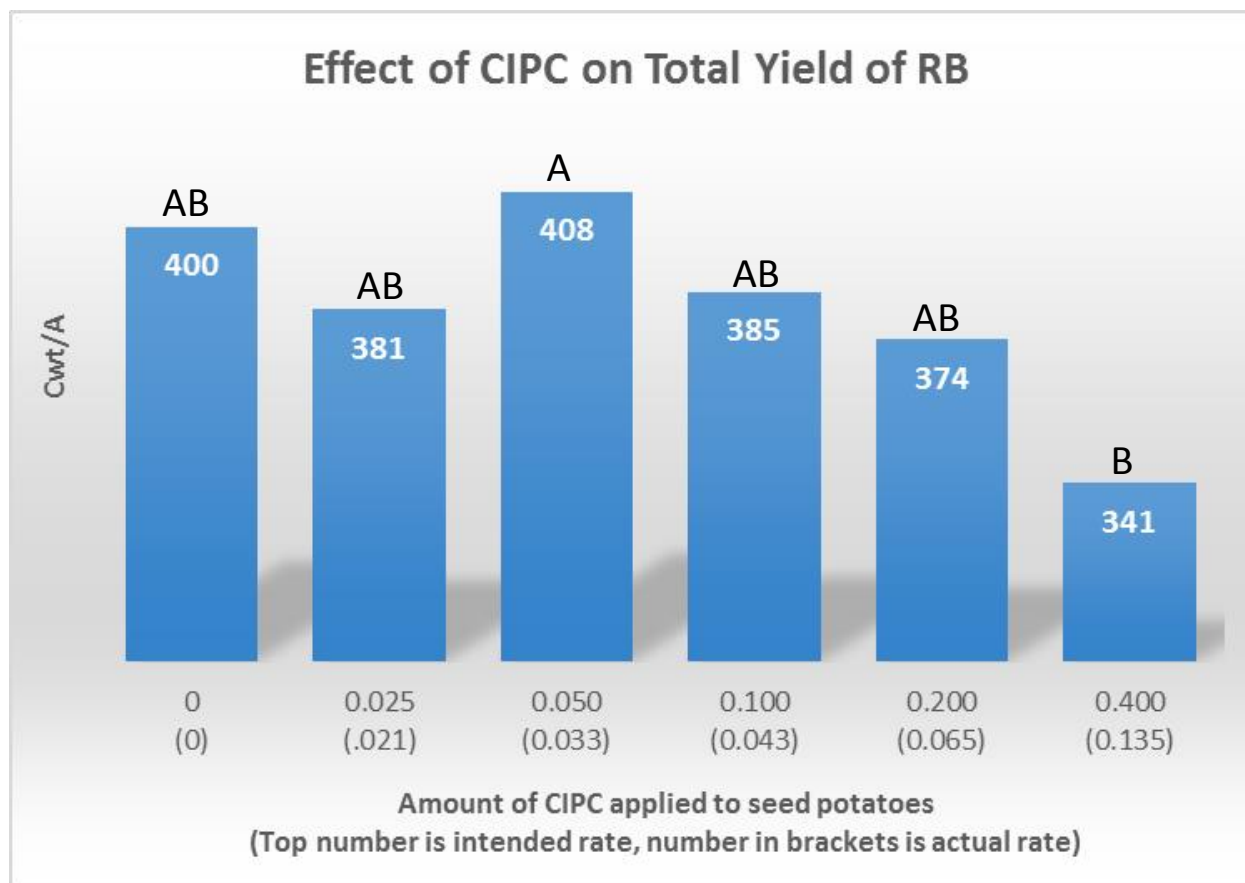


Emergence Numbers: Russet Burbank



Total Yield Results

Total Yield Results: Russet Burbank



No other significant effects of note.

Grower samples

Grower Samples: New Brunswick (2015)

- 🕒 11 growers, 22 samples
- 🕒 Different parts of storage
 - 🕒 Along walls
 - 🕒 Above ducts
- 🕒 All the growers washed and disinfected the bins, trucks, and handling equipment
 - 🕒 At least one grower washed duct

Client	Location in Bin	Cut or Whole Seed	CIPC Found (PPM)	Variety
1	Near duct	Cut	0.055	Shepody
1	Along wall	Cut	<0.005	Shepody
1	Near duct	Cut	0.240	Innovator
1	Along wall	Cut	0.008	Innovator
1	Middle of pile	Cut	0.012	Innovator
2	Along back wall	Cut	0.075	RB
2	Back centre of pile	Cut	0.072	RB
3	Along wall	Whole	<0.005	RB
3	Above duct	Whole	<0.005	RB
4	Along front wall	Whole	<0.005	Innovator
4	Above front duct	Whole	<0.005	Innovator
5	Along back wall	Cut	0.018	Monticello
5	Above back duct	Cut	0.083	Monticello
6	Along wall	Cut	0.007	RB
6	Above duct	Cut	0.012	RB
7	Next to wall	Whole	0.054	RB
7	Next to duct	Cut	<0.005	RB
8	Next to wall	Whole	<0.005	RB
8	Next to wall	Cut	<0.005	RB
9	Next to wall	Whole	0.014	Blazer
9	Next to wall & duct	Whole	0.011	Shepody
11	Next to wall	Whole	0.012	Innovator



Grower Samples: Maine (2015)

- Nine grower samples from Maine
- Similar results
- No information on whether storages were cleaned and disinfected prior to seed
- Also no information on equipment

No.	Variety	Seed Type	mg/kg	Notes
1	Innovator	Cut - not treated	0.036	Stored in mesh bags in plenum
2	Burbank	Whole	0.010	
3	Burbank	Whole	Trace	Runs Ventilation
4	Burbank	Whole	Trace	
5	Burbank	Whole	0.042	
6	Innovator	Whole	0.210	1st time treated was 2014
7	Burbank	Cut - treated	Trace	Runs ventilation after dumps seed. Last treated in '14
8	Burbank	Whole	0.160	Samples in mesh bags on top of pile
9	Innovator	Whole	0.092	Samples in mesh bags on top of pile

Design of 2016 Trial

Design of 2016 Trial

- Dipped seed potatoes in solutions of CIPC and water
 - 0 ppm (0)
 - 0.025 ppm (0.021)
 - 0.050 ppm (0.128)
 - 0.100 ppm (0.143)
 - 0.200 ppm (0.230)



What we saw... delayed emergence

Russet Burbank

June 28, 2016



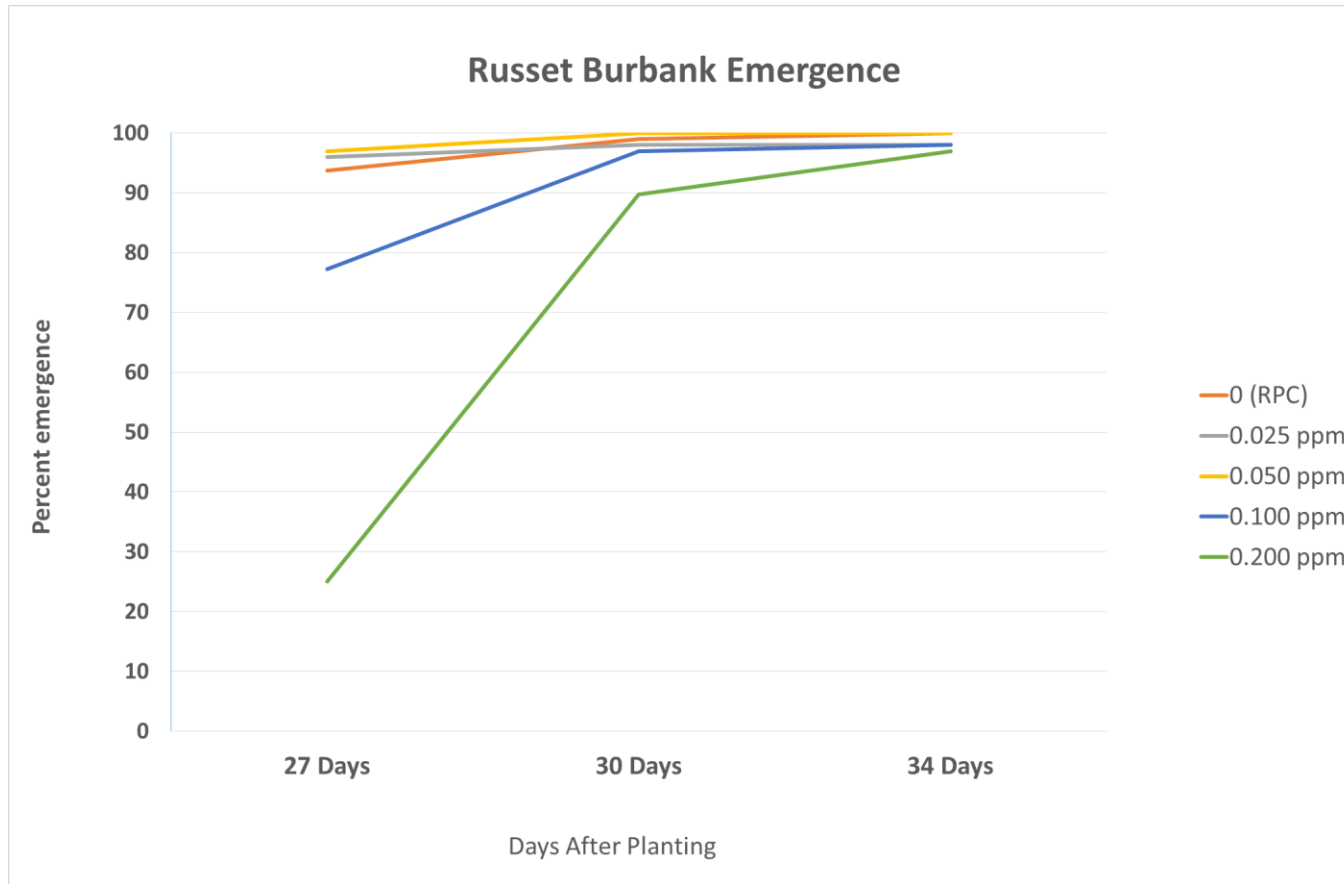
Control 0.025 ppm 0.050 ppm 0.100 ppm 0.200 ppm

July 8, 2016



Control 0.025 ppm 0.050 ppm 0.100 ppm 0.200 ppm

What we saw... delayed emergence



What we saw... delayed emergence

Innovator

June 28, 2016



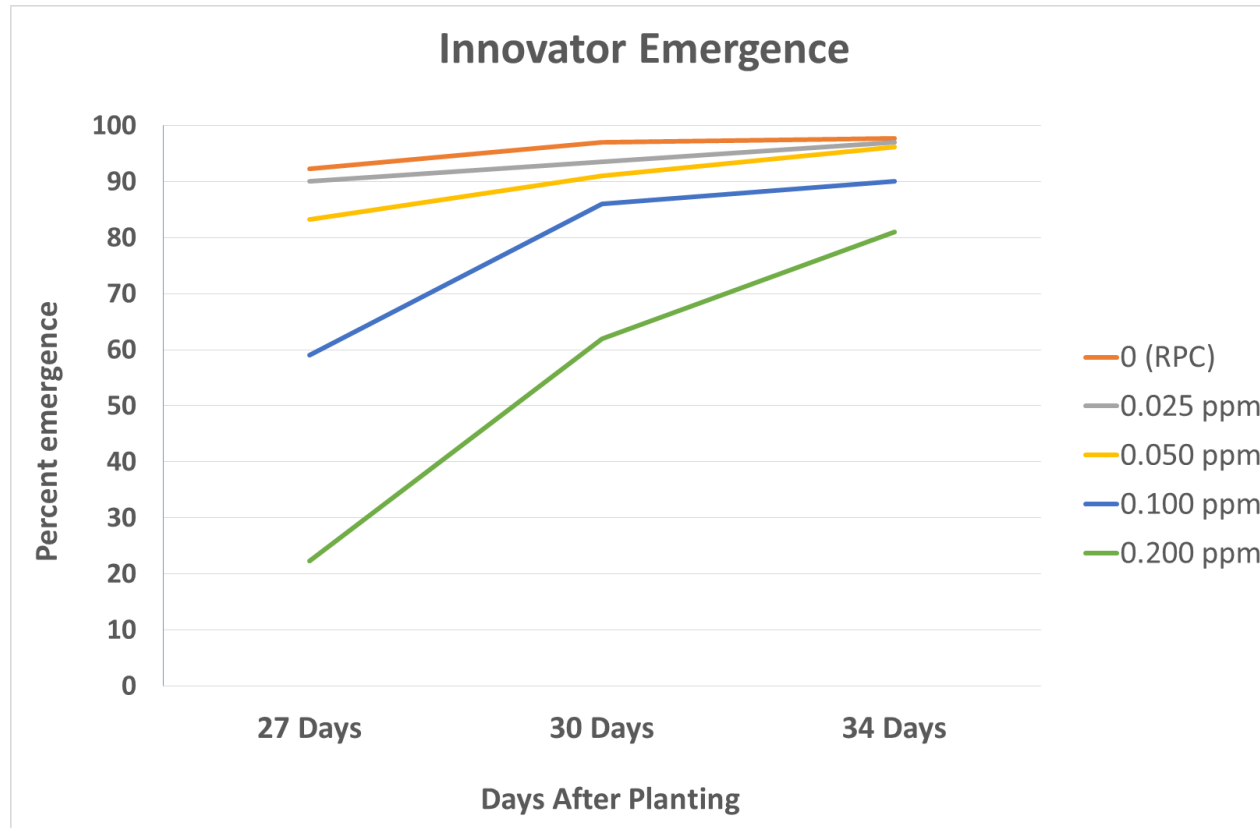
Control 0.025 ppm 0.050 ppm 0.100 ppm 0.200 ppm

July 8, 2016

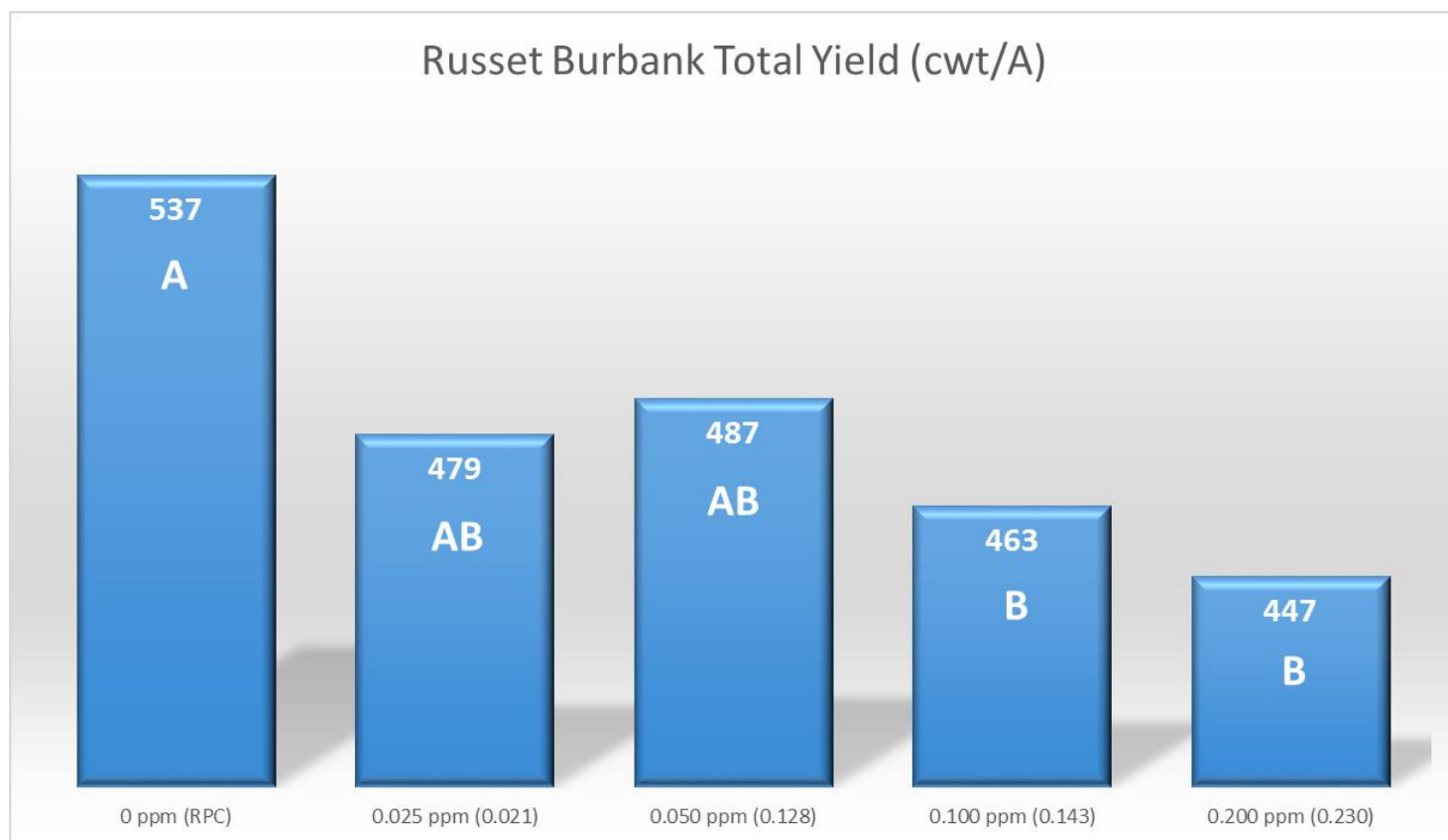


Control 0.025 ppm 0.050 ppm 0.100 ppm 0.200 ppm

What we saw... delayed emergence

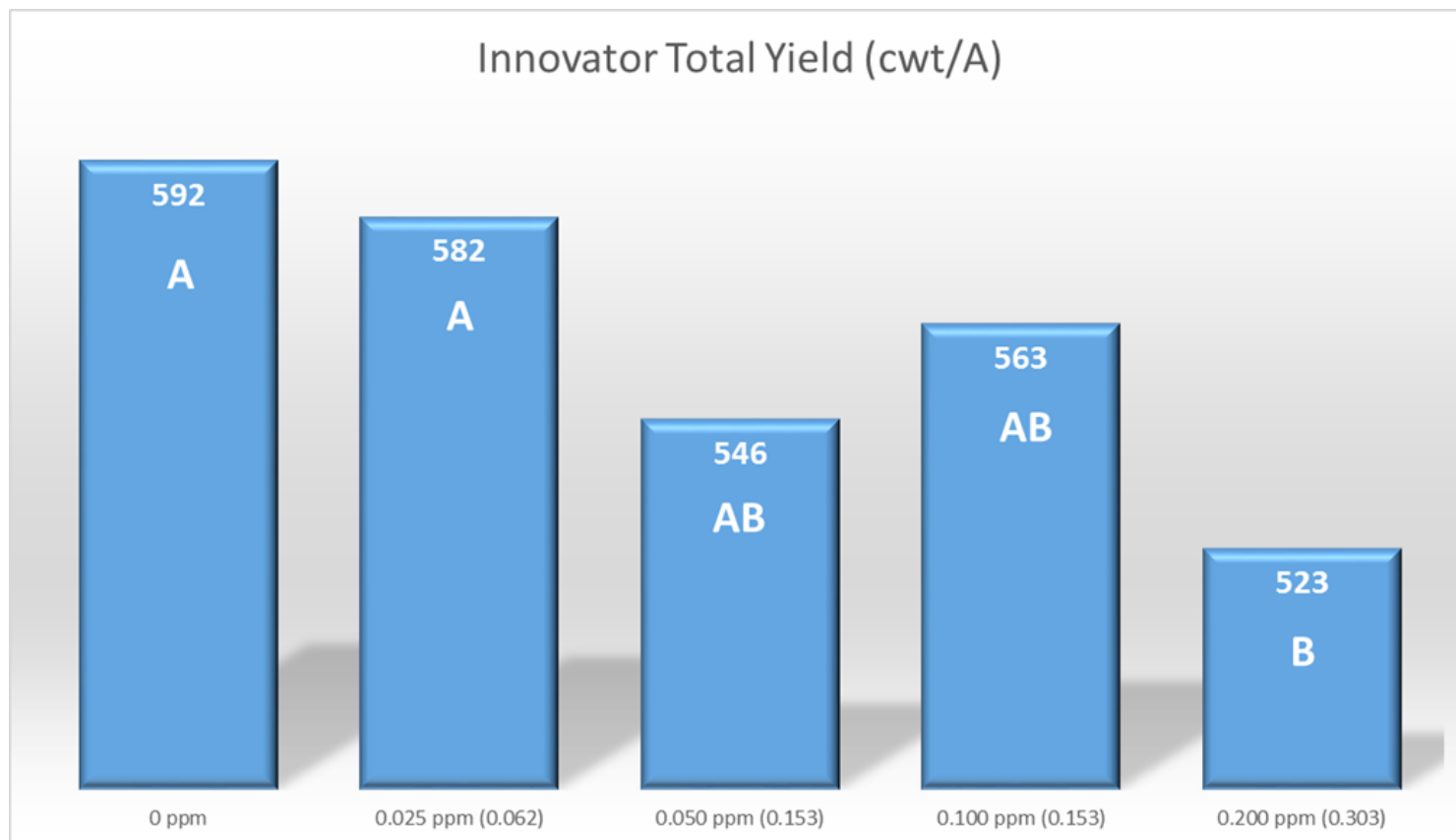


What we saw ... Lower yields



15.9% yield decrease

What we saw ... Lower yields



11.7% yield decrease



Bottom Line

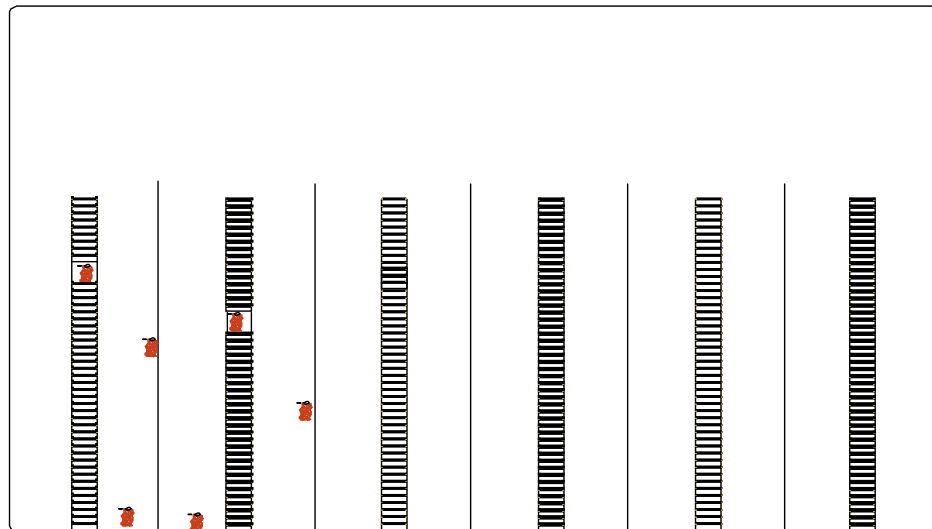
Even tiny amounts of CIPC, 0.025 ppm or less (?), can adversely affect emergence and yields!



What can you do about it?

What can you do about it?

- One grower stopped using CIPC and steam-cleaned all the bins for 2 years
- We put samples in the empty storage
 - No CIPC detected
 - We also sampled the bins in December...



What can you do about it?

0.007 ppm	<0.005 ppm	0.011 ppm	<0.005 ppm	0.010 ppm	0.007 ppm
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Recommendations

1. Cut seed in a CIPC-free building if possible
 - Build new?



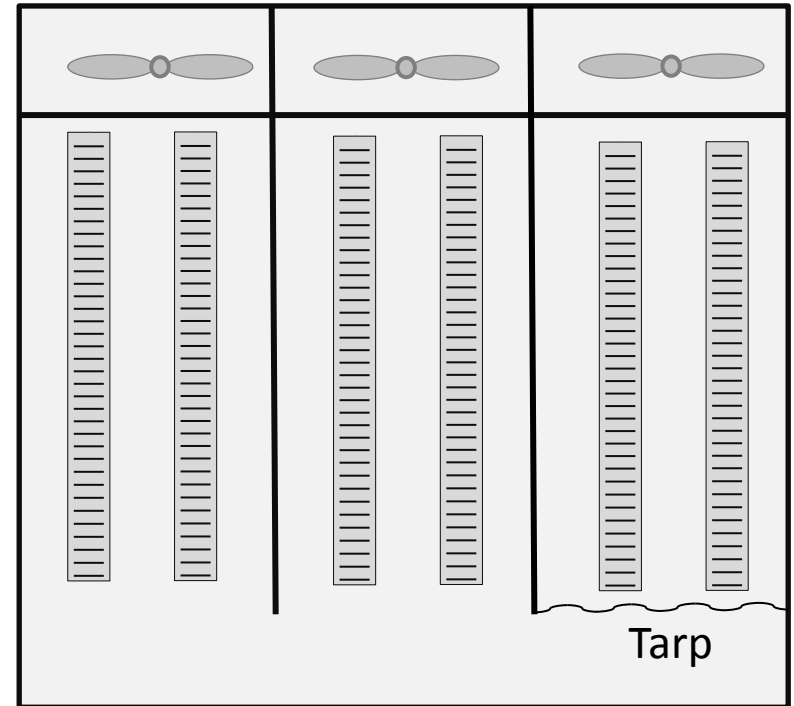
Recommendations

2. Select a storage for short-term storage, and steam clean every year
 - Don't even store treated samples there
 - NO CIPC!!!!!!!
 - Ever!



Recommendations

3. Select a separately ventilated bin, keep it CIPC free and steam-clean every year
 - Make sure ventilation is off when gassing other bins



Recommendations

4. Don't forget about trucks, conveyors and bin pilers
 - Steam-clean



Acknowledgements

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Questions?