Green Manure Crops and Soil Solarization Effects on *Aphanomyces cochlioides*

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Objectives

Effect of green manure crops, with and without solarization on:

- Aphanomyces root rot on sugar beet
- Viability of *A. cochlioides* oospores

Materials and Methods

- Cover crops sown in Aphanomyces nursery May 15, 2001
  - -buckwheat
  - -oilseed radish
  - -sorghum sudan grass
  - -fallow control

-7 X 9 m plots, randomized block design, 6 replicates

Buckwheat **Oilseed Radish** **Sorghum Sudan Grass**

18 mt/ha fresh wt 38 mt/ha fresh wt 13 mt/ha fresh wt

- Incorporated residue July 11, 2001
  - -Crops mowed and rototilled to a 10-cm depth
- Oospore viability tests
  - -Oospores produced in beet hypocotyls for 7 wk
  - -Averaged 8,000 oospores/hypocotyl, 99% viable

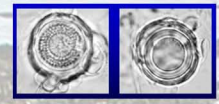
-Placed one oospore-filled hypocotyl in nylon mesh bag
-Mesh bags buried at 8, 15, and 23 cm depths (4 reps)
-Thermocouples buried at each depth in 1 rep

Main plots were split and half of each covered with horticultural grade clear polyethylene plastic for 9 wk.

Data collected

- Soil indexed for Aphanomyces (growth chamber assay, 0-100 scale)
  1) Before green manure crops sown
  2) After green manure crops incorporated
  3) Spring, 2002
- Soil temperatures during solarization at 8, 15, and 23 cm
- Mesh bags recovered after polyethylene tarp removed and 4 wk later
- Amount of hypocotyl tissue remaining
  - 0 = no tissue recovered
  - 1 = 1-20% or only stele remaining
  - 2 = 21-40%
  - 3 = 41-60%
  - 4 = 61-80%
  - 5 = 81-100%
- Viability of oospores

Viable **Dead**



Results

Effect of Green Manure Crop on Soil Index Value

	Soil Index Value*		
Crop	Before crop Sown	After crop Incorp.	Change
Buckwheat	96	63	-33
Oilseed radish	98	75	-22
SS Grass	96	78	-18
Fallow	98	97	-1

* Value 0-100 scale; 0 = healthy, 100 = all seedlings dead

Maximum Soil Temperature (C)

	Depth (cm)		
Soil treatment	8	15	23
Solarized			
Fallow	41	38	33
Oilseed radish	43	36	34
Nonsolarized			
Fallow	31	29	27
Oilseed radish	32	30	27

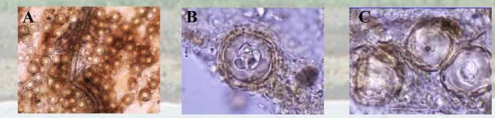
Examples of maximum soil temperatures for green manure crops compared to fallow soil

Sugar beet hypocotyl cortex and vascular tissue with oospores

Results (continued)

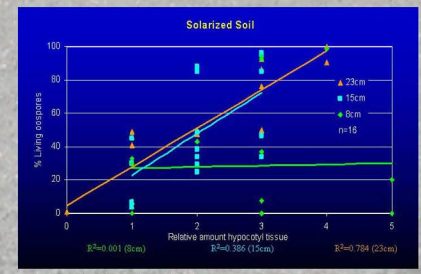
% Viable Oospores

	No. weeks buried in soil	
Soil treatment	9	13
Sorghum sudan grass	52	41
Oilseed radish	48	31
Buckwheat	32	36
Fallow soil	33	35
Mean	**41**	**36**
LSD (P=0.05)	NS	NS



A) Hypocotyl cortex embedded with dead oospores, B) fat globule in a decomposing oospore, C) fat globule decomposed and outer walls of oospore decomposing

- Immediately after tarps were removed, viability of oospores buried at 8 cm was lower in solarized (16%) than in non-solarized (59%) plots, but 4 weeks later, percent viability was equal in solarized and non-solarized plots at 8, 15, and 23 cm.



Four weeks after solarization tarps were removed, lowest oospore viability occurred at 8 cm and there was a significant and positive correlation between percent living oospores and relative amount of hypocotyl tissue at 15 and 23 cm. The same response occurred in non-solarized soils (data not shown).

Conclusion

- Green manure crops may suppress Aphanomyces root rot of sugar beet through mechanisms not related to a reduction in oospore inoculum.
- Solarization at the 8-cm depth increased death of *A. cochlioides* oospores during the solarization process.