Non-Chemical Means to Reduce the Sugarbeet Cyst Nematode Population and Minimizing Yield Losses

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In Idaho and eastern Oregon the sugarbeet cyst nematode has been recognized as one of the most serious problems for the sugarbeet industry. It is, in fact, one of the most important limiting factors for sugarbeet production. Growers must choose between a long rotation practice using non-host plant or applying expensive nematicides to obtain optimum yield in nematode infested fields. In Idaho and eastern Oregon more than 50% of the sugarbeet acreage is infested with sugarbeet cyst nematodes at a level where treatment is a must to obtain economically feasible yield.

The damage caused by this nematode depends on the initial nematode population density, and on the general soil and climate conditions which influence the growth of the host plant and the nematode survival. In areas of intensive sugarbeet production and short rotations, it is impossible to grow a profitable crop without expensive nematicide application.

Because of the strict EPA regulations on existing nematicides and the new ones, and the increasing cost of chemical control, there is a need for developing an alternative control tactic for sugarbeet nematodes.

Some of the alternative cultural and biological tactics under investigation are:

1. The use of green manure crop as soil amendment (e.g. nematode resistant oil radish variety.

2. The use of nematode resistant oil radish varieties in sugarbeet rotation as a trap crop to control the sugarbeet cyst nematode.

3. The use of rapeseed oil meal. Meal extracted for high glucosonulate variety contained chemicals similar to the active ingredient of the nematicide vapam.

Accomplishments

1. The effect of different nematode resistant oil radish varieties on sugarbeet cyst nematode population.

   It is known that host root exudate stimulate hatching of the cyst nematode. If the eggs hatch and there is no susceptible host for larvae to feed on, they will die from starvation.

   Most of the radish family plants are considered hosts to the sugarbeet cyst nematode. Some of the radish varieties have been found resistant to thisnematode and can be used as a trap crop. Several varieties developed in Germany were found to stimulate cyst nematode hatching but does not provide all of the nutrients required for female development.

The result of the ongoing sugarbeet rotation research at Parma Idaho (Table 1,2,3) indicated that planting these nematode resistant oil radish varieties in the fall following wheat crop will reduce the cyst nematode population significantly in comparison to no-plant. Nematode larvae can develop into females or males depending on certain conditions during their development. There are indications that these oil radish varieties disrupt the normal development of larvae to become females, thus resulting in an unusually high number of males.

Table 1. The effect of nematode resistant oil radish varieties on sugarbeet cyst nematode population under field conditions.

a) Viable cyst /500 cc soil

Oil Radish Varieties	Sampling Date				% of Reduction
	Pre-Plant	Post-Plant			
	8/31/89	11/2/89	3/19/90	6/27/90	
1. Pagletta	7.0	6.0	4.0	3.0	57%
2. Nemex	9.0	9.0	11.0	4.0	55%
3. R-1 84	6.0	6.0	2.0	3.0	50%
4. No. Plant	12.0	11.0	9.0	9.0	25%

Crop History

Spring 1989 Wheat
Fall 1989 Oil Radish
Spring 1990 Dry Beans

Table 2. The effect of nematode resistant oil radish varieties on sugarbeet cyst nematode population under field conditions. ID 1990.

b) Total # of eggs & larvae /500 cc soil

Oil Radish Varieties	Sampling Date				% of Reduction
	Pre-Plant	Post-Plant			
	8/31/89	11/2/89	3/19/90	6/27/90	
1. Pagletta	581	750	328	237	59.2
2. Nemex	900	720	847	668	25.8
3. R-1 84	528	336	198	234	55.7
4. No. Plant	1260	840	821	809	35.8

Table 3. The effect of nematode resistant oil radish varieties on sugarbeet cyst nematode population under field conditions. ID 1990

c) Total # of eggs /500 cc soil

Oil Radish Varieties	Sampling Date				% of Reduction
	Pre-Plant	Post-Plant			
	8/31/89	11/2/89	3/19/90	6/27/90	
1. Pagletta	420	624	200	159	62
2. Nemex	594	558	572	568	4
3. R-1 84	408	222	134	159	61
4. No. Plant	984	720	668	603	39

2. The effect of rape seed oil meal on sugarbeet plant growth and cyst nematode population.
Rape seed meal, nitrogen, (Amonium sulfate), and Temik at the rate of 4,000, 200 and 33 lbs/A were applied in the spring in a sugarbeet field heavily infested with sugarbeet cyst nematodes. Each treatment was replicated five times in randomize strip design and an untreated control was included. Rape and nitrogen treatments were applied 2 weeks before planting, Temik was applied at planting. The nitrogen treatment was included to exclude the nutrient effect of the rape meal from its nematicide effect. Results for this trial indicated that rape seed

meal significantly increased the sugarbeet root yield under heavy infestation of sugarbeet cyst nematode. (Table 4)

Table 4. The effecte of Rape Seed oil meal on sugarbeet yield and cyst nematode population.

Treatment		Yield # of Beets IA	Yield T/A	Nematode Population Before Treatment #of Eggs/500cc soil
1	Rape Meal 2 T/A	16,125	26.2	1182.6
2	Nitrogen 200 lbs/A	15,938	23.9	583
3	Temik 15G 5 lbs ai/A	16,063	20.7	875
4	Untreated	14,375	16.0	1180

3. Sugarbeet resistant hybrids test:
Several sugarbeet hybrids were evaluated under greenhouse conditions to determine their susceptibility to sugarbeet cyst nematode by measuring nematode population build up. Results of this test indicated that most of the hybrids tested significantly reduced the nematode population. (Table 5) In comparison with the susceptible variety Mono Hy
RH 83.

Table 5. The effect of different sugarbeet nematode resistant hybrids on sugarbeet cyst nematode populations under greenhouse conditions.

Sugarbeet Hybrids	Cyst Nematode Population					
	Roots	Soil				
	Cyst/Plant	Mature Female	# of Eggs/ Cyst	# of Larvae/ Cyst	No. of E & L/ 1cc Soil	% of Reduction
1. KWS-1	34	235	205	23	107.2	50.1
2. KWS-2	10	291	136	24	93.1	57.1
3. KWS-3	14	103	153	30	37.7	82.6
4. KWS-4	13	235	132	19	71.0	67.3
5. KWS-5	11	291	116	26	82.6	61.9
6. N801-HLB Hyb.13883	9	103	103	17	24.7	88.6
7. M. HYRH83	22	542	166	34	216.8	--

Pot size 4" x 4" 500cc soil
Initial nematode population 13.5 egg/1cc soil
Planting date 8/25/89
Harvesting date 12/11/89

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