

BENEFITS VERSUS COST FROM PREPLANT FUMIGATION OF ALFALFA

Marsha Campbell
Farm Advisor
University of California
Cooperative Extension
Modesto

Nematodes have long been known to be a key factor in reducing alfalfa hay yields on the light sandy loam soils of the Turlock area. What has not been clear is whether an expensive fumigation treatment would increase production enough to be economical.

A 20-acre field known to be severely infested with root knot, lesion and stubby root nematodes was selected as the site of a fumigation trial (Fig. 1). The field was divided up into 8 checks. Alternative checks were fumigated with Tellone II, a DD nematicide, on Sunday, October 26, 1980, at the rate of 12 to 15 gallons per acre. The material was injected 12 inches deep with shanks 18 inches apart. The untreated checks were also ripped by driving the applicator through them but without injecting the material. The field was planted about 10 days after the nematicide treatment. However, due to major stand loss from damping off, the field had to be replanted in early spring.

The first cutting yields were discarded because of excessive weeds. Bale counts were taken after each cutting thereafter. There was a visual difference in the growth of the alfalfa beginning with the second cutting. Untreated checks grew more slowly and stressed for water more easily. Second cutting yields confirmed a 56 percent increase in the treated checks (Fig. 2). After the second cutting crabgrass began to establish in the untreated checks. The crabgrass infestation has become increasingly severe as the season has progressed. Fourth cutting yields of the untreated portions of the field, although similar in total production to those of the treated checks, are averaging almost 30 percent weeds. The treated checks are showing only about 3 percent weeds (Fig. 3). The difference in weed population can be easily seen when viewing the trial because the crabgrass has a pinkish color and the field appears from the air as alternating strips of pink and green.

Fumigation also resulted in a considerable improvement in the numbers of crowns per square foot effecting a 63 percent increase over the untreated checks. There was not, however, any difference in the number of stems per unit area (Fig. 4). Nematode counts taken one year after application of the fumigant show that root knot nematode populations are still being kept to minimum levels. The root lesion nematode is not being held back. The resurgence of stubby root nematode can also be noted from this data (Fig. 5).

The cost of this fumigation treatment was about \$98 per acre including the cost of custom application. The first year to date there has been an increase of .88 tons per acre. If hay is \$112 per ton, the cost of the fumigation would equal the return from additional yield. However, this does not take into consideration the added value of weed-free hay. The hay produced in the untreated areas was about 30 percent weeds.

This study will be continued over the life of this stand. A similar project by Richard N. Eide and E. J. Gregory was reported in 1963.* They noted a 60 percent increase the first year with a 20 gpa DD treatment, however, no yield increases in subsequent years. It is possible this current trial will follow a similar trend. However, stand losses and weeds are a severe problem in the untreated checks of this field and hay quality and stand persistence factors will need to be considered in addition to the yield.

*Eide, R. N. and E. J. Gregory. 1963. Nematicides for Use on Alfalfa. California Agriculture, p. 15. March.

Figure 1: Initial nematode population levels, October 1, 1979
Nematodes/100 ml.

Check Number	Root Knot (<i>Meloidogyne</i> Spp.)	Root Lesion (<i>Pratylenchus</i> Spp.)	Stubby Root (<i>Trichororus</i> Spp.)
1,2	75.2	129.6	52.8
3,4,5	8.0	155.2	88.0
6,7,8	129.6	555.2	67.2
Average	77.3	280.0	64.0

Figure 2: Yield of fumigated versus unfumigated alfalfa.

	Check Number	Cutting Yield (T/A)			Total
		Second	Third	Fourth	
Untreated:	1	1.58	1.39	1.07	4.05
	3	0.90	1.08	0.68	2.67
	5	0.71	0.90	0.59	2.20
	7	<u>0.66</u>	<u>1.07</u>	<u>0.72</u>	<u>2.45</u>
	Average	0.96	1.11	0.77	2.84
Treated:	2	2.07	1.62	1.03	4.72
	4	1.73	1.52	0.77	4.02
	6	1.11	1.24	0.69	3.04
	8	<u>1.12</u>	<u>1.32</u>	<u>0.67</u>	<u>3.11</u>
	Average	1.51	1.42	0.79	3.72
% of Untreated:		156	128	103	131

Figure 3: Yield of alfalfa versus weeds, fourth cutting, October 6, 1980.

	Check Number	Alfalfa (gms/6 ft ²)	Weeds (gms/6 ft ²)	Total Yield (gms/6 ft ²)	% Weeds
Untreated:	1	85.4	38.1	123.5	30.9
	3	103.2	27.5	130.7	21.0
	5	53.4	41.6	95.0	43.8
	7	<u>77.6</u>	<u>21.5</u>	<u>99.1</u>	<u>21.7</u>
	Average	79.9	32.2	112.1	29.4
Treated:	2	127.3	0.1	127.4	< .1
	4	97.1	11.9	109.0	10.9
	6	137.0	0.1	137.1	< .1
	8	<u>110.6</u>	<u>0.1</u>	<u>110.7</u>	<u>< .1</u>
	Average				

Figure 4: Crown and stem counts, fumigated versus nonfumigated alfalfa, September 26, 1980.

	Check Number	Ave Crown/ft ²	Ave Stems/ft ²
Untreated:	1	13.7	57.5
	3	17.7	69.8
	5	16.2	63.0
	7	<u>13.4</u>	<u>51.8</u>
	Average	15.2	73.5
Treated:	2	31.7	80.3
	4	20.0	63.1
	6	28.0	96.5
	8	<u>19.4</u>	<u>51.8</u>
	Average		

Figure 5: Nematode population levels one year after treatment, October 17, 1980.

	Root Knot (<u>Meloidogyne</u> Spp.)	Root Lesion (<u>Pratylenchus</u> Spp.)	Stubby Root (<u>Trichororus</u> Spp.)	Stunt Nematode (<u>Tylenchorhynchus</u> Spp.)
Nematodes/100 ml soil				
Untreated:				
1	35	70	52.5	2.25
3	45	60	15	10
5	15	52.5	35	10
7	<u>35</u>	<u>62.5</u>	<u>20</u>	<u>22.5</u>
Average	32.5	61.3	30.6	44.8
Treated:				
2	10	55	32.5	5
	0	72.5	95	2.5
	0	27.5	122.5	0
	<u>0</u>	<u>65</u>	<u>102.5</u>	<u>0</u>
Average	2.5	55	88.1	1.9