peratures that prevail in May or later, and adverse effects on the sugar beets are even more evident.

Irrigation is necessary for germination and must be timely and carefully done to achieve a good stand with late plantings. It may also be necessary to irrigate more frequently in the early part of the summer to prevent late-planted beets from wilting, as it takes time to develop a deep root system.

The sugar beet armyworm, the crown borer and the cutworm may also cause more damage to late-planted beets and should be controlled when necessary. Fertilizer applications should be planned so that plants will be nitrogen-deficient from six to eight weeks prior to fall harvest. This may mean the use of less fertilizer than would be required for an early-planted, disease-free crop.

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Nematocides *for Use on* Alfalfa

R. N. EIDE · E. J. GREGORY

DD fumigation for nematode control in "marginal" light sandy soils increased alfalfa hay yields by 3.25 tons per acre in Fresno County tests—and was considered profitable (on proven nematode infested soils) when hay prices average $20 or more per ton.

THIS EXPERIMENT was conducted in Fresno County to determine if nematocides are effective and profitable when used for "marginal" plantings of alfalfa hay in light sandy soils. This trial was on Ripperdan sandy loam soil which had previously given a cotton yield increase of ½ to ¾ bale per acre from fumigation for nematode control. The average annual yield of alfalfa in this area is about 5 tons per acre.

Nemagon and DD were the two materials tested. Nemagon was applied at the rate of 1¼ gallons per acre and DD was used at 20 gpa. Nemagon was applied by both soil injection and in the irrigation water. DD was applied only by injections into the soil.

Soil and root samples taken prior to treatment indicated spotty rootknot nematode infestation of *Meloidogyne javanica*. All fumigation treatments were made at least 10 days before planting. Moapa alfalfa was seeded February 12, 1960. Soil and alfalfa root samples, taken one year after treatment, were examined by the funnel technique, tomato indicator, and root staining methods.

Both nematocides were effective in controlling nematodes with either application method used. All treated plots had a high degree of nematode control; whereas the control plots were heavily infested (as shown in table 1).

TABLE 1. EFFECT OF DD AND NEMAGON ON NEMATODE POPULATIONS IN ALFALFA

Treatment	Nemo'odes
Control	Heavy infestotion
DD 20 gpa	All replications clean
Nemagon 1¼ gpa (inj)	All replications clean
Nemagon 1¼ gpa (water)	All replications clean

Hay weights were taken for three years after treatment. Individual bale weights were taken by specially made bale scales mounted on the hydraulic lift of a tractor.

Fumigation with DD resulted in significantly greater yields than all other treatments in 1960 but did not result in significantly greater yields during the last two years (as shown in table 2). Nematodes probably had little effect on the establishment of stands during the first year but did have a depressing effect on yields. This is indicated by the uniform yield of all treatments during the last two years.

TABLE 2. EFFECT OF NEMATOCIDES ON YIELDS OF ALFALFA

	Average yields in tons per acre			
Treatments	1960	1961	1962	Total 3 years
Control	4.06	6.53	6.22	16.81
DD 20 gpa ..	6.41*	6.96	6.69	20.06
Nemagon 1¼ gpa (inj)..	4.84	6.85	6.32	18.01
Nemagon 1¼ gpa (water) ..	4.28	6.75	6.20	17.23

* Significantly different at the 1% level of probability.

Nemagon gave good nematode control but did not significantly affect yields—indicating that it may have had a depressing effect. When Nemagon was applied in the irrigation water, lower yields were obtained than when it was injected. This probably resulted from a lack of sufficient water to take the Nemagon deep into the soil. If Nemagon has a depressing effect on yields, the high concentration of chemical left in the surface twelve inches of soil would explain the lower yields obtained from the irrigation water application.

Over the three-year test period, the DD treatment resulted in an average yield increase of 3.25 tons per acre above the control. The cost of the material and application was $30.50 per acre. The cost of cutting, raking, baling and selling the extra hay was approximately $22.69 per acre. This makes the total cost of producing and processing the extra hay $53.19 per acre. At $21 per ton the extra hay per acre would be worth $68.25. This leaves a net income on the DD treatment of $15.06 per acre (as shown in table 3).

The costs involved and the lack of additional yields make Nemagon impractical for use on alfalfa hay. Treatment with DD would be profitable on proven nematode-infested soils if the hay can be sold for an average of $20 per ton or better.

Residue data are not available on this material when used on alfalfa and recommendations cannot be made until this information is available.

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TABLE 3. COST ANALYSIS FOR TREATMENT OF ALFALFA WITH NEMATOCIDE

Treatment	Yield tons/A.	Yield increase over control tons/A.	Gross income/A. over control @ $21/ton	Total extra cost/A.	Net profit per acre
Control	16.81				
DD 20 gpa	20.06	3.25	$68.25	$53.19	+$15.06
Nemagon 1¼ gpa (inj)	18.01	1.20	25.20	37.13	- 11.93
Nemagon 1¼ gpa (water)	17.22	.41	8.61	29.11	- 20.50