

The Effects of Five Legume Crops on Soil Populations of the Sugar Beet Nematode (*Heterodera schachtii* Schmidt)¹

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In studies of rotation systems on nematode infested land, Johnson and Wheatley (2)³ found that inclusion of beans in the rotation greatly increased yields of sugar beets. Golden and Shafer (1) demonstrated that Navy beans had a stimulatory-trap crop effect on larvae of the beet nematode and suggested that beans might have some practical value in rotation systems for the control of this pest. This suggested trials to determine the magnitude of the trap crop effect of certain legumes.

Jones (3, 4 and 5) found that difficulties such as uneven distribution of nematodes, soil type variations, and contamination were overcome when small plots were used instead of field plots. His plots (termed microplots by the author) were constructed of slotted concrete posts and paving stones joined together with bitumastic, measured 2 feet 4 inches square and two feet deep. Mai (6) reported successful use of 8 × 5 feet plots bounded by 12 inch redwood boards for research involving the golden nematode, *Heterodera rostochiensis*.

Materials and Methods

Twenty-five microplots, measuring 4 feet square and 3 feet deep, constructed of 3/4" × 12" redwood fastened with aluminum nails, were lined with polyethylene plastic sheeting, and sunk into the ground to a depth of 2 1/2 feet, spaced 4 feet apart. Examination of the soil in the experimental area did not reveal the presence of sugar beet nematode.

Sugar beets (*Beta vulgaris* L. var. U. S. 75) were grown in the greenhouse in individual aluminum foil cylinders containing steam-sterilized soil. When the plants were well established, the aluminum foil was removed and 16 beets transplanted to each microplot during the spring of 1960 (Figure 1). Soil infested with cysts of *Heterodera schachtii* was added to each of the microplots at the time beets were transplanted.

¹ Cooperative Investigations of the Crops Research Division, Agricultural Research Service, United States Department of Agriculture and the Beet Sugar Development Foundation.

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³ Numbers in parentheses refer to literature cited.



Figure 1.—Microplot containing sugar beet plants infected with *Heterodera schachtii*.

Soil samples were obtained from each microplot on March 9, 1961, after beets had been removed. The samples were oven dried, weighed, and processed to recover cysts. Counts of the number of cysts per 100 grams of soil ranged from 35 to 64 and averaged 49 per sample.

Legume non-host crops were planted in individual microplots on April 25, 1961, and again on May 25, 1962, each crop being replicated 5 times in a randomized block design. The crops used in this test were: Kentucky wonder white-seeded pole beans (*Phaseolus vulgaris* L.); California Small White bean; Alderman peas (*Pisum sativum*); White Dutch clover (*Trifolium repens*); or Chilean alfalfa (*Medicago sativa*). Microplots receiving peas or beans contained 4 planting rows spaced 1 foot apart; seeds of clover or alfalfa were planted broadcast. (Figure 2).

Random samples of soil were taken from all microplots on October 25, 1961 and October 25, 1962, after legume crops were removed from the microplots. The samples were oven dried, weighed, and processed to recover cysts.

Seeds of sugar beets were planted in each of the 25 microplots on February 4, 1963. On March 12, 1963, several plants were removed from each microplot and taken to the laboratory where the plants were washed and weighed and the roots stained in a boiling solution of lactophenol and examined for the presence of nematode larvae. Counts of larvae are listed by crops in Table 1.

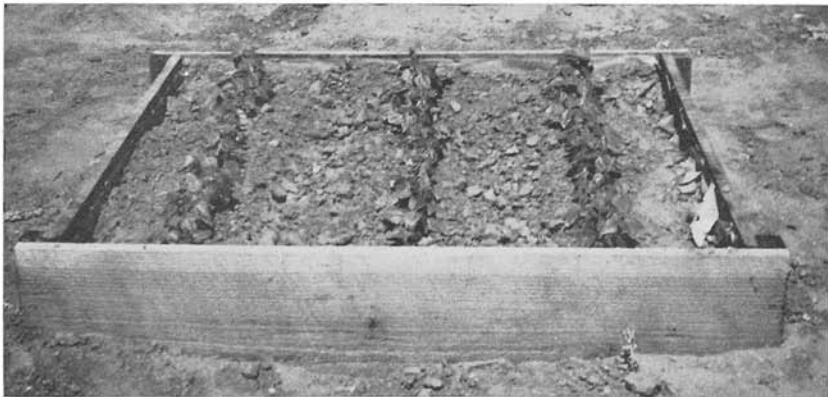


Figure 2.—Infested microplot containing legume crops.

Table 1.—Effects of legume crops on populations of *Heterodera schachtii*.

Crop	Replications					Total	Average
	1	2	3	4	5		
Alfalfa	260 ¹	122	238	381	196	1,197	239.4
Clover	196	397	676	188	205	1,662	332.4
Navy bean	797	504	554	646	412	2,913	582.6
Pea	163	835	488	884	750	3,420	684.0
Pole bean	752	320	178	1,077	1,203	3,530	706.0
Significance LSD .05							354.4

¹ Figures listed are average numbers of larvae per gram of roots of sugar beet.

Beets were thinned to 20 plants per microplot on March 14, 1963, and harvested and weighed on October 2, 1963. Soil samples taken on October 10, 1963, were again oven dried, weighed, and processed to recover cysts.

Results and Conclusions

Soil samples removed from microplots after legumes were grown for 2 seasons averaged 27.9 cysts per 100 grams of soil. This number was about 43 percent of numbers of cysts present at the beginning of the test, but significant differences between legume crops were not apparent.

Data from the larval counts (Table 1) indicated that alfalfa or clover reduced populations of sugar beet nematode larvae significantly more than did beans or peas. However, the nematode-trapping effect of these crops was not sufficient to affect subsequent population increases appreciably when sugar beets were grown. Samples taken after beets were harvested contained an average of 128.6 cysts per 100 grams of soil with no significant differences between treatments. Under the conditions of this

test, enough larvae remained to increase the population more than 2.6 times when beets followed legumes.

Since alfalfa gave the greatest reductions of nematode populations, this crop may be particularly suited to use in rotations on nematode-infested soil. The data indicate that further experiments with alfalfa and beans in rotation studies are warranted.

Literature Cited

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