

## Nematicide Trials against Root-Knot Nematodes and Stubby Root Nematodes in 2002

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The root knot nematode, *Meloidogyne chitwoodi*, causes serious problems to potato production in the Pacific Northwest. The economic threshold for *M. chitwoodi* is very low, i.e. 1 nematode per 250 cc soil. However, during the 2002 field season, nematode counts as high as 4,500 per 250 cc were reported from several commercial fields. In this work, we are reporting the 2002 field data on the effect of synthetic nematicides on *M. chitwoodi*.

The plots at WSU-IAREC, Prosser consist of loam sand with <1% organic matter with a pH 6.0 – 6.2. The plot size was 8.5' x 25', arranged in a randomized complete block with 5 replications per nematicide treatment. Nematode soil samples for *Meloidogyne chitwoodi* were taken before treatment application (March 26), mid season (August 9), and after harvest (November 19). Nematode counts, potato yield and tuber infection data were obtained from the middle row (20 ft.) of each plot. Tubers were sorted and graded, and 20 tubers were selected at random and peeled by hand and examined for nematode infection. Tubers were rated for nematode infection in terms of % infection, % culls, and infection index. Our rating system is approximately twice as critical as inspectors in the potato processing plants.

Tank mixes of Mocap + Vapam were compared to spring applied Telon II 20 gallons, Temik and Vapam 37.5 gallons. Telone 20 gallons provided excellent control, tuber protection and high yields. The combination of Mocap + Vapam provided very good control, tuber protection and high yields. The addition of Temik to Mocap + Vapam tank mix also provided control. However, Temik on its own, did not provide season long control (**Table 1a, 1b, 1c**).

Vydate following Vapam 30 gallons controlled the nematode, provided tuber protection, and resulted in higher yields than the untreated controls. Vapam alone, at 37 gallons, controlled the nematodes, provided tuber protection, and resulted in higher yields than the untreated controls. Treatments with the same rates but with pH 5.5 were also evaluated and provided similar results as the rest of the Vydate + Vapam treatments (provided tuber protection, and resulted in higher yields than the untreated controls) (**Table 2a, 2b, 2c**).

Fosthiazate by itself and following Vapam was compared to a Vapam + Fosthiazate tank mix. AgriMek as at plant seed treatment was also included. Telone, 20 gallons, was applied in the fall but soil conditions were too wet and the treatment was not successful. Telone II usually provides excellent nematode control, unless the soil is either too wet or soil temperature is low. The Fosthiazate + Vapam tank mixes provided very good nematode control, provided tuber

protection, and increased the yield in comparison to the untreated control. The AgriMek treatments did not control the nematodes and were phytotoxic to the plants (Table 3a, 3b, 3c).

Kpam, 30 gallons, was compared to Vapam HL and Telone II 20 gallons. Telone II gave excellent control. Kpam provided good control and was slightly better than Vapal HL at 37.5 gallons in terms of nematode control and yield (Table 4a, 4b and 4c).

**Table 1a.** Populations of *Meloidogyne chitwoodi* at pretreatment, mid season, and post-harvest from Mocap 6EC treated Russet Burbank potato field plots, WSU-IAREC, 2002.

Treatment (rate ai/A)	Apr 02	Aug 02	Nov 04
Untreated	511 + 206 a	363 + 141 a	2240 + 390 a
Telone II 20 gal, Spring	429 + 220 a	0 b	2 + 2 b
Mocap 2 gal + Vapam HL 37.5 gal (tank mix)	199 + 82 b	0 b	0 b
Mocap 1.5 gal + Vapam HL 30 gal (tank mix)	165 + 93 b	0 b	0 b
Mocap 1.5 gal + Vapam HL 30 gal (tank mix) + Temik 20lb	375 + 160 a	0 b	5 + 2.7 b
Temik 15G 20lb	231 + 123 b	107 + 36 b	2077 + 409 a
Vapam HL 37.5 gal	243 + 52 b	1 + 1 b	5 + 2.7 b

**Table 1b.** Percent infection, % culls, and infection index of Russet Burbank potato tubers caused by *Meloidogyne chitwoodi* from Mocap 6EC treated field plots, WSU-IAREC, 2002

Treatment (rate ai/A)	Infection index <sup>1</sup>	% Culls <sup>2</sup>	% Infection <sup>3</sup>
Untreated	6 a	100 a	100 a
Telone II 20 gal, Spring	0 b	0 b	0 b
Mocap 2 gal + Vapam HL 37.5 gal (tank mix)	0.05 b	1.25 b	1.25 b
Mocap 1.5 gal + Vapam HL 30 gal (tank mix)	0.14 b	1.25 b	7.5 b
Mocap 1.5 gal + Vapam HL 30 gal (tank mix) + Temik 20lb	0.04	1.25 b	3.8 b
Temik 15G 20lb	2.7	55 b	66.3b
Vapam HL 37.5 gal	1.5	25 b	29 b

Values are means of five replicates. Values in each column followed by the same letter are not significantly different at  $P < 0.05$ , according to student t-test.

<sup>1</sup> Infection index: 0=no infection; 1=1-3; 2=4-5; 3=6-9; 4=10+; 5=50+; 6=100+ infection sites

<sup>2</sup> % culls = tubers with six or more infection sites.

<sup>3</sup> any tubers infected with *M. chitwoodi*

**Table 1c.** Tuber yields (lb/plot) of Russet Burbank potato treated with Mocap 6EC against *Meloidogyne chitwoodi* plots, Pear Acres Unit, WSU-IAREC, 2002

Treatments (rate ia/A)	Grade		Total Yield
	No. 1	No. 2	
Untreated	37 a	3.9 a	41.1 a
Telone II 20 gal, Spring	88.2 b	3.6 a	94.3 b
Mocap 2 gal + Vapam HL 37.5 gal (tank mix)	82.7 b	1.5 b	93.9 b
Mocap 1.5 gal + Vapam HL 30 gal (tank mix)	74.2 b	1.5 b	77.4 b
Mocap 1.5 gal + Vapam HL 30 gal (tank mix) + Temik 20lb	79.3 b	3.2 a	84.5 b
Temik 15G 20lb	64.8 b	3.2 a	70.9 b
Vapam HL 37.5 gal	62.7 b	0.5 b	63.9 b

Values are means of four replicates. Values in each column followed by the same letter do not differ at  $P < 0.05$ , according to student t-test.

**Table 2a.** Populations of *Meloidogyne chitwoodi* at pretreatment, mid season, and post-harvest from Vydate treated Russet Burbank potato field plots, WSU-IAREC, 2002.

Treatment (rate ai/A)	Mar 26	Aug 09	Nov 19
Untreated	582 + 91 a	168 + 21 a	1644 + 300 a
Vap 30 gal shanked + Vyd 2.2oz banded	169 + 36 b	256 + 132 a	542 + 277 b
Vap 30 gal shanked + Vyd 2.2ozbanded /pH 5.5	150 + 29 b	170 + 75 a	634 + 162 b
Vap 30 gal shanked + Vyd chemigation	185 + 37 b	795 + 335 b	1118 + 308 a
Vapam 38 gal shanked	420 + 90 a	44 + 34 b	340 + 123 b
Vapam 30 gal shanked	548 + 124 a	179 + 52 a	2216 + 614 a

**Table 2b.** Percent infection, % culls, and infection index of Russet Burbank potato tubers caused by *Meloidogyne chitwoodi* from Vydate treated field plots, WSU-IAREC, 2002.

Treatment (rate ai/A)	% Infection <sup>1</sup>	% Culls <sup>2</sup>	Infection index <sup>3</sup>
Untreated	100 a	100 a	6.0 a
Vap 30 gal shanked + Vyd 2.2oz banded	43 b	20 b	1.1 b
Vap 30 gal shanked + Vyd 2.2ozbanded /pH 5.5	42 b	25 b	1.2 b
Vap 30 gal shanked + Vyd chemigation	64 a	47 b	2.2 b
Vapam 38 gal shanked	21 b	14 b	0.7 b
Vapam 30 gal shanked	97 a	95 a	5.3 a

Values are means of five replicates. Values in each column followed by the same letter are not significantly different at  $P < 0.05$ , according to student t-test.

<sup>1</sup>any tubers infected with *M. chitwoodi*

<sup>2</sup> % culls = tubers with six or more infection sites.

<sup>3</sup> Infection index: 0=no infection; 1=1-3; 2=4-5; 3=6-9; 4=10+; 5=50+; 6 =100+ infection sites

**Table 2c.** Yields (lb/plot) of Russet Burbank potato tubers from field plots infected with *Meloidogyne chitwoodi* and treated with Vydate, WSU-IAREC, 2002.

Treatments (rate ia/A)	Grade		Total Yield
	No. 1	No. 2	
Untreated	43.3 a	1.9 a	49.9 a
Vap 30 gal shanked + Vyd 2.2oz banded	62.0 b	11.6 b	74.9 b
Vap 30 gal shanked + Vyd 2.2oz banded /pH 5.5	51.0 a	6.8 b	63.9 a
Vap 30 gal shanked + Vyd chemigation	60.3 b	10.2 b	72.8 b
Vapam 38 gal shanked	78.2 b	0.6 a	81.3 b
Vapam 30 gal shanked	65.9 b	1.0 a	68.7 a

Values are means of four replicates. Values in each column followed by the same letter are not significantly different at  $P < 0.05$ , according to student t-test.

**Table 3a.** Populations of *Meloidogyne chitwoodi* at pretreatment, mid season, and post-harvest from Fosthiazate-Vapam treated Russet Burbank potato field plots, WSU-IAREC, 2002.

Treatment (rate ai/A)	Fall 2001	Mar 26/02	Aug 9/02	Oct 9/02
Untreated	340 + 114 a	511 + 206 a	363 + 141 a	2240 + 390 a
Telone II 20 gal Fall *	913 + 166 b	1 + 1 b	50 + 18 b	0 b
Fosthiazate EC 4.5 lb Spring	905 + 350 b	702 + 138 a	193 + 113 b	1878 + 307 a
Fosthiazate EC 6.0 lb Spring	336 + 36 a	352 + 96 a	170 + 91 b	1152 + 542 b
Vapam 37.5 gal + Fos 4.5 lb Spring	807 + 180 b	3 + 3 a	0 b	70 + 58 b
Vapam 37.5 + Fos 6.0 lb Spring	984 + 290 b	0 a	0 b	36 + 19 b
Vapam 37.5 + Fos 3.0 (mix) + Fos 3.0 (at planting)	612 + 145 b	514 + 179 a	3 + 3 b	209 + 168 b
Agri-Mek 48 Fl oz/A	734 + 185 b	937 + 255 b	145 + 47 b	3346 + 983 b

Values are means of five replicates. Values in each column followed by the same letter are not significantly differed at  $P < 0.05$ , according to student t-test.

\* Telone II 20 gal Fall application was not successful as soil conditions were too wet

**Table 3b.** Percent infection, % culls, and infection index of Russet Burbank potato tubers caused by *Meloidogyne chitwoodi* from Fosthiazate-Vapam treated field plots, WSU-IAREC, 2002.

Treatment (rate ai/A)	%	%	Infection
	Infection <sup>1</sup>	Culls <sup>2</sup>	index <sup>3</sup>
Untreated	100 a	100 a	6.0 a
Telone II 20 gal Fall *	74 b	60 b	2.9 b
Fosthiazate EC 4.5 lb Spring	35 b	18 b	0.9 b
Fosthiazate EC 6.0 lb Spring	14 b	6 b	0.3 b
Vapam 37.5 gal + Fos 4.5 lb Spring	1 b	0 b	0.01 b
Vapam 37.5 + Fos 6.0 lb Spring	2 b	0 b	0.03 b
Vapam 37.5 + Fos 3.0 (mix) + Fos 3.0 (at plant)	1 b	1 b	0.04 b
Agri-Mek 48 Fl oz/A	96 a	89 a	4.9 a

Values are means of five replicates. Values in each column followed by the same letter are not significantly different at  $P < 0.05$ , according to student t-test.

<sup>1</sup> % infection = any tubers infected with *M. chitwoodi*.

<sup>2</sup> % culls = tubers with six or more infection sites.

<sup>3</sup> Infection index: 0 = no infection; 1=1-3; 2=4-5; 3=6-9; 4=10+; 5=50+; 6 =100+ = infection sites.

\* Telone II 20 gal Fall application was not successful as soil conditions were too wet

**Table 3c.** Yields (lb/plot) of Russet Burbank potato tubers from field plots infected with *Meloidogyne chitwoodi* and treated with Fosthiazate-Vapam, Pear Acres Unit, WSU-IREC, 2002.

Treatments (rate ia/A)	Grade		Total Yield
	No. 1	No. 2	
Untreated	42 a	2.7 a	50.6 a
Telone II 20 gal Fall *	82 b	20.8 b	106 b
Fosthiazate EC 4.5 lb Spring	58 a	8.4 b	68.2 a
Fosthiazate EC 6.0 lb Spring	64 a	12.4 b	82.6 b
Vapam 37.5 gal + Fos 4.5 lb Spring	73.8 b	23 b	97.9 b
Vapam 37.5 + Fos 6.0 lb Spring	85.1 b	30 b	118.7 b
Vapam 37.5 + Fos 3.0 (mix) + Fos 3.0 (at plant)	72.2 b	25 b	102.3 b
Agri-Mek 48 Fl oz/A	34.4 a	3 a	41.4 a

Values are means of five replicates. Values in each column followed by the same letter are not significantly different at  $P < 0.05$ , according to student t-test

\* Telone II 20 gal Fall application was not successful as soil conditions were too wet

**Table 4a.** Populations of *Meloidogyne chitwoodi* at pretreatment, mid season, and post-harvest from Kapam and Vapam treated Russet Burbank potato field plots, WSU-IAREC, Prosser, WA, 2002.

Treatment (rate ai/A)	Apr 02	Aug 02	Nov 04
Untreated	511 + 206 a	363 + 141 a	2240 + 390 a
Telone II 20 gal, Spring	429 + 220 a	0 b	2 + 2 b
Vapam HL 37.5 gal	243 + 52 b	1 + 1 b	5 + 2.7 b
Kapam 30.0 gal	388 + 82 a	9 + 9 b	40 + 35 b

**Table 4b.** Percent infection, % culls, and infection index of Russet Burbank potato tubers caused by *Meloidogyne chitwoodi* from Kapam and Vapam treated field plots, WSU-IAREC, Prosser, WA., 2002.

Treatment (rate ai/A)	Infection index <sup>1</sup>	% Culls <sup>2</sup>	% Infection <sup>3</sup>
Untreated	6 a	100 a	100 a
Telone II 20 gal, Spring	0 b	0 b	0 b
Vapam HL 37.5 gal	1.5	25 b	29 b
Kapam 30.0 gal	0.3 b	13 b	6 b

Values are means of five replicates. Values in each column followed by the same letter are not significantly different at  $P < 0.05$ , according to student t-test.

<sup>1</sup> Infection index: 0 = no infection; 1=1-3; 2=4-5; 3=6-9; 4=10+; 5=50+; 6 =100+ infection sites.

<sup>2</sup> % culls = tubers with six or more infection sites.

<sup>3</sup> any tubers infected with *M. chitwoodi*

**Table 4c.** Tuber yields (lb/plot) of Russet Burbank potato treated with Kapam and Vapam against *Meloidogyne chitwoodi* plots, Pear Acres Unit, WSU-IAREC, 2002

Treatments (rate ia/A)	Grade		Total Yield
	No. 1	No. 2	
Untreated	37.0 a	3.9 a	41.1 a
Telone II 20 gal, Spring	88.2 b	3.6 a	94.3 b
Vapam HL 37.5 gal	62.7 b	0.5 b	63.9 b
Kapam 30.0 gal	79.0 b	1.0 b	81.1 b

Values are means of five replicates. Values in each column followed by the same letter do not differ at  $P < 0.05$ , according to student t-test.