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Soybean Cyst Nematode



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Presentation to
Getting it Right- Crop Production Meeting
Winkler, Manitoba
March 5, 2019



UNIVERSITY
OF MANITOBA

Important Tip

- Important stuff is indicated in Green
 - All other stuff is optional, feel free to do something else
 - Suggestions to do
 - Follow Mario on Twitter
 - Check what Trump has said today
 - Funny cat videos
- <https://www.youtube.com/watch?v=hY7m5jjJ9mM>

2015 Disease Losses

Table 1. Estimated soybean yield losses from diseases in the top 28 U.S. soybean-producing states and Ontario, Canada, in 2015.

Disease/Pathogen	2015 Estimated Yield Losses for U.S. (thousands of bushels)	2015 Estimated Yield Losses for Ontario (thousands of bushels)
Root Rots and Seedling Blights		
Soybean cyst nematode	109,288	3,696
Seedling diseases (caused by species of <i>Fusarium</i> , <i>Pythium</i> , or <i>Rhizoctonia</i>)	62,948	2,957
Root-knot nematode	12,366	0
Reniform nematode	4,438	0
Other nematodes (lesion, Columbia lance, sting, stubby root)	1,465	148
Leaf and Aboveground Diseases		
Septoria brown spot	26,868	37
Frogeye leaf spot	17,662	15
Cercospora leaf blight	12,840	0
Downy mildew	4,383	7
Bacterial diseases (bacterial blight and bacterial pustule)	2,774	4
Virus Diseases (AMV, BPMV, SbDV, SMV, SVNV, TRSV, TSV)*	2,602	74
Other leaf and aboveground diseases (Phyllosticta leaf spot, target spot)	2,427	0
Purple seed stain	1,594	15
Rhizoctonia aerial blight	652	0
Soybean rust	157	0

Stem Diseases		
Sudden death syndrome	43,776	2,218
Sclerotinia stem rot (also known as white mold, caused by <i>Sclerotinia sclerotiorum</i>)	40,083	2,957
Phytophthora root and stem rot	28,275	1,479
Charcoal rot	20,808	15
Brown stem rot	17,389	74
Stem canker	12,349	222
Pod and stem blight	10,718	296
Anthraco-nose	5,188	0
Diaporthe/Phomopsis complex (seed rot)	3,612	44
Fusarium wilt and root rot	3,169	1,109
Other stem diseases (Phymatotrichopsis root rot, red crown rot, taproot decline)	2,253	0
Southern blight	523	0

*AMV = alfalfa mosaic virus, BPMV = bean pod mottle virus, SbDV = soybean dwarf virus, SMV = soybean mosaic virus, TRSV = tobacco ringspot virus, TSV = tobacco streak virus.

Soybean Cyst Nematode



Warning signs:

- **Areas of stunted plants, and poor canopy**
- **Areas of chlorotic growth**
- **Areas where weed control is sub optimum**
- **White females (i.e. cysts) on roots**

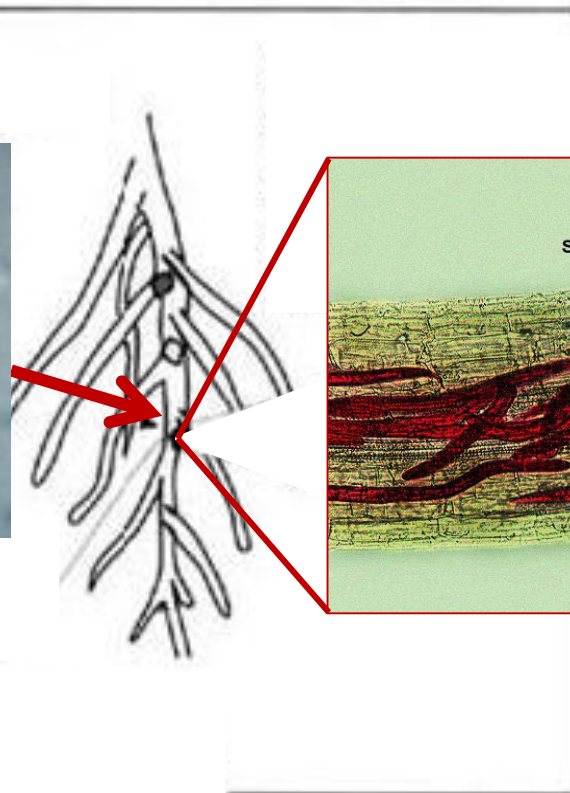
Soybean Cyst Nematode (SCN)

- Is a nematode (round worm) that parasitizes roots of soybean
- Like people, not all nematodes are bad, but SCN is bad

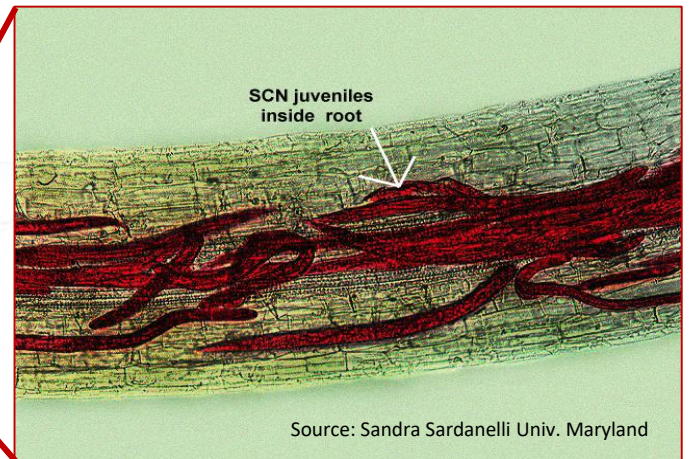


The Life of a SCN Female

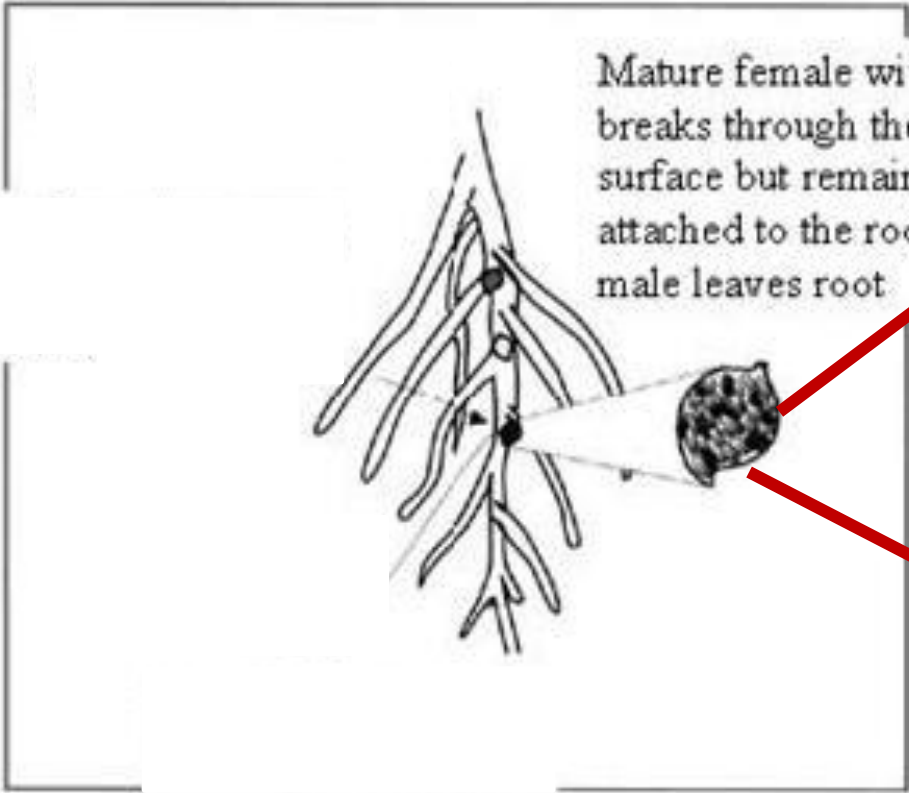
Soil



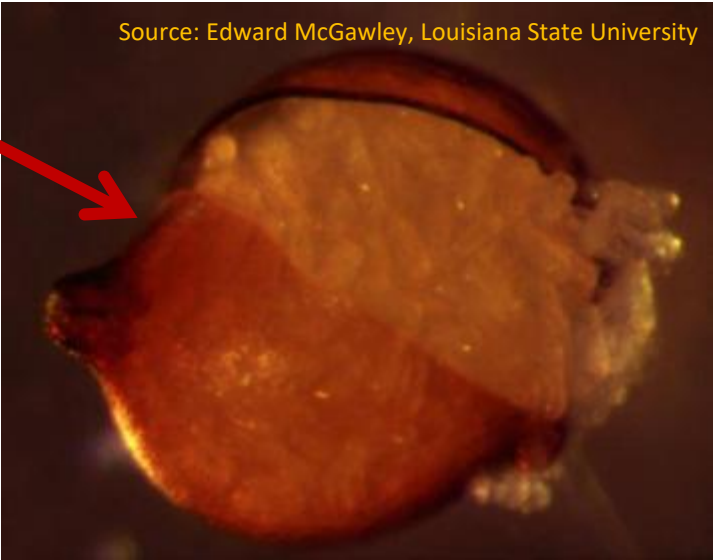
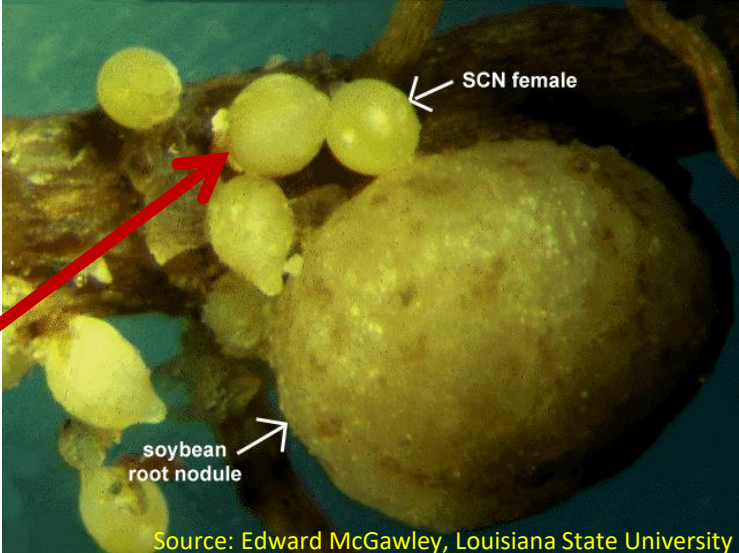
Root



Female Settles Down to Feed and Produce Eggs



Source: Greg Tylka Iowa State Univ.



Female Becomes Cyst Eventually Rupturing and Releasing Eggs



Source: Edward McGawley, Louisiana State University



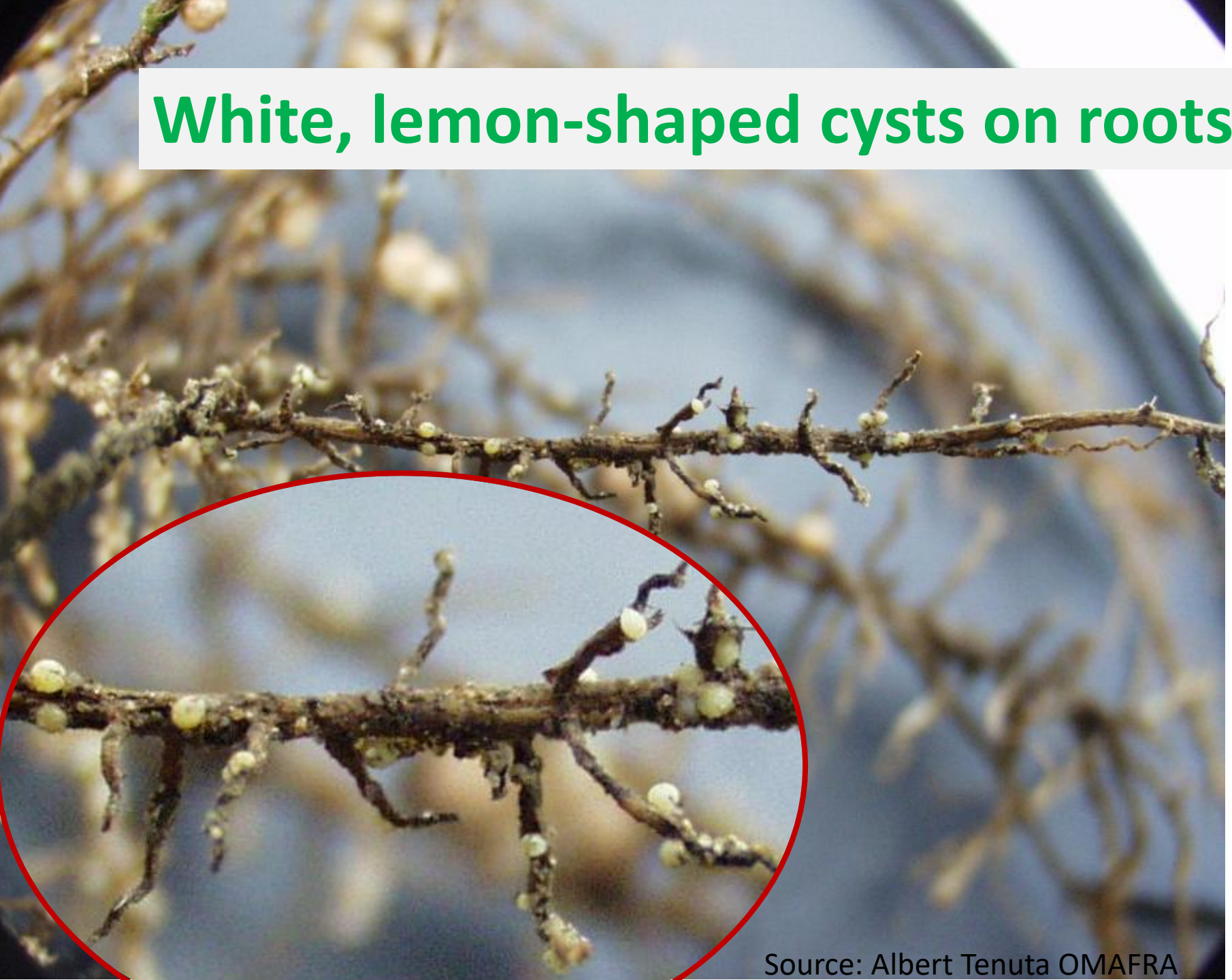
Soil



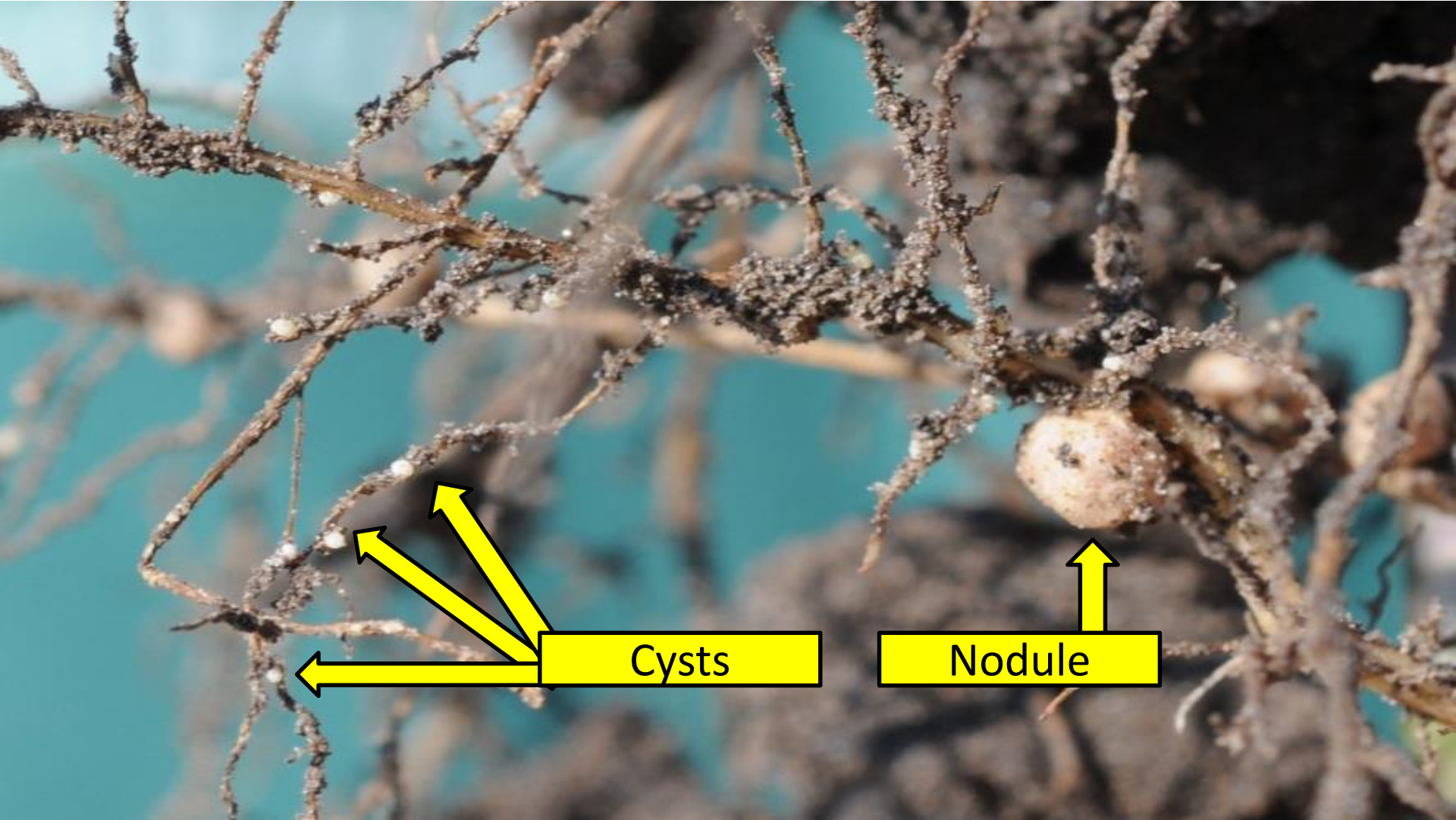
Eggs released in soil, develop into juveniles

Source: Edward McGawley, Louisiana State University

White, lemon-shaped cysts on roots



Source: Albert Tenuta OMAFRA



Cysts

Nodule

Damage Patches in Fields



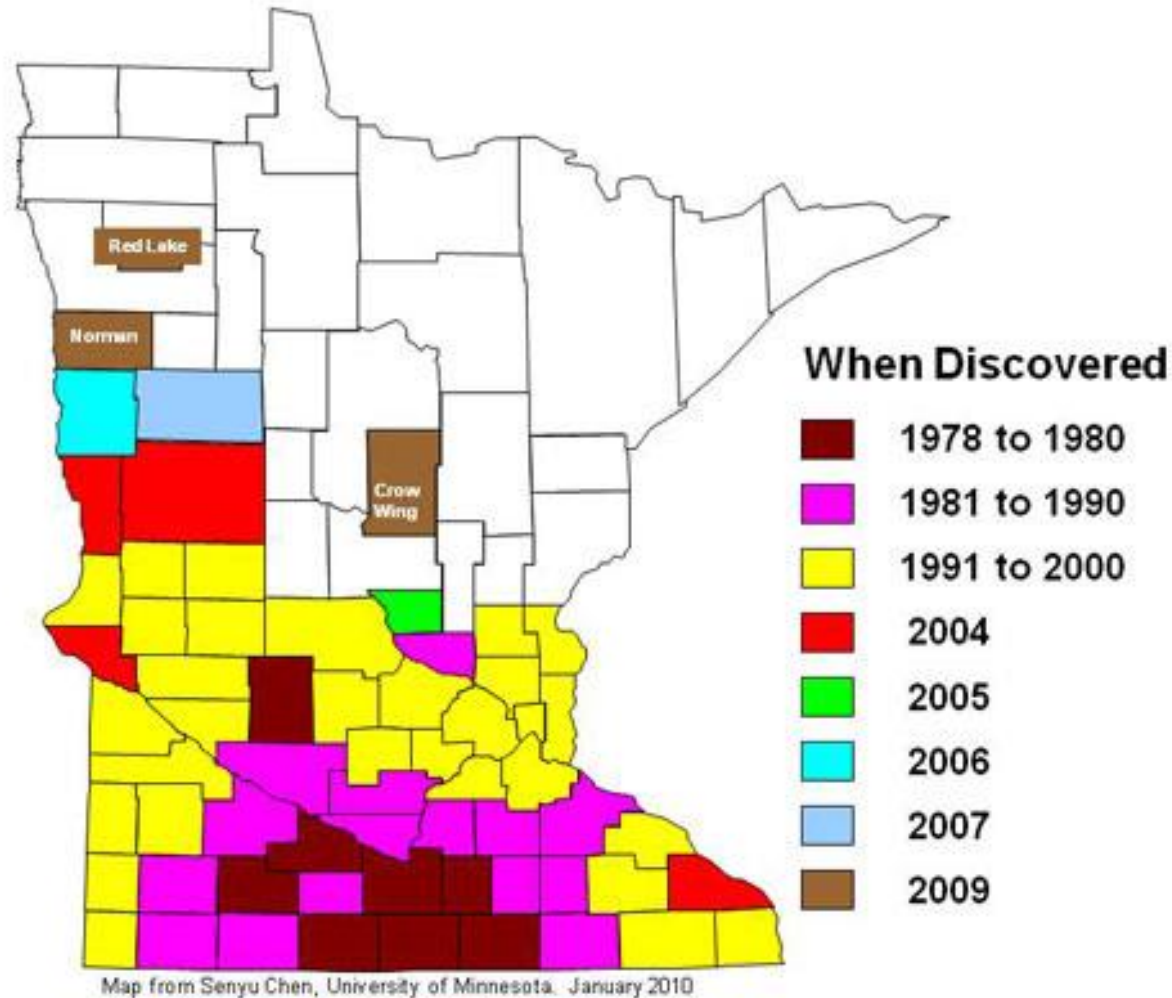
Source: American Phytopathology Society

Source: Albert Tenuta OMAFRA

SCN is Spreading to all Soybean Areas of Canada and U.S.

- Japan in 1880
- North Carolina in 1954
- Moved rapidly from there through much of soy growing area of the U.S.
- Minnesota in 1978
- Ontario in 1987
- North Dakota in 2003

SCN in Minnesota (2009)

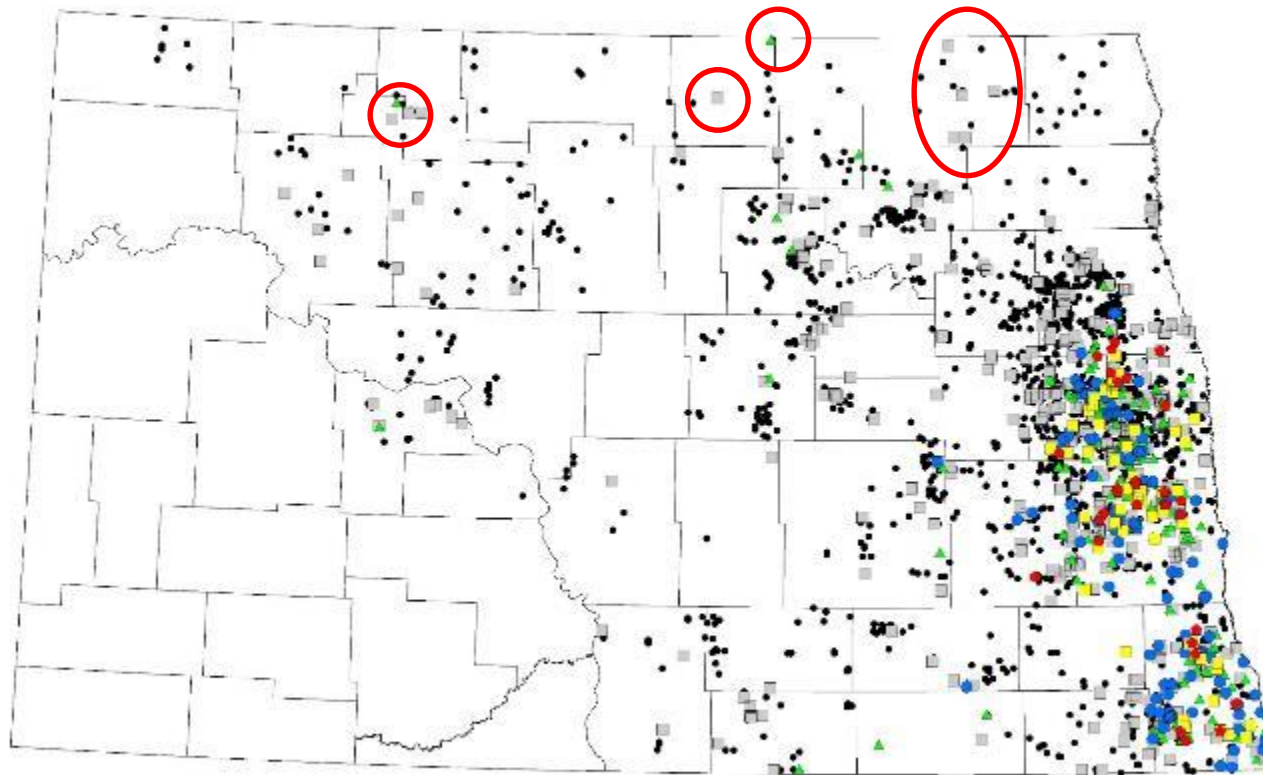


Minnesota counties infested with soybean cyst nematode

SCN Survey in North Dakota



SCN Survey 2013 - 2017

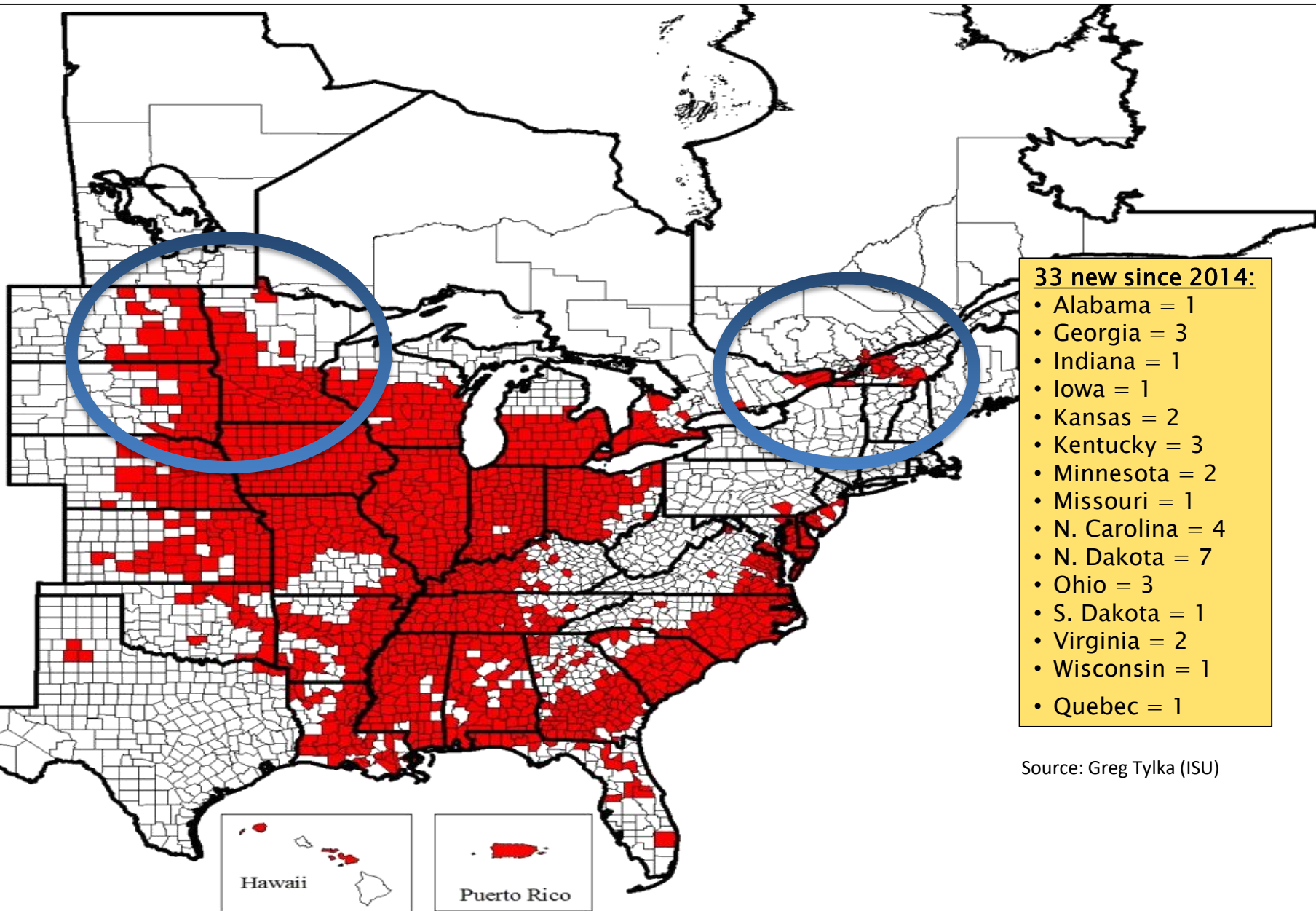


Eggs/100cc

0 12.5 25 50 Miles

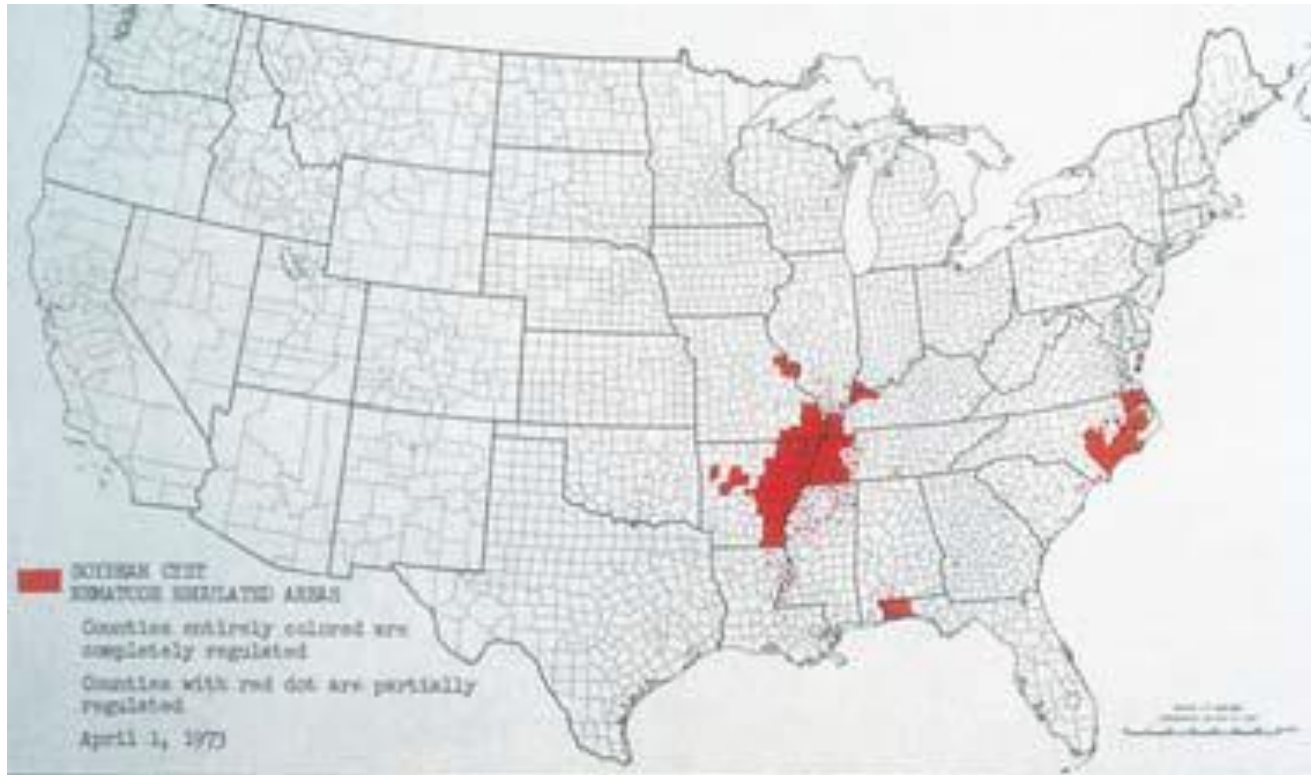
• 0 ■ 50 - 200 ▲ 201 - 2000 ● 2001 - 10000 ■ 10001 - 20000 ● 20000 +

Known SCN-Infested Counties - Feb. 2017



Source: Greg Tylka (ISU)

SCN in the U.S. (1973)



Spread of SCN Took U.S. Nematologists by Surprise

- Doesn't like cold soil (wrong)
- Doesn't like clay soil (wrong)

Can be Confused with Drown Outs



Source: Albert Tenuta OMAFRA

Can be Confused with Iron Chlorosis



Source: Jay Goos North Dakota State University

Effects of SCN on Soybean

What does it do?

- Takes away nutrients
- Water uptake disrupted
- Interferes with nodulation
- Damages roots (holes)

Field symptoms?

- **Yellowed plants**
 - Resembles Iron Chlorosis
- **Stunted plants**
 - Uneven height
- **Early maturity**
- **Reduction of yield**
- **Fewer pods**
- **Damage shows earlier on sands**

Avoid Host Plants in Fields

Crop Plants

Adzuki Bean

Alsike Clover

Bird's-foot Trefoil

Common Vetch

Cowpea/Black-eyed Pea

Crimson Clover

Crownvetch

Pinto, Navy, Cranberry, Black, Kidney,
Great Northern, Snap Bean

Hairy Vetch

Lespedezas

Lima Bean

Lupines

Mung Bean

Pea

Soybean

Sweet Clover

Weed Plants

American Vetch

Carolina Vetch

Common Chickweed

Common Mullein

Field Pennycress

Hemp Sesbania

Henbit

Hop Clovers

Milk Vetch

Mouse-ear Chickweed

Pokeweed

Purple Deadnettle

Purslane

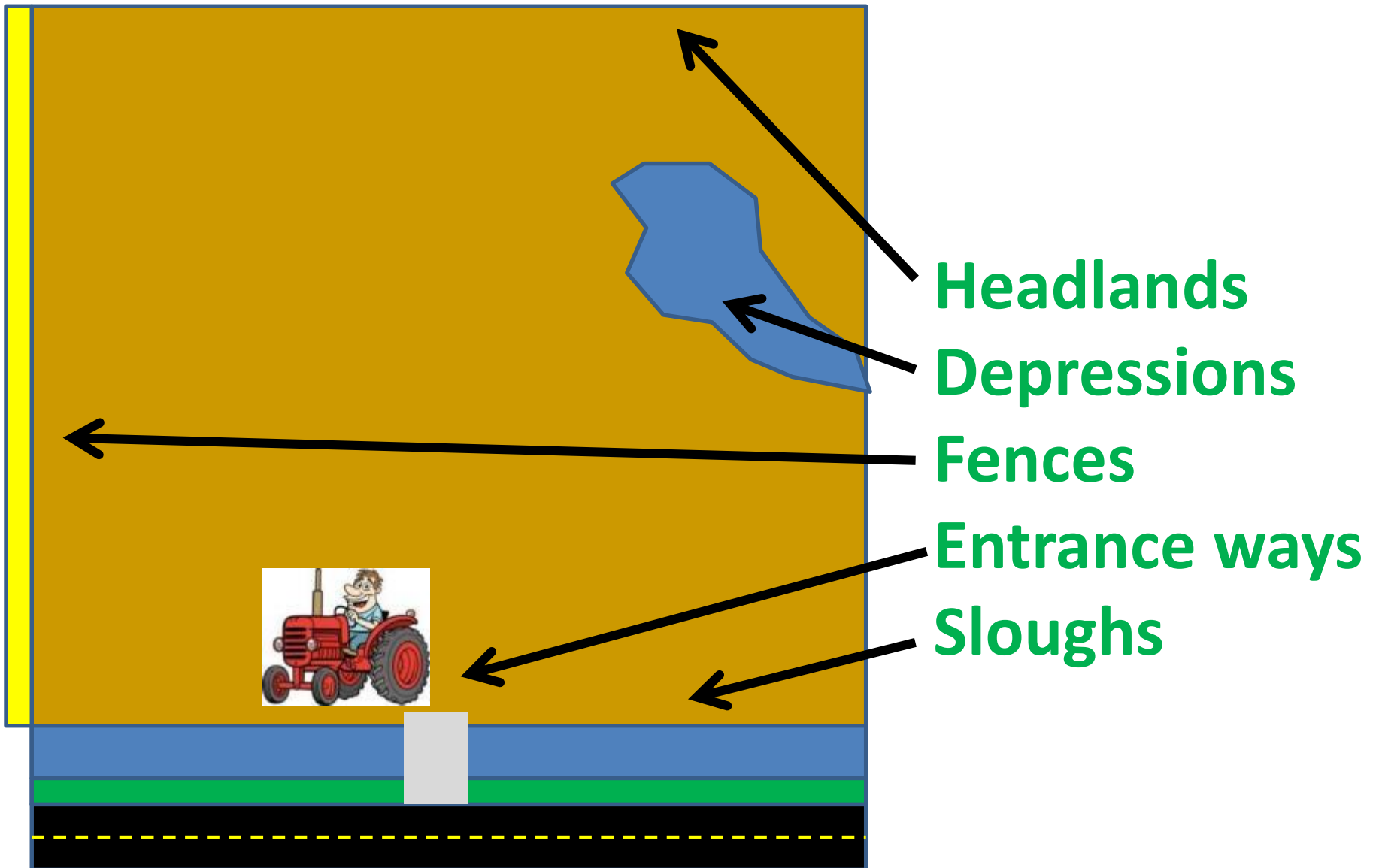
Shepherd's Purse

Wild Mustard

Winged Pigweed

Wood Vetch

Risk Areas in Fields



Prevent Soil Movement Between Fields

- Purchase clean used equipment
- Wash implements and tires between fields
- Don't drive pickups between fields
- Clean footwear



Source: Greg Tylka Iowa State Univ.



Source: Sandra Sardanelli Univ. Maryland

Prevent Birds From Landing on Fields



Use Resistant Soy Varieties



Not Resistant

Not Resistant

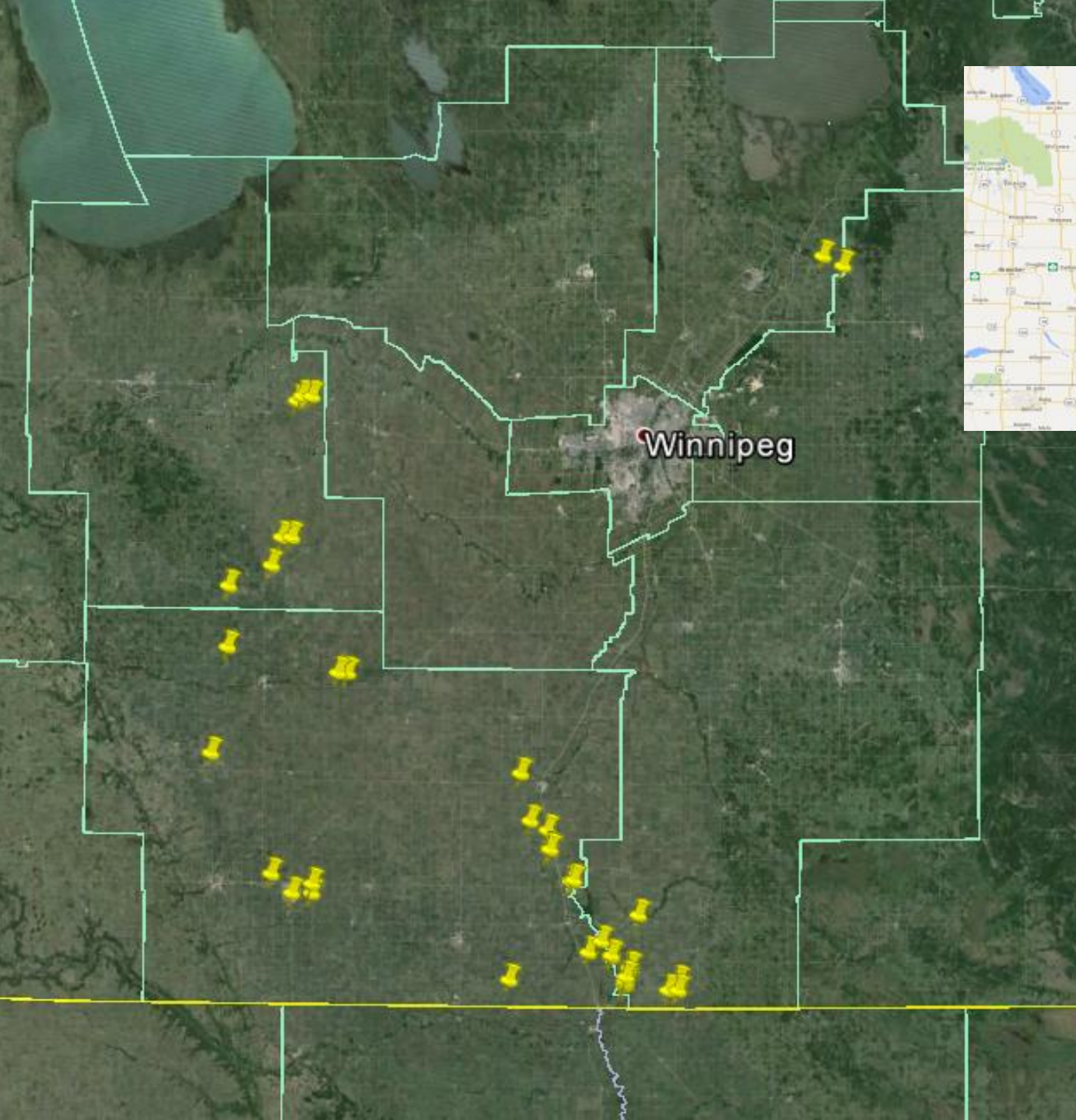
SCN in Manitoba?

- Canadian Food Inspection Agency (CFIA) has done some survey work of random fields
- CFIA found in survey of potato soil in 2010 what seemed to be a lot of SCN in one field
- CFIA has removed SCN as a Regulated Pest in Canada and thus will not survey fields any longer

SCN Survey of Manitoba 2012-2015

- 76 soybean fields sampled
- > 5500 soil samples
- 487 composite samples for processing
- Priority fields based on
 - Proximity to water courses from U.S. that flood
 - Number of soybean years
 - History of dry beans
 - Sampled prone areas of fields

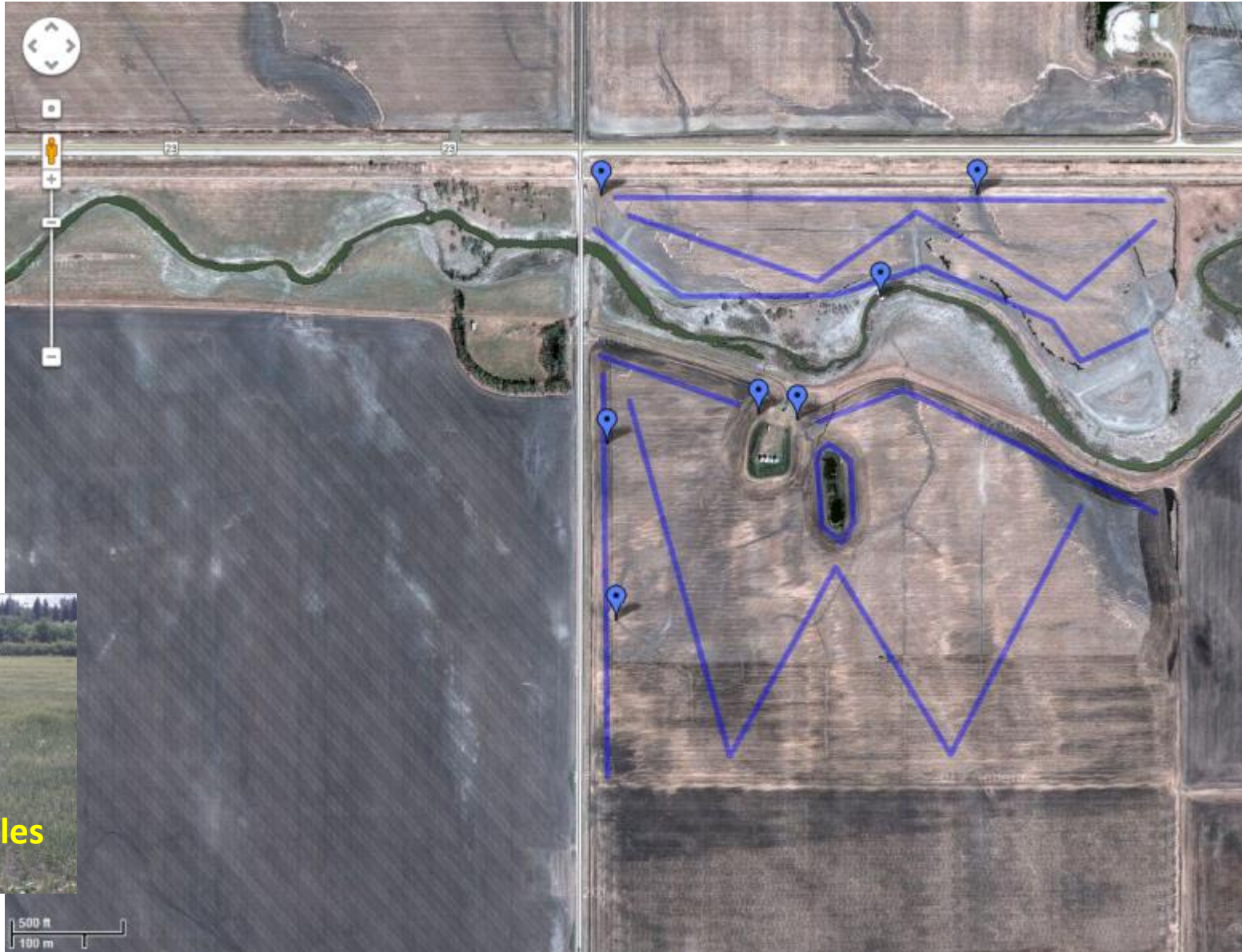
2015



35 fields sampled
Oct/Nov 2012

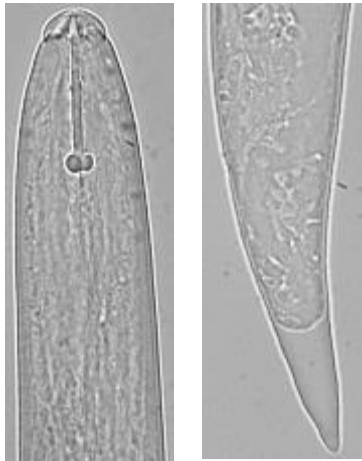
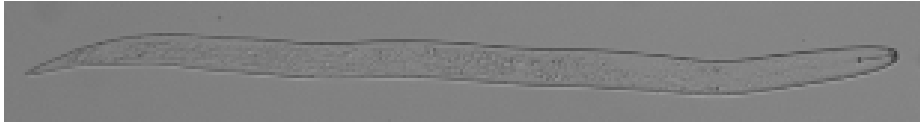
13 fields sampled
July/Aug 2013

Collecting Soil Samples

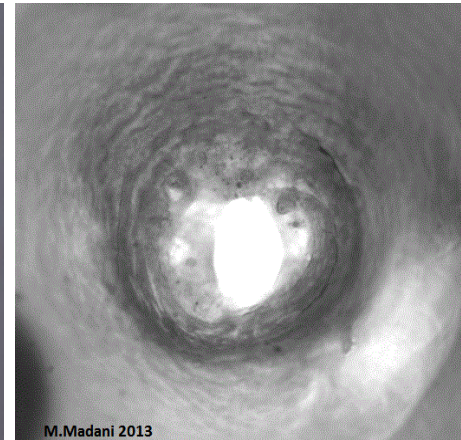
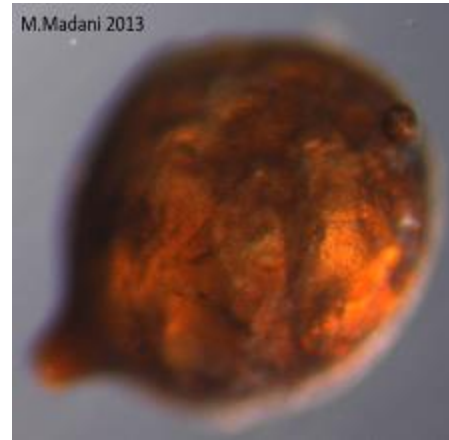


1 foot samples

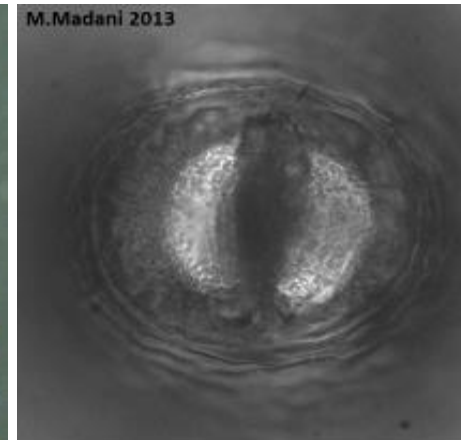
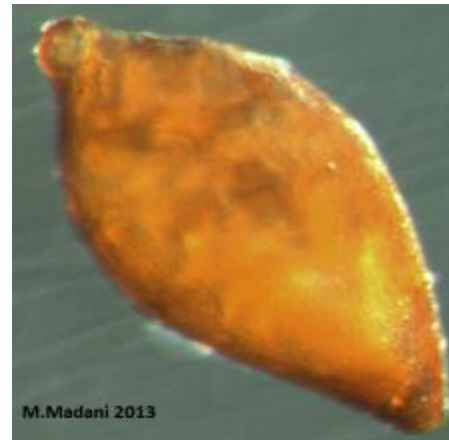
Juveniles and Cysts



Circumfenestrate



Bifenestrate



Results 2012/13

- 37 composite samples from 22 fields had cysts
- Total of 60 cysts recovered
- 26 cysts were not damaged
- 23 cysts had circumfenestrate vulval cone structures – *Cactodera*, *Punctodera*, *Betulodera*
- 3 cysts were bifenestrate – *Heterodera*

Results

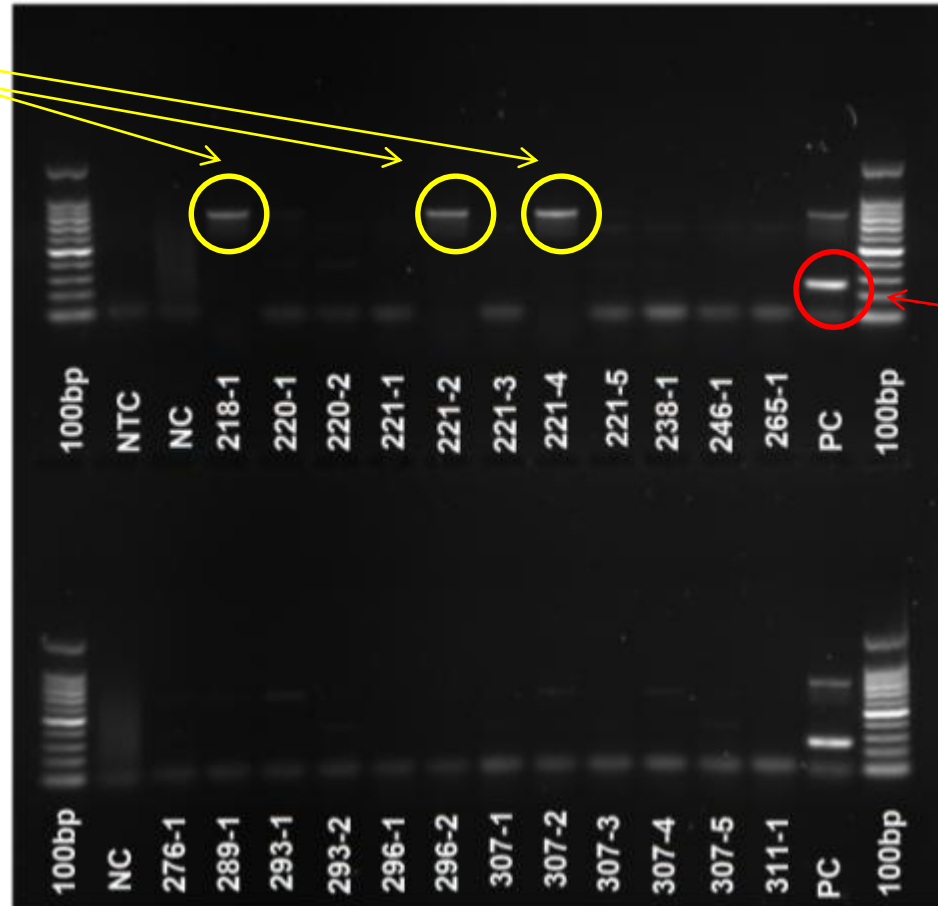
- 15 circumfenestrate cysts had eggs or juveniles
- 1 bifenestrate cyst had eggs and juveniles
- ITS sequencing, species-specific PCR
- Circumfenestrate cysts ITS matched *Cactodera*
- Bifenestrate cyst ambiguous – *Heterodera* by morphology, SCN by 2/3 primer sets, *Cactodera* by ITS sequencing

Results 2014/15

- 28 fields sampled
- 205 composite samples analyzed
- 32 samples had cysts, but only a few each
- Most cysts were round and not lemon shaped
- Cone top patterns circumfenestrata
- 6 cysts yielded DNA for analysis, failed to be SCN

Species Specific PCR for SCN in 2015

3 cysts yielding quality DNA but not positive for SCN



Positive control SCN yielding good DNA and giving band for SCN

SCN and Manitoba

- Cysts with quality for morphological and molecular analysis belonged to genera *Punctodera* and *Cactodera*
- Likely not of economic concern but on weeds
- But!!! Most of Manitoba's +1,200,000 acres of soybean production, thus over next 5-10 years likely establishment of SCN in Manitoba

Survey and Development of Molecular Soil Diagnostics for Soybean Cyst Nematode in Manitoba
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²Agriculture and Agri-Food Canada, Marston, ON, K0E 1G0, Canada
³Ontario Ministry of Agriculture, Food, and Rural Affairs, Midland, ON, N0P 2G0, Canada

SUMMARY
 The soybean cyst nematode (SCN; *G. fabae* and *G. glycines*) is the major disease agent of soybean in Canada and worldwide. Each detection of SCN in a field is considered to be critical to yield loss. With the support provided by the Soil Science Laboratory, we published diagnostic PCR primers and three new sets of microsatellite DNA markers were developed for identification of SCNs from 30 positive fields in Ontario and one population from the U.S. The published SCNs and newly developed Co-2 primers were able to identify SCNs from Ontario and U.S. Then, a total of 70 fields with history of having grown soybean or corn within a range were sampled from 2013, 2014, and 2015 in Manitoba. This is a first study that reported from about 1% of samples. Most of the samples were identified and empty, but 14 were suitable for genotyping. Molecular and microsatellite DNA analysis for SCNs analysis. Based on molecular analysis these samples were positive for SCNs and they belonged to the genus *Cactodera*, and possibly *Punctodera*. A new survey is underway in summer 2017 for the presence of SCNs in soybean fields in Manitoba. Further, we continue to develop the PCR assay (10) and new markers for identification of SCNs with additional appropriate additional egg counts from soil.

OBJECTIVE
 To develop PCR diagnostic methods and survey soybean fields in Manitoba for the presence of SCNs.

MATERIALS AND METHODS
PCR Primer Screening
 To verify the molecular identification of populations of the soybean cyst nematode, a total of 30 populations of SCNs from southern Ontario were used.
 • Data of PCR primers to the glycine from the literature (17), SCAR 1 and three were newly designed from M-ORF4 gene sequences of *G. fabae* (Co-2, Co-3, Co-4).
 • Diagnostic diagnostic primers, PCR and real time PCR for the gene *gD-1* for *G. fabae* in single and duplex PCR were developed.

SCN Survey in Manitoba
 • A total of 70 fields with history of having grown soybean or corn within a range were sampled (Fig. 1).
 • Each field was sampled into three three to six risk areas for SCN population such as soybean rows, depressions and headlands.
 • A soil sampling set, a modified French's chamber based on the 1000g soil and soil volume was used to extract nematode cysts from samples.
 • Gen identification was first performed based on morphology and microscopy analysis.
 • Cyst were then followed up with molecular analysis by PCR sequencing, three SCNs species-specific PCR approaches (14) et al. 1995, Roberts et al. 2001, Madani et al. 2014, 2015) to the case, by the DNA gene sequencing.

RESULTS AND DISCUSSION
PCR Primer Screening
 • The laboratory investigated the M-ORF4 gene from *G. fabae*, Co-2, Co-3, and Co-4 as well as previously developed Co-1 and SCAR based primers were for their ability to identify SCNs population from Ontario (Table 1).
 • The published SCAR and newly developed Co-2 primers were able to identify SCNs from Ontario and U.S. without cross-reactivity, by other soil nematode species. The Co-2 primer could identify SCNs but provided false positives (some markers) in *G. fabae*.
SCN Survey in Manitoba
 • The samples collected from a few fields were, with the support being sent and 1000g.
 • Further molecular were used and soil based, the later a possible indicator of SCNs.
 • Further, soil cysts were identified from 14 fields in some type, the later possible indicator of SCNs.
 • Just 14 were suitable for genotyping observation and six yielded DNA suitable for PCR analysis and these were all positive for SCNs by species-specific microsatellite PCR analysis.
 • They belonged to the genus *Cactodera*, and possibly *Punctodera* (Table 2). These are not associated but were a part of soybean or soybean plots of other crop plants in Manitoba.
 • With the survey conducted by the Soil Science Laboratory a total of 70 commercial soybean fields in Manitoba have been sampled and are positive for the presence of SCNs.

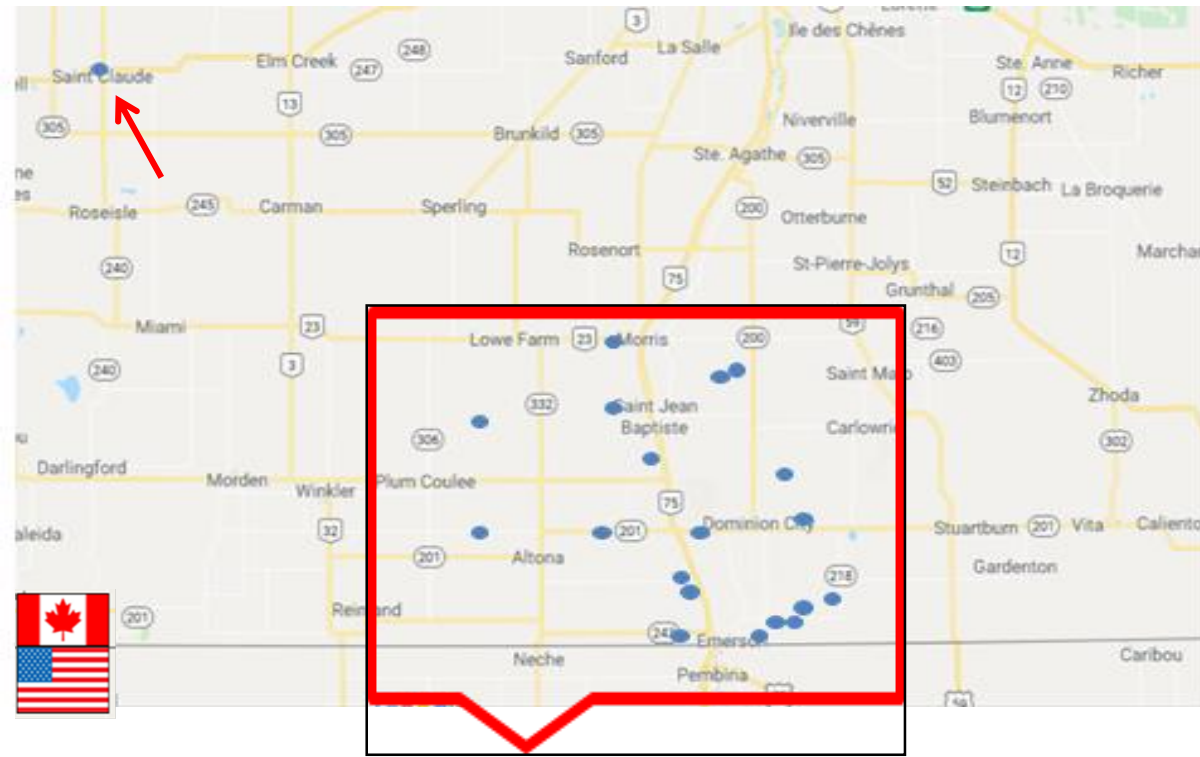
Conclusion
 • Analysis of soil using diagnostic primers of SCNs identification with species-specific primers showed an accurate and efficient technique, that can strongly support any survey for detection of SCNs in fields in the northern latitudes in Canada.
 • Most fields in Manitoba have a history of soybean or corn crops in the past. It may still be a first time survey of SCNs population in southern Ontario because SCNs is now the most likely and widespread nematode with Manitoba. It is recommended survey to be conducted every two to three years.

Field No.	Year	Soil Type	SCN Genus	SCN Species	Field Size (ha)	Yield (t/ha)
1	2013	Soil 1	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
2	2013	Soil 2	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
3	2013	Soil 3	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
4	2013	Soil 4	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
5	2013	Soil 5	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
6	2013	Soil 6	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
7	2013	Soil 7	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
8	2013	Soil 8	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
9	2013	Soil 9	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
10	2013	Soil 10	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
11	2013	Soil 11	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
12	2013	Soil 12	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
13	2013	Soil 13	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
14	2013	Soil 14	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
15	2013	Soil 15	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
16	2013	Soil 16	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
17	2013	Soil 17	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
18	2013	Soil 18	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
19	2013	Soil 19	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
20	2013	Soil 20	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
21	2013	Soil 21	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
22	2013	Soil 22	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
23	2013	Soil 23	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
24	2013	Soil 24	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
25	2013	Soil 25	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
26	2013	Soil 26	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
27	2013	Soil 27	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
28	2013	Soil 28	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
29	2013	Soil 29	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
30	2013	Soil 30	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
31	2014	Soil 31	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
32	2014	Soil 32	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
33	2014	Soil 33	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
34	2014	Soil 34	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
35	2014	Soil 35	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
36	2014	Soil 36	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
37	2014	Soil 37	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
38	2014	Soil 38	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
39	2014	Soil 39	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
40	2014	Soil 40	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
41	2014	Soil 41	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
42	2014	Soil 42	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
43	2014	Soil 43	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
44	2014	Soil 44	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
45	2014	Soil 45	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
46	2014	Soil 46	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
47	2014	Soil 47	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
48	2014	Soil 48	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
49	2014	Soil 49	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
50	2014	Soil 50	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
51	2014	Soil 51	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
52	2014	Soil 52	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
53	2014	Soil 53	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
54	2014	Soil 54	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
55	2014	Soil 55	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
56	2014	Soil 56	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
57	2014	Soil 57	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
58	2014	Soil 58	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
59	2014	Soil 59	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
60	2014	Soil 60	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
61	2014	Soil 61	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
62	2014	Soil 62	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
63	2014	Soil 63	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
64	2014	Soil 64	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
65	2014	Soil 65	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
66	2014	Soil 66	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
67	2014	Soil 67	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
68	2014	Soil 68	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
69	2014	Soil 69	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5
70	2014	Soil 70	<i>Cactodera</i>	<i>Cactodera</i>	1.5	2.5

Funding

Manitoba 2017/2018 SCN Survey

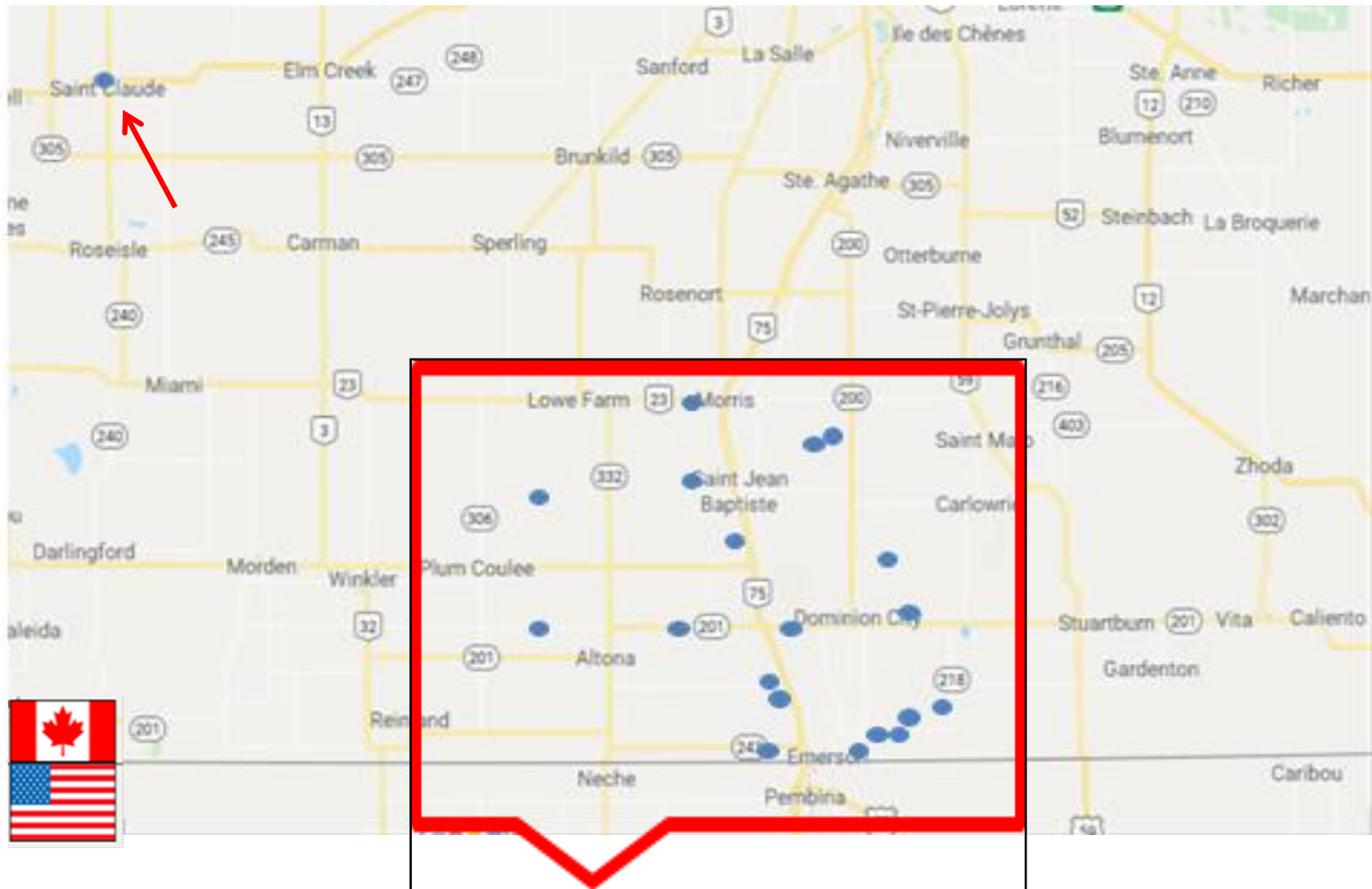
- Fall 2017, 29 soybean fields soil sampled
- Samples have been extracted and being analyzed now for cysts



PhD student: Nazanin Ghavami

Soil Sampling

- 29 commercial soybean fields along the Manitoba/U.S. border with history of soybean and edible bean cultivation and one field sampled by CFIA as part of nematode survey of seed potato farms which claimed there were lemon-shaped cyst in field, were sampled



Soil Preparation

- A total of 90 composite soil samples were obtained for about 3 samples for analysis per field
- Soil from each area was air-dried and 2.2 Kg soil kept in fridge for extracting cyst using a soil washing unit, a modified Fenwick elutriator based on the USDA soil cyst extractor



Cyst Extractor

- Modified Fenwick elutriator based on the USDA soil cyst extractor
- We got an efficiency of 70 % in recovery of cysts from reference samples

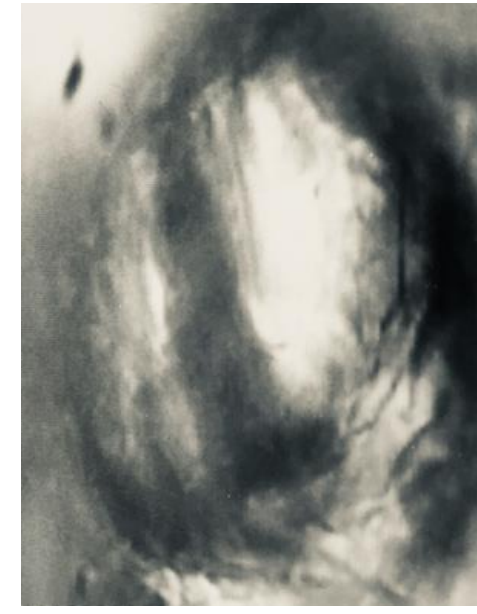
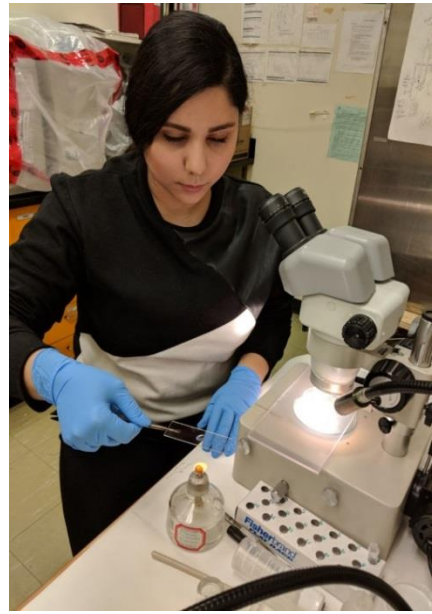
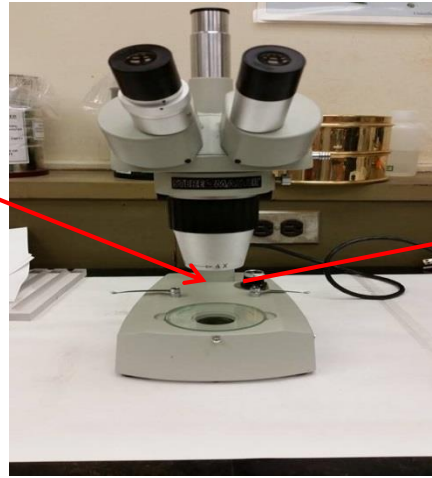
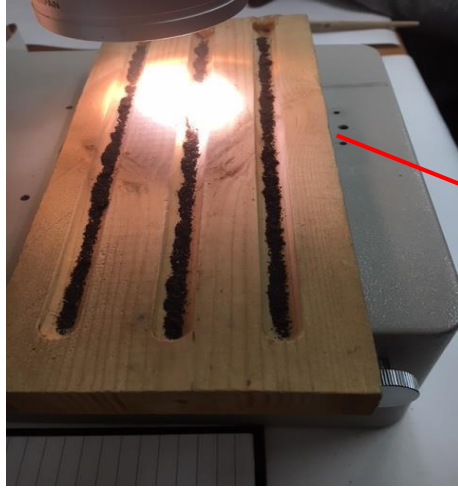


Ethanol Flotation

- Collected debris from cyst extractor was dried and then floated in ethanol and trapped onto filter paper
- The ethanol flotation step had an efficiency of 95%

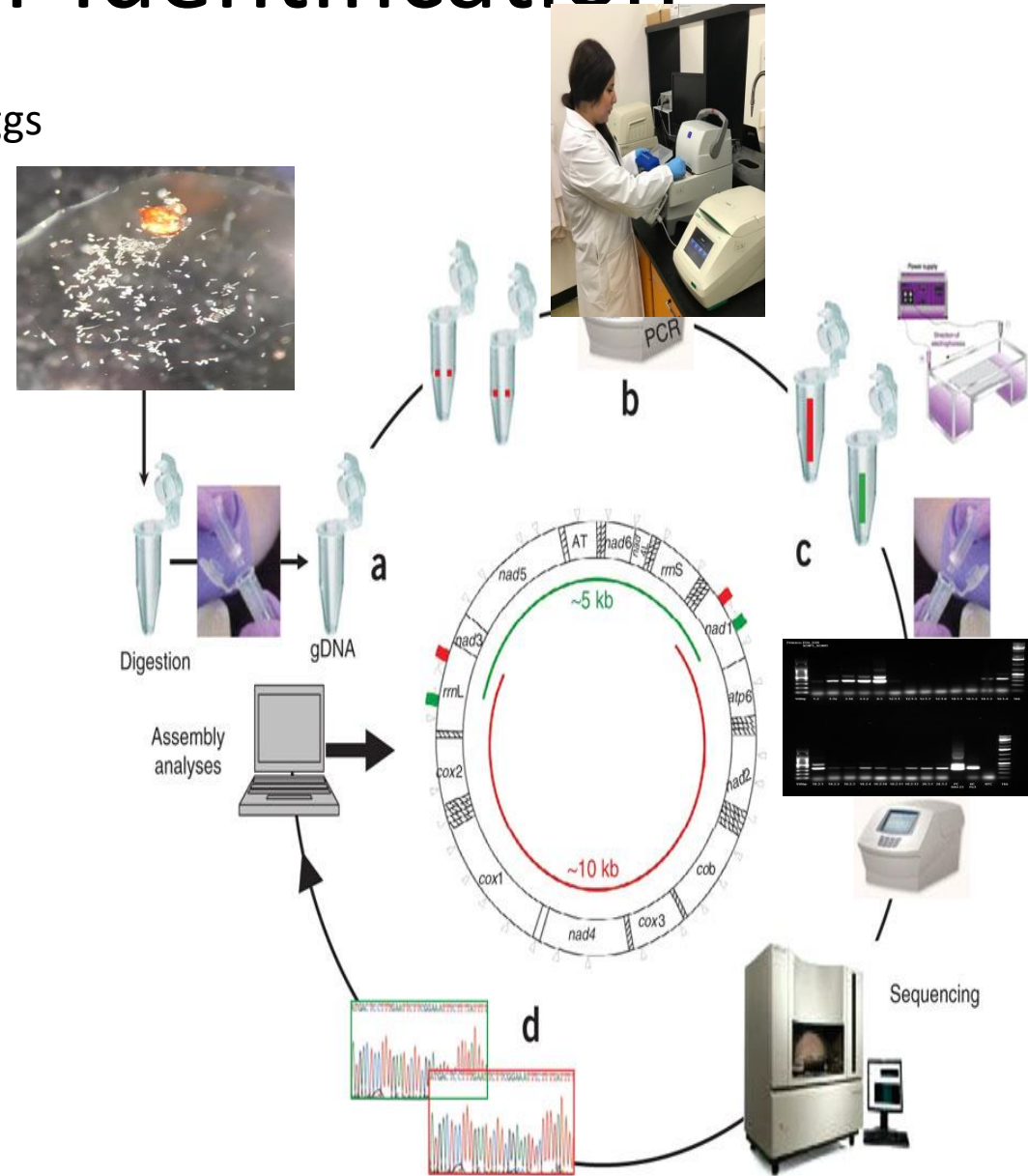


Cyst Identification Based on Morphology



Molecular Identification

- ✓ DNA extraction from juveniles and eggs suspension by Crushing Method with glass Beads
- ✓ Quantifying DNA extracted Using Nanodrop Spectrophotometer
- ✓ DNA Amplification Using Polymerase Chain Reaction using species specific primers (Conventional)
- ✓ Visualizing DNA
- ✓ DNA Purification
- ✓ Sequencing based on the NCBI database.



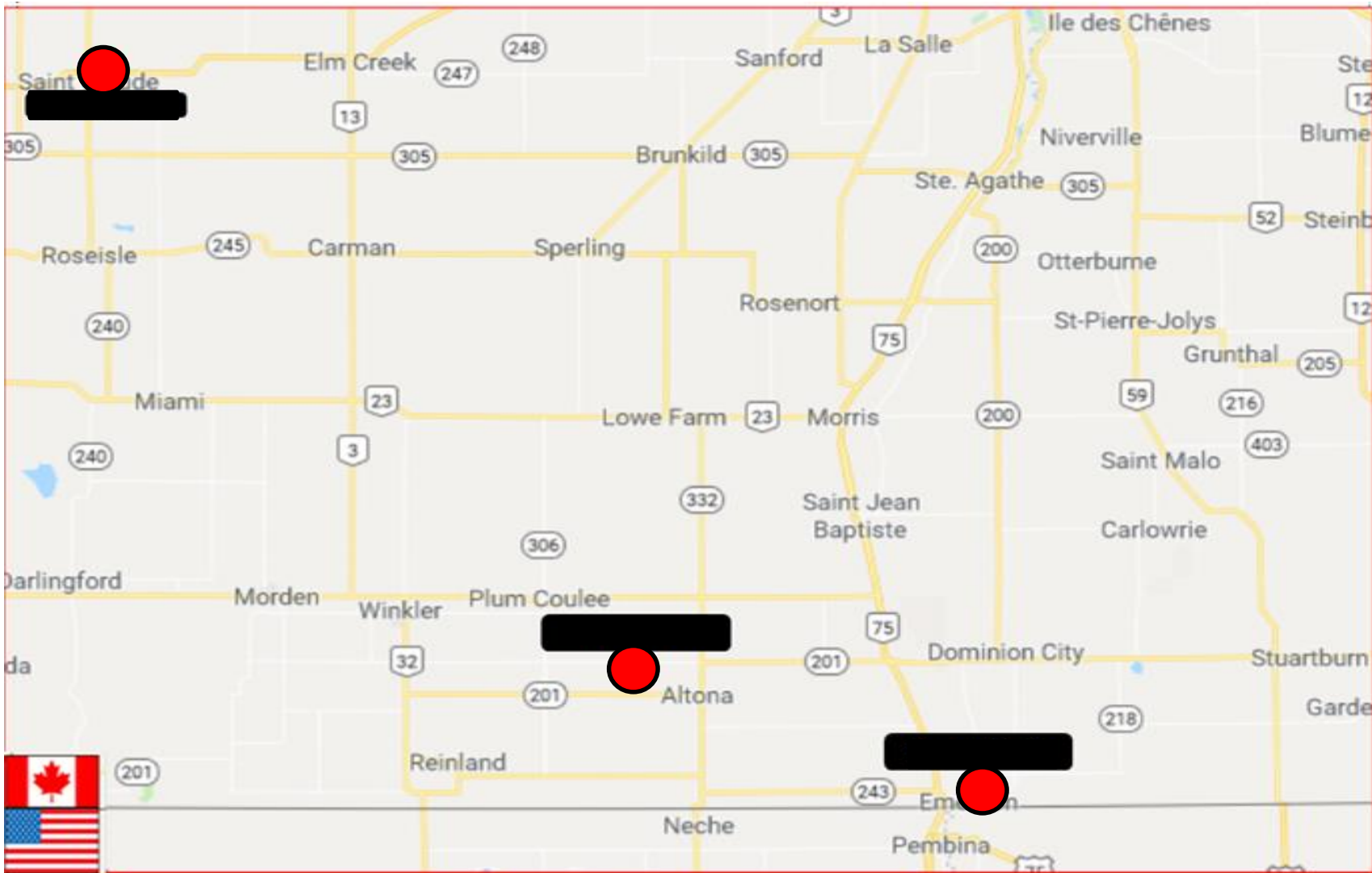
Preliminary Results 2018

- ✓ 30 commercial soybean fields were sampled
- ✓ A total of 90 composite soil samples were obtained
- ✓ Overall, 17 of the composite samples from 12 fields had nematode cysts
- ✓ One to a few cysts were recovered from each of these 17 composite samples.
- ✓ In total, 42 cysts were recovered and 30 of the cysts from seven fields were brown and lemon-shaped as expected of SCN

Preliminary Results

- ✓ 10 lemon-shaped cysts and bifenestrate were obtained from three fields
- ✓ PCR of 14 lemon-shaped cysts the 252 bp (CoxIIIF1- CoxIIIR1) and 477 bp (SCNFI-SCNRI) genes regions were SCN
- ✓ Based on the morphological characters and PCR assays conducted so far, we speculate that three fields had 2, 14 and 4 SCN cysts / 5 lbs soil
- ✓ DNA sequencing of multiple regions is being done

Suspected Fields



On-going

- ✓ DNA sequencing of multiple regions for the SCN cysts is now being done
- ✓ The positive 3 fields will be re-sampled in spring 2019
- ✓ Soil from the 3 fields will be planted to soybean in the greenhouse for development of cysts on roots

SCN Emerging Issue for Dry Beans

plant disease

Editor-in-Chief: Alison E. Robertson
Published by The American Phytopathological Society

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<https://doi.org/10.1094/PDIS-09-16-1257-PDN>

DISEASE NOTES

First Report of the Soybean Cyst Nematode *Heterodera glycines* Infecting Dry Bean (*Phaseolus vulgaris* L.) in a Commercial Field in Minnesota

G. P. Yan, A. Plaisance, I. Chowdhury, R. Baidoo, A. Upadhaya, J. Pasche, S. Markell, and B. Nelson, North Dakota State University, Department of Plant Pathology, Fargo 58108-6050; and S. Chen, University of Minnesota, Department of Plant Pathology, St. Paul 55108.

- 2016 stunted patches in dark-red kidney bean field
- Roots infested with SCN females
- Soybean last grown in 2010



Sudden Death Syndrome

- First reported 1971 in Arkansas
- Disease complex of SCN with *Fusarium virguliforme*
- Occurs after first flowering
- In Minnesota and South Dakota

Scout for SCN

- Fields more than 3 years of soybean
- Get out of the truck and walk
- 30–45 days after emergence, gently lift roots with spade, dunk in bucket of water, look for females using a hand lens
- Collect soil samples and SCN test (Agvise or Soil Ecology Lab U Manitoba)





Dig It



Gently obtain roots

How to Check Roots

Look for small white lemon-shaped cysts



Nodules

SCN Females

http://www.nwroc.umn.edu/Cropping_Issues/2010/July_20/SoybeanCystNematodeScouting/index.htm

Soil Sampling for SCN

- Every third soybean crop year
- Sampling in fall following crop harvest and before soil freezes
- Following soybean harvest, sample directly within harvested rows before tillage
- Following other crops, sample after fall tillage, if you till
- Sample top eight inches
- Use a soil push probe or small diameter soil auger
- Take 15 cores for a sample from every 20 acres
- Sample specifically for trouble soybean area

More on Soil Sampling

- Put cores into a bucket
- Mix the cores and place into a ziplock freezer bag
- Label both sides of bag with marker for name, legal, date, field sample number
- Keep bag out of sun
- Place in refrigerator
- Drop off samples to Agvise as you would do for soil fertility testing
- SCN is not a regulated pest, so call Mario if samples come back positive

Exam Study Points

- SCN can silently rob yield
- SCN is confused with other crop problems
- SCN is marching in our direction and is inevitable
- Can delay and lessen damage by
 - Clean machinery, tires and footwear
 - Know your field risk areas
 - Dig plants to scout fields
 - Weed suppression
 - Avoid tight rotations
 - Don't rotate with edible beans and pea
 - SCN soil test
 - Use resistant varieties
 - Bird suppression
- Scout roots for cysts, and soil sample every 3rd soy crop
- You need to know everything for the exam!

Acknowledgements

Numerous colleagues for pictures

Partners: Dennis Lange, Kristen Podolsky, Holly Derksen, growers, Tom Welacky (AAFC Harrow), Albert Tenuta (OMAFRA)

My Lab: Dr Mehrdad Madani, Nazanin Ghavami, Lanny Gardner, Jehn Francisco, Fernanda Pereira, William Shaw, Patrick Finnsson

Funders: MPSG, ARDI, WGRF, MRAC, Pulse Science Cluster II, Canada Research Chair Program in Applied Soil Ecology



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Three Things Are Forever

- Diamonds
- Taxes
- SCN

