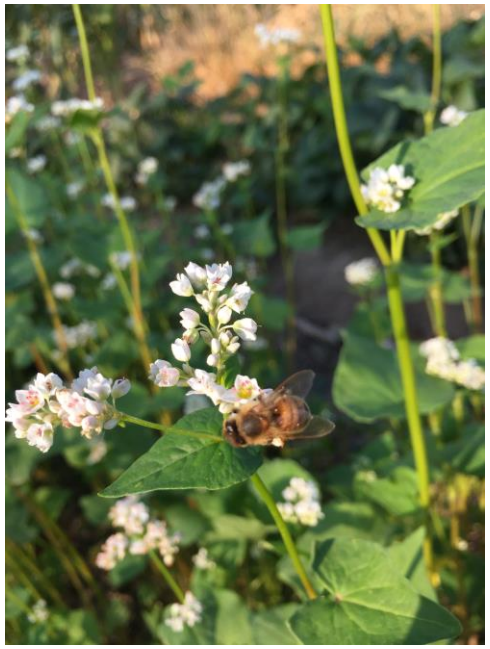
Cover Crops and Bio Fumigation for Nematode Reduction



December 13, 2017

Kent Whittig

Topics

- Definitions
- Understanding Nematode Host
- European Situation
- Nematode-Resistant Brassica Breeding Programs
- Bio-Fumigation
- Locally Grown & Tested
- Why Cover Crops?
- Cover Crop Recap
- Questions

Definitions

- **Trap Crop-**
  - Stimulation of cyst eggs and larvae present in the soil to develop without being able to complete their life cycle in what it perceived to be a host plant- but isn’t.

Definitions

- **Nematode-Resistant Crop-**
  - Crops either bred or naturally occurring that do not provide enough nutrition to nematodes to continue their reproduction cycle.
  - This has no negative impact on plant health (or the benefits to your field)

Definitions

- **Non-Host**
  - A plant/weed that does not increase nor decrease nematode populations

Definitions

- **Bio-fumigation-**
  - Occurs during the decomposition of the bio-mass following incorporation of brassicas into the soil. When it is time to terminate or chop your cover crop, it is best to flail chop then disk or plow the bio-mass into the ground. As the plant breaks down, it releases an organic formulation of isothiocyanate.

Southern ID 2017

Understanding Nematode Host

- **Beet Cyst Nematode**
  - Brassicas, including mustard and radish can be host plants for BCN
  - A **Host** normally multiplies 3 to 5 times the amount of BCN per life cycle of nematode

What does this mean?

Current Level	Plant Species	Projected Levels	Host/Resistant/Neutral
1,000 BCN	Daikon Radish	3,000-5,000 BCN	Host Plant
1,000 BCN	Radish/Mustard with Med Res	200 BCN	Resistant in optimum conditions (H20, temp, high density)
1,000 BCN	Radish with High Res	100 BCN	Highly Resistant
1,000 BCN	Neutral plants (Phacelia)	1,000 BCN	Neutral, will see natural 15-20% decline of older nematodes

NEMATODE-RESISTANT COVER CROPS

Understanding Nematode Host

- **Columbia Root Knot Nematode**
  - In general, radish is a poor host to CRKN
    - Average reduction range ~80%
    - European standards don't consider something a good resistance until…
      - 98 to 99.5% reduction
      - CRKN is quarantined in Europe
  - Mustard is considered a poor host
    - 70-80% resistance typically

European Situation

- **Soil Fumigants**
  - In many European countries, the use of soil fumigants are not allowed or highly regulated
  - Special restrictions
  - Town Hall Meetings

Nematode-Resistant Brassica Breeding Programs

- Europe
  - Six active breeders
  - Two universities
- US
  - None

Locally Grown & Tested

- 2016
  - Planted first US p mustard and one saia oat
- 2017
  - Harvest and clea
- 2018
  - Scheduled produ
- Working with uni
  - UI, OSU, NDSU, M

Testing

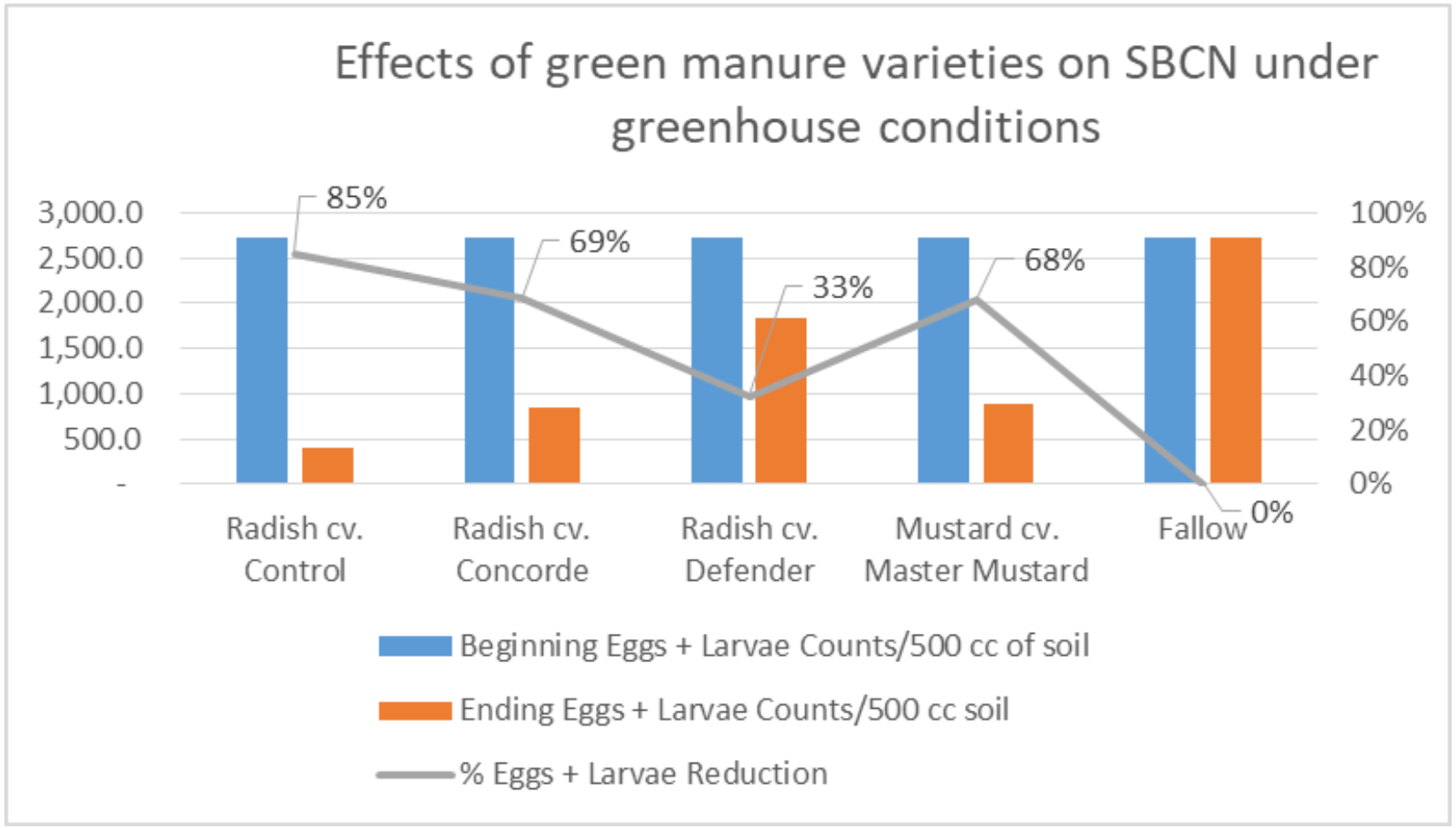
- Field Test (SBCN)

Photo courtesy of NDSU

Field Evaluations					
Date	**7/28/2017**	**Nematode Count**	**10/20/2017**	**Nematode Count**	Decrease
Nematode Type					
Root Lesion		220		60	72.7%
Stunt		150		10	93.3%
Pin		30		10	66.7%
Cyst					
Viable		87		0	100.0%
Empty		172		0	100.0%
Larvae		270		50	81.5%
Eggs		10		30	
		Comments: Recommendation was to fumigate field by Dr. Saad Hafez UI		**Comments**: Appears to be no major nematode issue	

Testing

- University Trial (SBCN)



Testing

- University Trial (CRKN)

Effect of green manure varieties on CRKN populations under greenhouse conditions, U of I 2016

Green Manure Variety	Beginning sample counts J2/500cc	Ending sample counts J2/500 cc	% Decrease
Mustard cv. **Master Mustard**	650.0	110.00	83.1%
Radishadish cv. **Control**	650.0	90.00	86.2%
Radish cv. **Defender**	650.0	88.57	86.4%
Radish cv. **Carwoodi**	650.0	151.43	76.7%
Fallow	650.0	274.29	57.8%

University of Idaho

NEMATODE-RESISTANT COVER CROPS

Asting

- University Trial(CRKN)

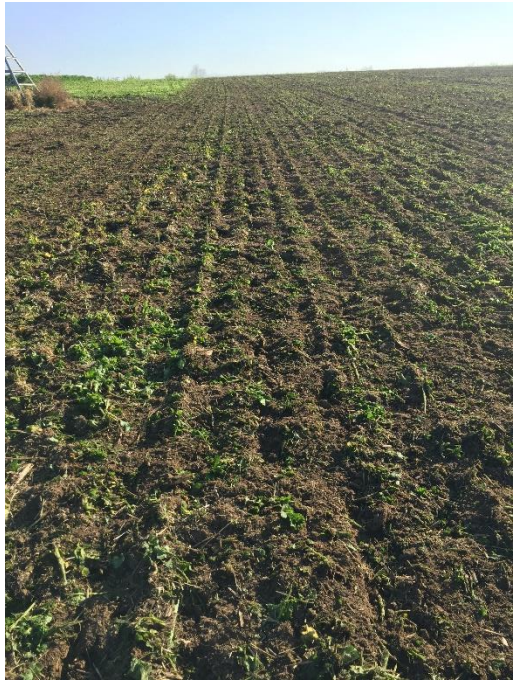
Photo courtesy of OSU

Allied Seed Host Status for Columbia Root-knot Nematode Summary

Plant	Reproductive Factor	Host Status
Stephens Wheat	66.76	Excellent Host
Pacific Gold Mustard	6.27	Good Host
Master White Mustard	5.95	Good Host
Terra Nova Radish	0.01	Non Host
Concorde Radish	1.83	Good Host
Control Radish	0.12	Poor Host

NEMATODE-RESISTANT COVER CROPS

Why Cover Crops?



REAP THE BENEFITS

- Nematode control
- Bio-fumigation
- Nutrient recycling
- Weed suppression
- Compaction reduction
- Increased organic matter
- Erosion control
- Improved water infiltration & penetration
- Pollinator attractant

NEMATODE-RESISTANT COVER CROPS

Cover Crop Recap

Questions?

Thank you!