Summer cover crops for fall vegetable production

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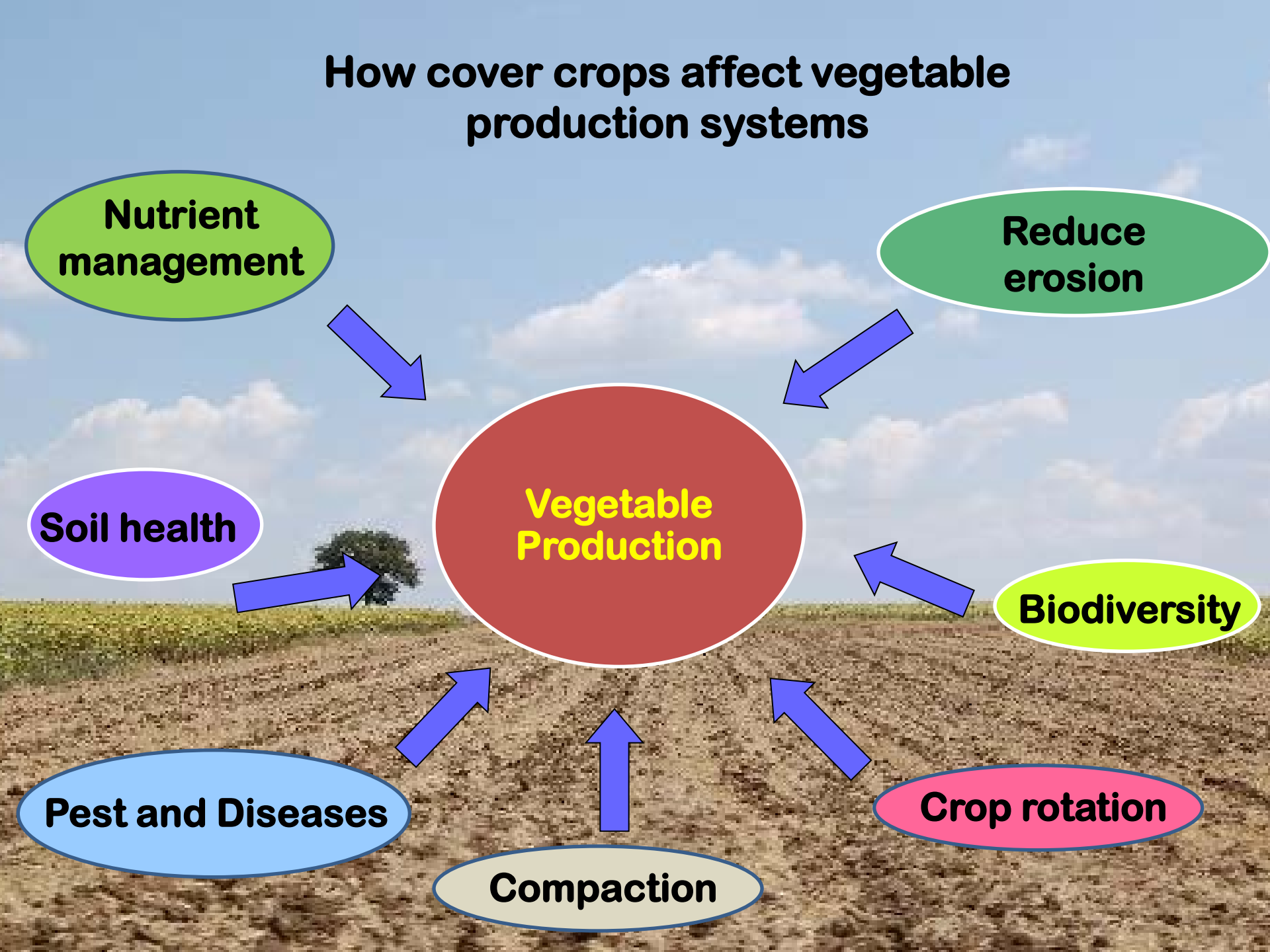

How cover crops affect vegetable production systems
Nutrient management
Reduce erosion
Soil health
Vegetable Production
Biodiversity
Pest and Diseases
Compaction
Crop rotation

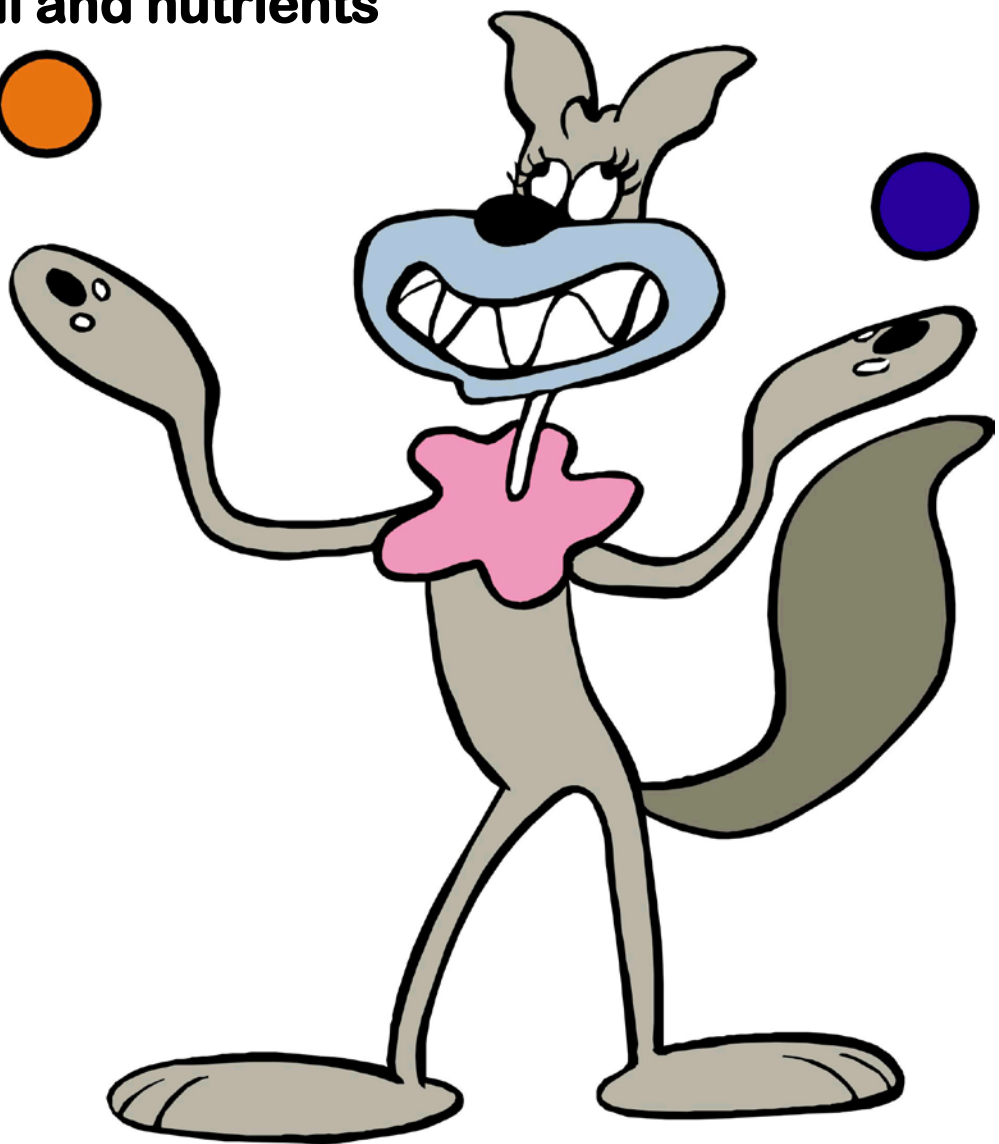
Marketing

Irrigation

Equipment

Soil and nutrients

Pest and Diseases



Horticulturist in action

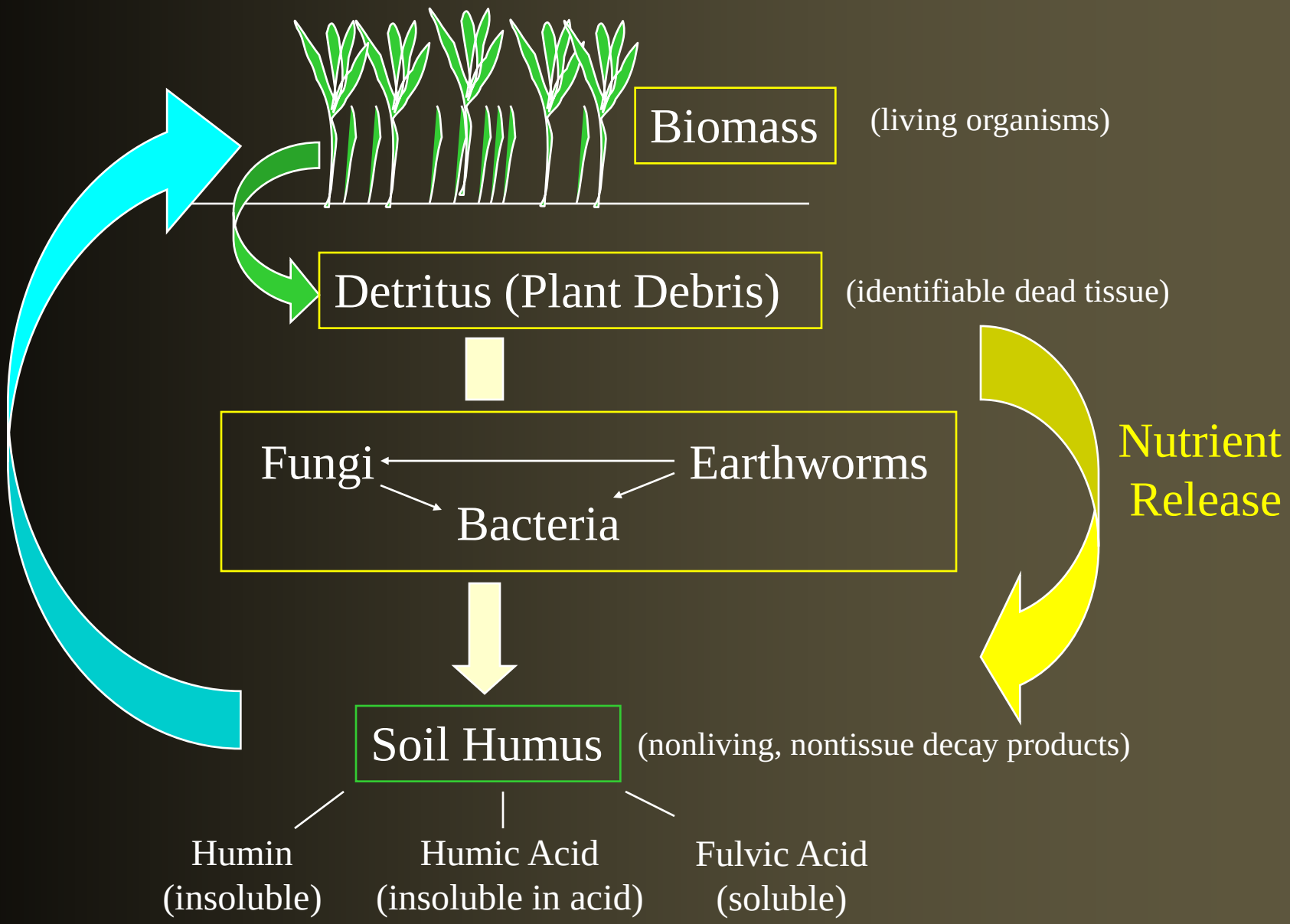
What do you want from a cover crop

- Soil organic matter
- Weed suppression
- Improve soil health
  - Microbial biomass
  - Microbial diversity
- Nitrogen addition
- Reduce soil erosion

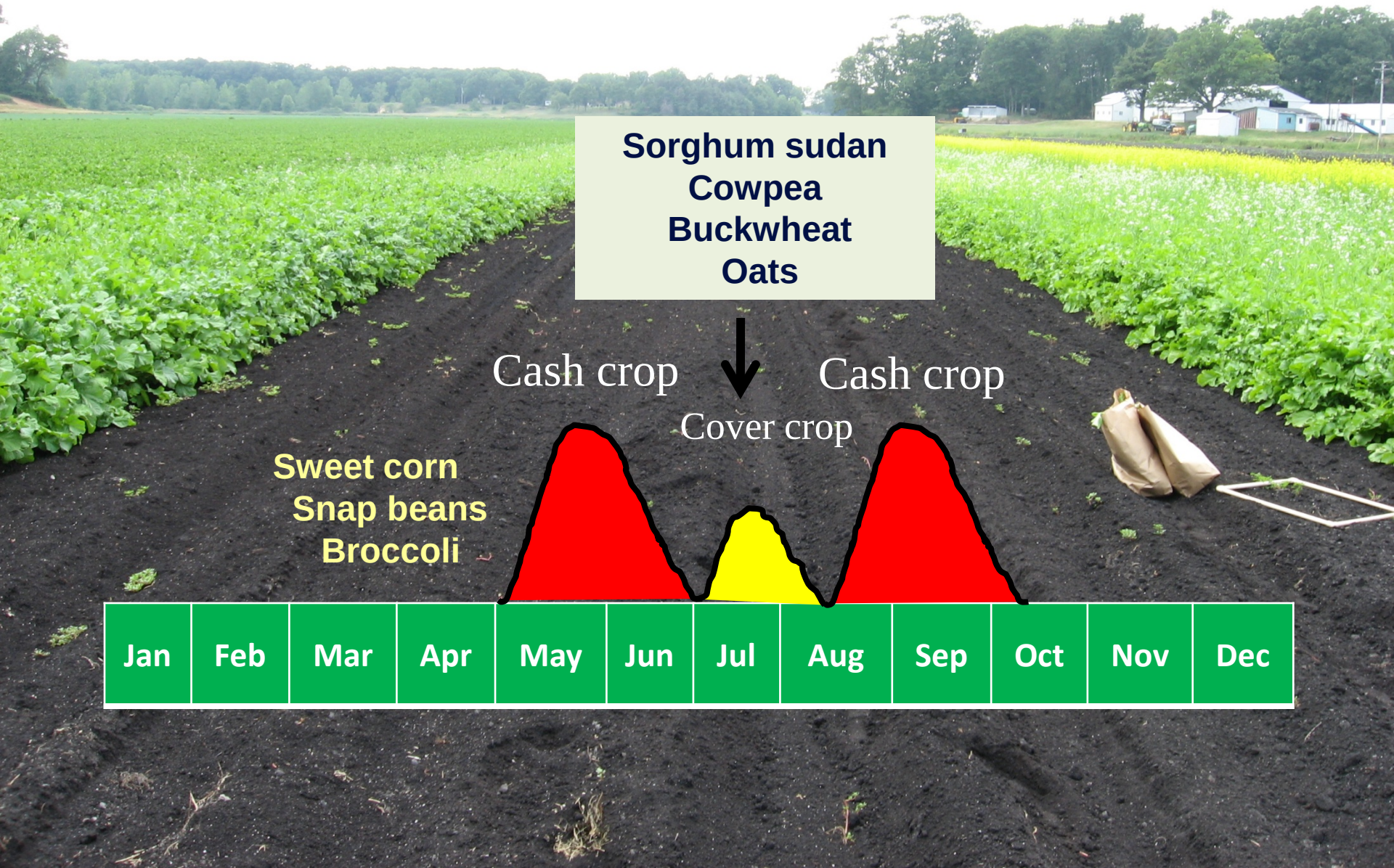
Cover crop benefits

- Add organic matter
- Reduce soil erosion
- Supply N to subsequent crops if legume
- Reduce soil compaction
- Improve nutrient recycling (catch crops)

Organic Matter



Cover cropping window: summer



Experimental Design

- **Split plot randomized complete block**
- **Whole plot= Cover crop**
- **Sub plot= Plastic mulch**

- **Cover crop**
  buckwheat, cowpea, sorghum sudangrass, or no-cover crop
- **Plastic mulch**
  black, blue, red, or white plastic mulch

Cover crop seeding
June 20, 2012; July 10, 2013

Sorghum sudangrass

- Summer cover crop
- Seed germination at 55F
- Biomass= 6-8 ton/A
- Seeding: 35-50 lb/A
- Rapid growth
- Great soil builder (biomass)
- Allelopathic properties

Seeded:
June 20, 2012
Harvested:
August 21, 2012


Sorghum-sudangrass

Buckwheat (*Fagopyrum esculentum*)

- Quick growth
- Seed germination at 50F
- Biomass= 2-3 ton/A
- Seeding: 35-45 lb/A
- Plant early fall or between crops in the summer
- Attracts beneficials

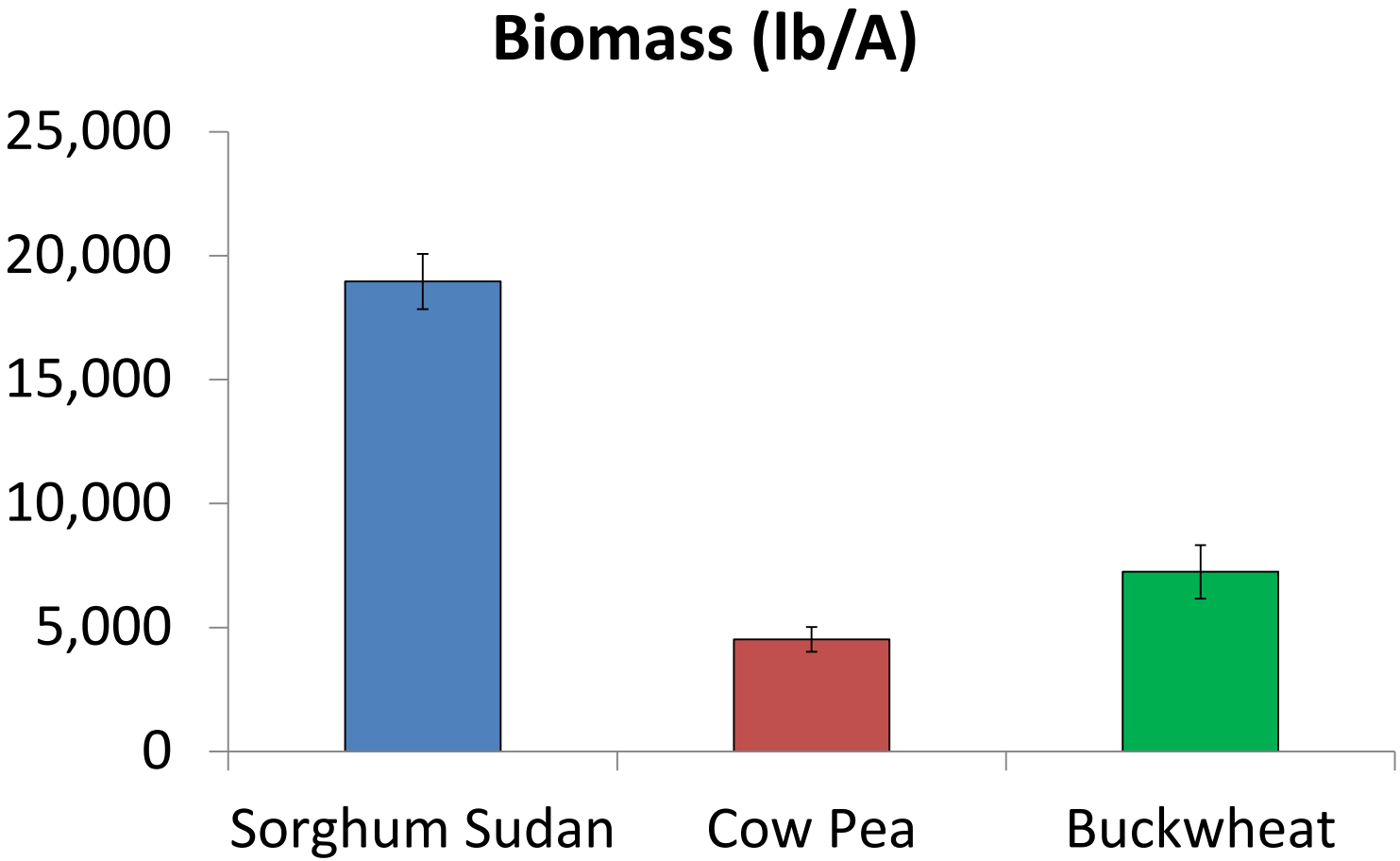

50-90lb/A
Buckwheat

Cow pea (80-90 lbs/A)


Control plot

Lettuce ‘Nancy’

What a range !


Biomass (lb/A)
25,000
20,000
15,000
10,000
5,000
0
Sorghum Sudan
Cow Pea
Buckwheat

Light reflectance (PAR spectrum)

micro moles per meter square per second

Plastic mulch	Mid October	Early November
Black	89	8
Blue	123	12
Red	166	16
White	555	29

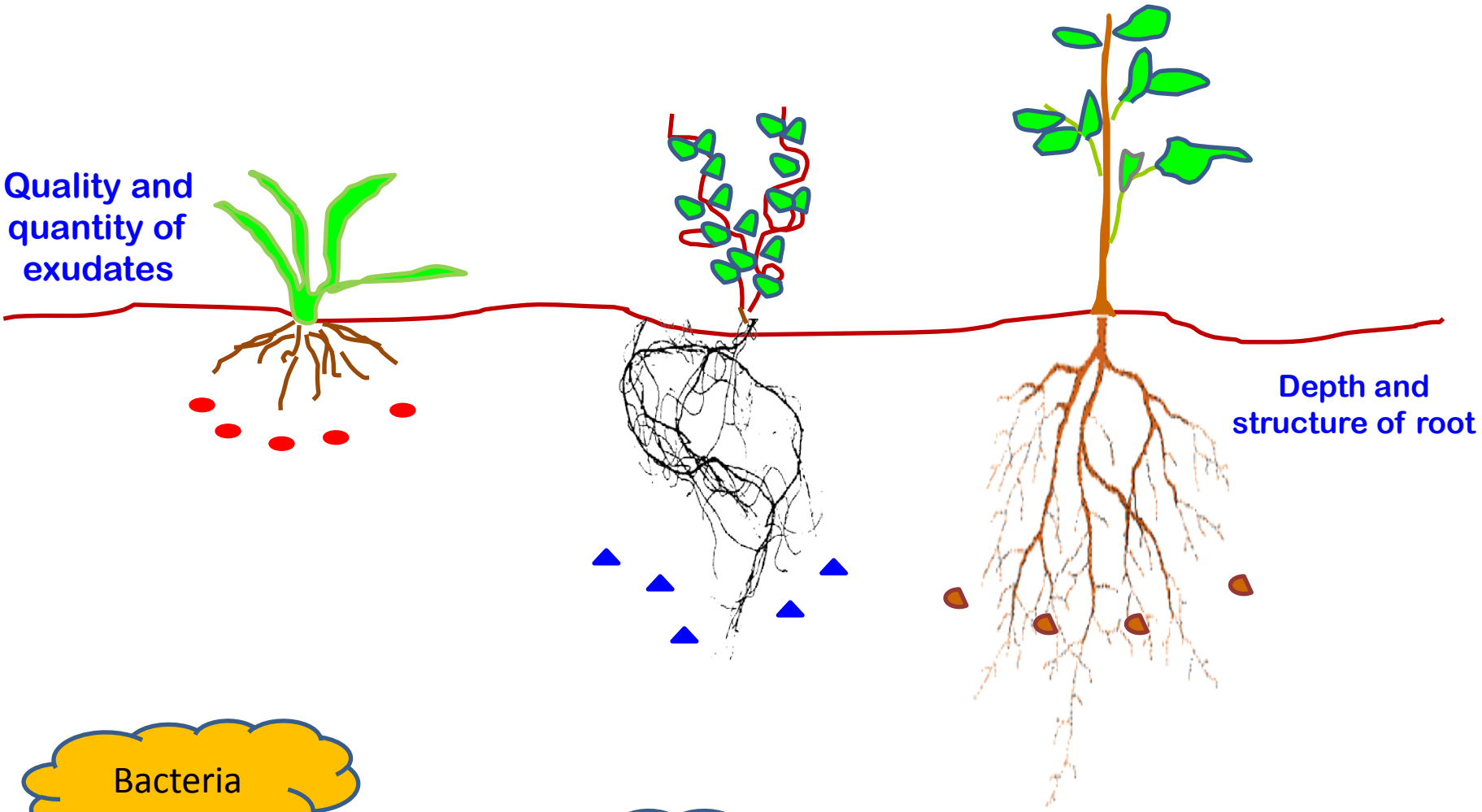
Soil Temperature (°F)

Plastic mulch	Averaged across the growing season
Black	52
Blue	51
Red	51
White	50

Lettuce yield

Treatment	Marketable number	Marketable weight (kg)
Control	13 b	1.0 b
Cowpea	18 a	1.6 a
Buckwheat	5 c	0.3 c
Sorghum Sudan	0 d	0 d

Crop diversity can influence soil biology



Control

Sorghum sudangrass

Cover crop effect on leaf characteristics

Treatment	SPAD	Leaf number	Leaf area (sq. cm)
Buckwheat	27.7 a	19 b	891 c
Control	27.1 a	21 a	1100 b
Cowpea	27.7 a	22 a	1207 a
Sorghum Sudan	23.7 b	15 c	435 d

Plastic mulch effect on leaf characteristics

Treatment	SPAD	Leaf number	Leaf area (sq. cm)
Black	26.9	19 ab	879 b
Blue	26.4	17 c	862 c
Red	26.6	20 a	1056 a
White	26.4	18 b	838 d

Oats (*Avena sativa*)

- Quick growth
- Seed germination at 38F
- Biomass= 1-2 ton/A
- Seeding: 35-45 lb/A
- Plant early fall or between crops in the summer


Oats

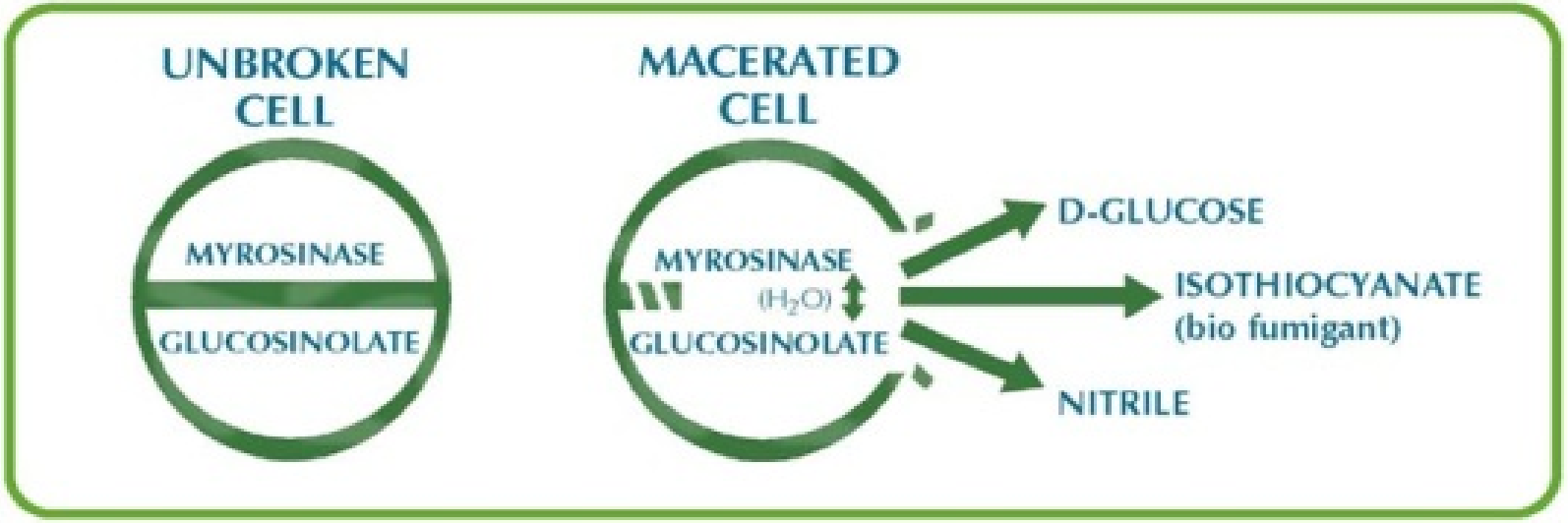
Brassica Cover Crops

Yellow mustard
Brown mustard
Oilseed radish

- **Fall planted**
- **Erosion control and nutrient scavenging**
- **Biofumigants**
- **Nematode suppression**
- **Reduce compaction**
- **No-till option with mustards**

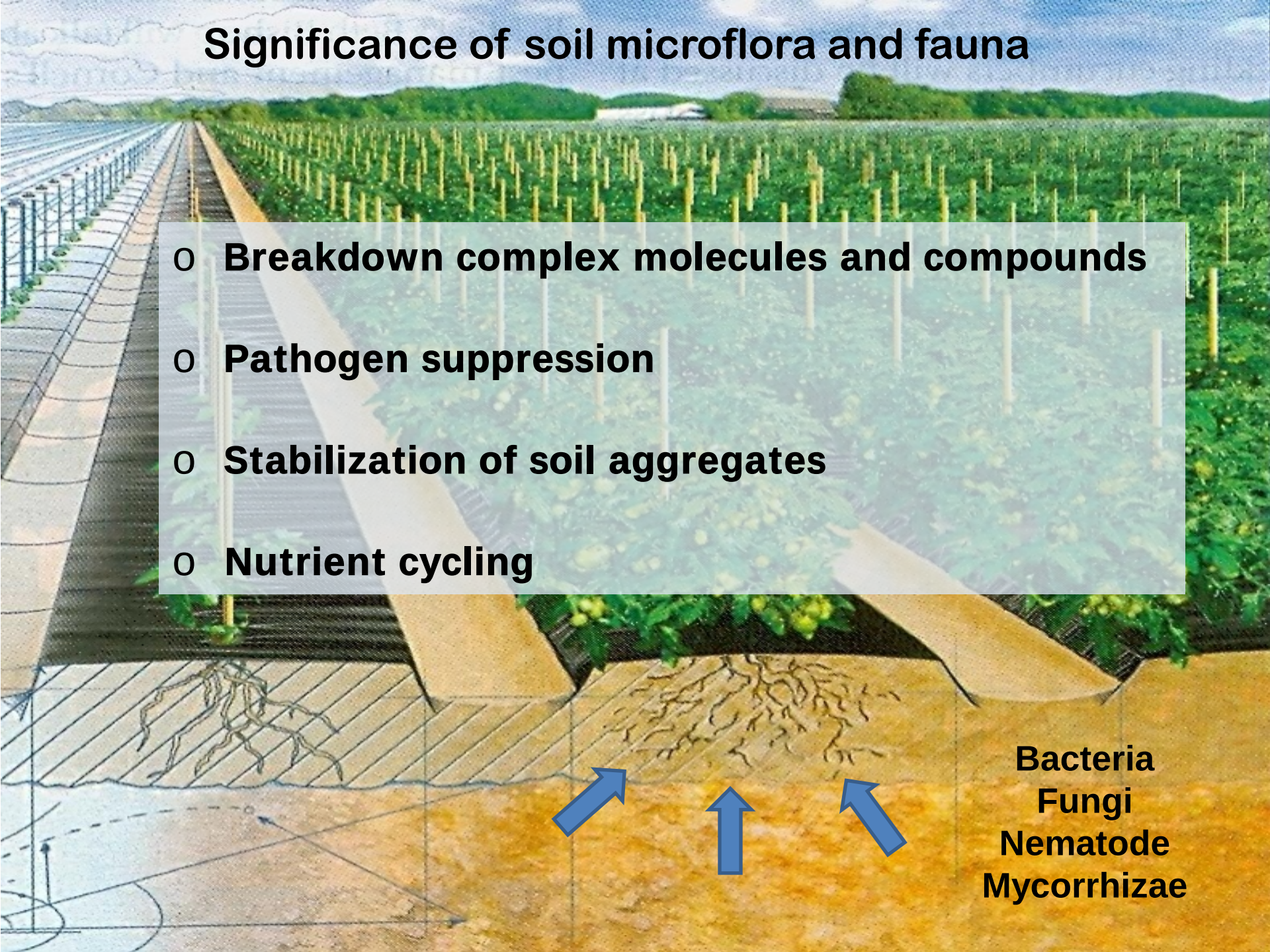
Brassica cover crops as Biofumigants

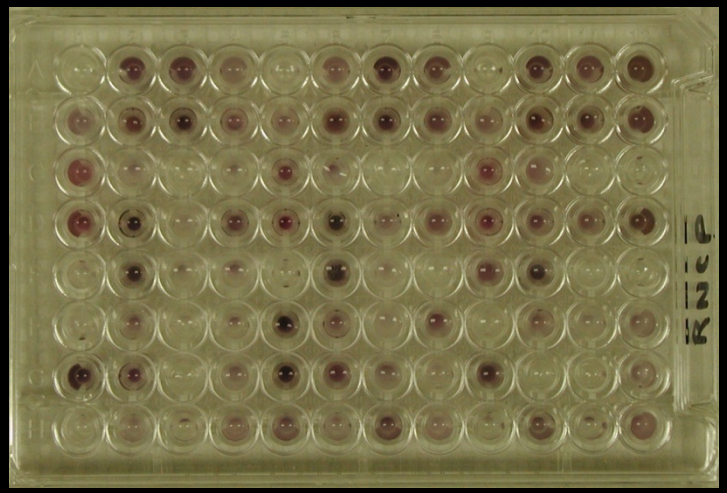
The biofumigation process.



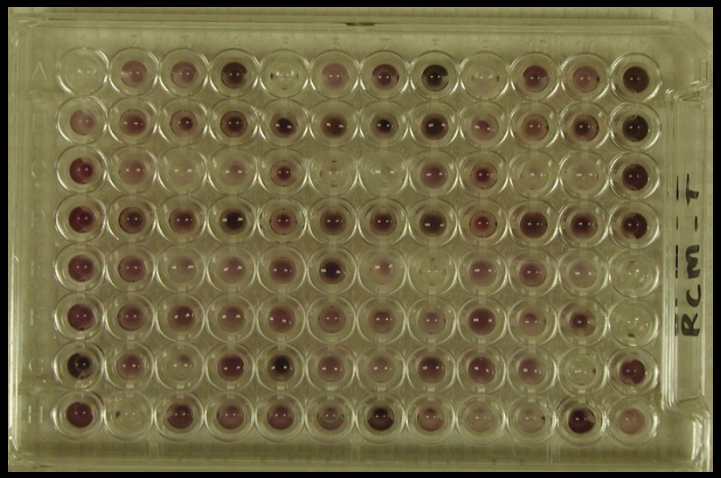
Significance of soil microflora and fauna

- **Breakdown complex molecules and compounds**
- **Pathogen suppression**
- **Stabilization of soil aggregates**
- **Nutrient cycling**

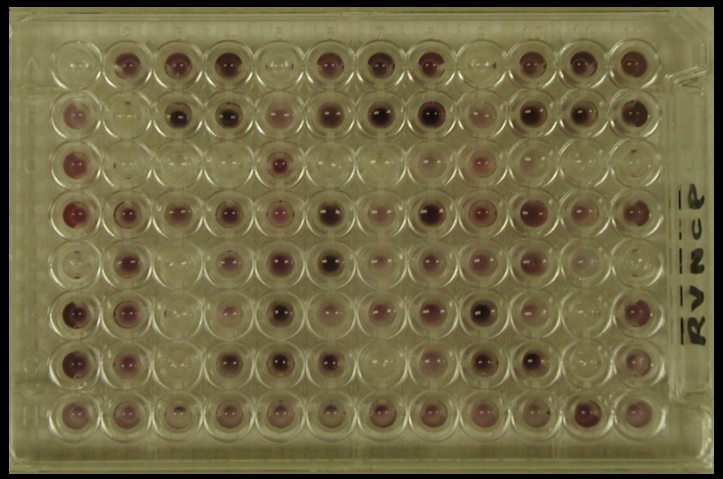




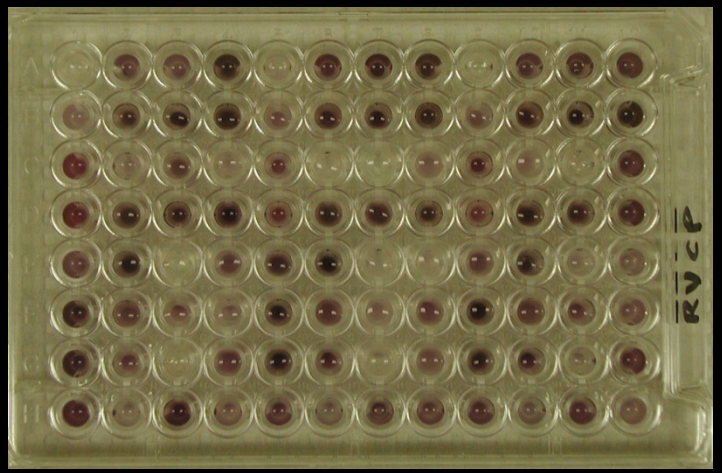
Rye – No Compost



Rye - Compost



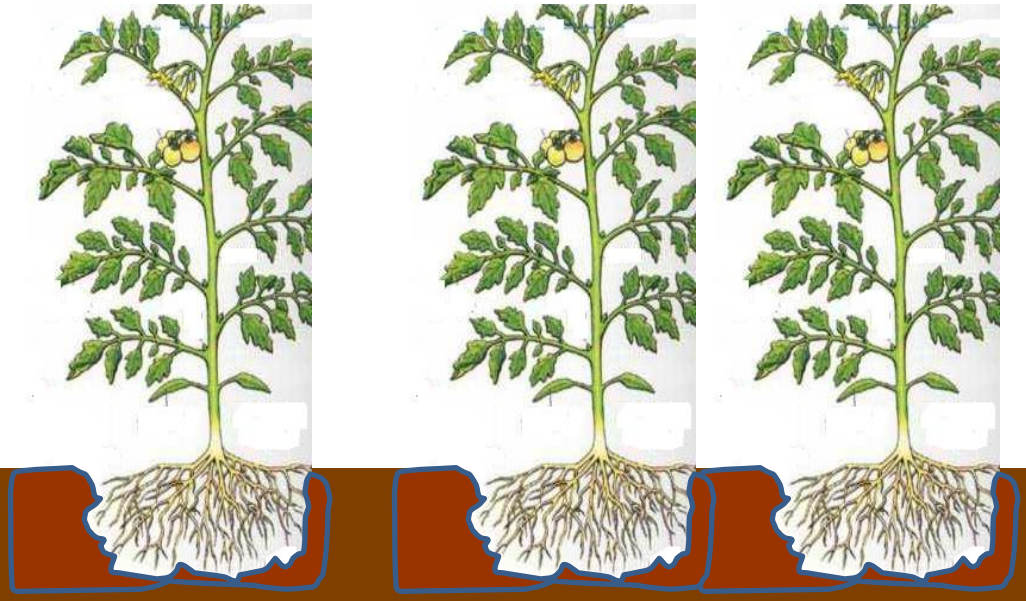
Rye Vetch – No Compost



Rye Vetch - Compost

What do nematodes do in the soil ?

Nutrient Cycling



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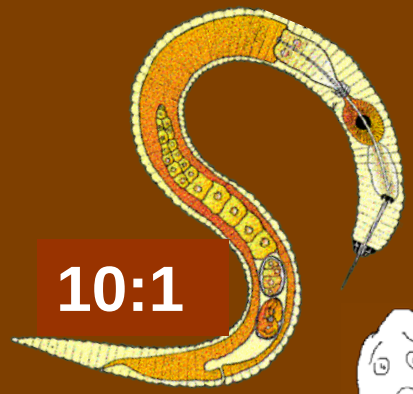


10:1

Happy bacteria

C:N 5:1

C:N 5:1

C:N 5:1

C:N 5:1

Impact of cover crops on Nematode community

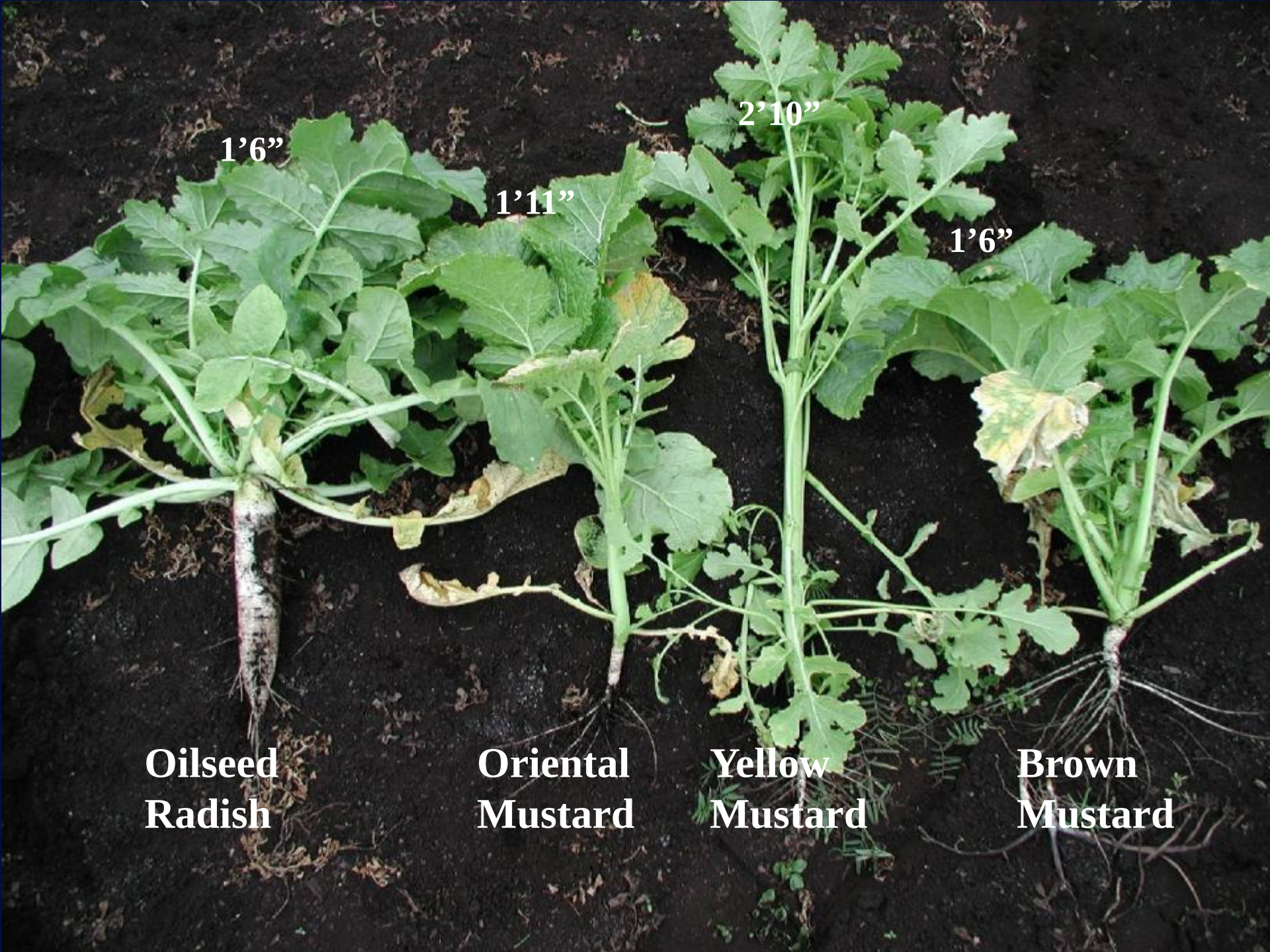
Cover Crop	Plant parasitic nematodes	Bacterial feeders
Control	178 a	383 b
Cereal Rye	97 ab	498 ab
Yellow Mustard	114 ab	533 ab
Oriental Mustard	102 ab	683 ab
Oilseed Radish	79 b	1382 a

Yellow Mustard or oilseed radish

- 3-4 ton/A biomass
- Seeding: 7-10lb/A (broadcast)
- Late fall or early spring
- 35-40 days from seeding to flowering
- Could become a weed ! so terminate when 70-80% bloom

Cover crop research at Rinehart Farms, Boone IA

IOWA STATE UNIVERSITY
Extension and Outreach


1’6”
1’11”
2’10”
1’6”
Oilseed Radish
Oriental Mustard
Yellow Mustard
Brown Mustard

- *Excellent biomass production*
- *Large taproot good for soil aeration*

Cultivar 'Daikon'

Source: Mathieu Ngouajio

- *Huge tap roots if allowed adequate time to grow*

Cultivar 'Defender'

Source: Mathieu Ngouajio

Yellow mustard


High Weed pressure
Control plots (no cover crop)


Very low weed pressure
Yellow Mustard


Kroul Farms (07-16-2013)
HANES
ELECTRIC
Solon, IA


John Kroul Farms
Mt. Vernon
Seeded: 3rd June 2013
Harvested: 16th July

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WELTER SEED & HONEY CO
Onslow, IA
563-485-2762
563-852-3325

Source: PFI

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Nick Howell
Vince Lawson

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http://iowavegetables.blogspot.com
www.extension.iastate.edu/vegetablelab

Thank you !

Yes I am in Iowa