Status of Crop Sequences Related to Heterodera Schachtii on Sugar Beets

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Introduction

The sequence of crops and the frequency of susceptible crops are a major factor in the population buildup of *Heterodera schachtii* Schmidt, 1871. Study and experience show that at least a four years' rest from sugar beets or other susceptible crops is required in rotation to reduce the nematode population to a level where the cultivation of a crop of sugar beets is profitable.

Procedure

The Beet Sugar Development Foundation initiated a study of the incidence of nematodes in sugar beet production.[2] Samples of soil and sugar beets were collected from 35 counties in the

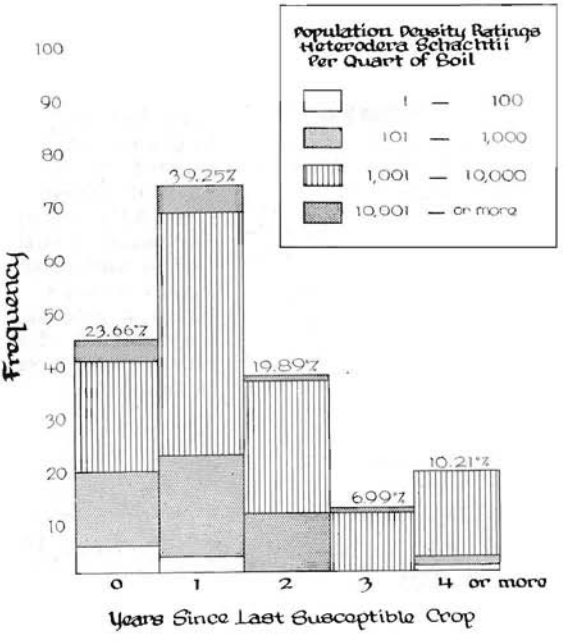

Figure 1.—The frequency of *Heterodera schachtii* soil population density ratings in relation to the years in which the last susceptible crop was grown with percentages of infested fields planted to a host crop for each year.

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states of California, Colorado, and Michigan. A total of 2,072 sugar beet and soil samples from 273 fields were examined for the presence of plant parasitic nematodes. Infestations of *H. schachtii* were found in 205 of the fields. A detailed description of the procedures employed have been reported previously (1).[3]

Results and Discussion

The data presented in Figure 1 show that growers are not practicing satisfactory crop rotations for the suppression of damage inflicting levels of *H. schachtii* populations. Of the fields for which a cropping history was available, 44 fields, or 23.66 percent, had no rest since the last susceptible crop; 73 fields, or 39.25 percent, had one year between susceptible crops; a two-year period between susceptible crops occurred in 37, or 19.89 percent of the fields; 13 fields, or 6.99 percent, had three years between susceptible crops. The generally recommended four or more years' rotation between susceptible crops was followed in 19, or 10.21 percent of the infected fields.

Graphic presentation of the years in which susceptible crops were grown is given in Figure 2. The year 1956 was naturally

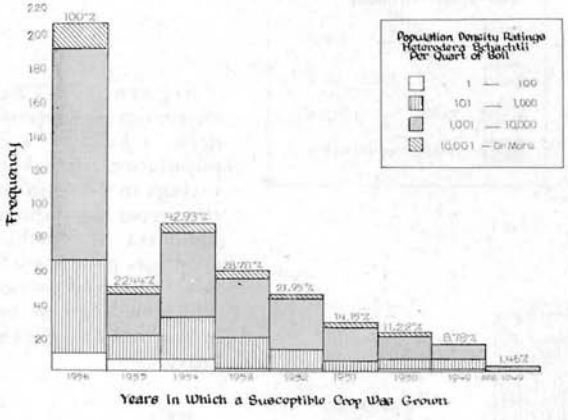

Figure 2.—The frequency of fields planted to a host crop of *Heterodera schachtii* showing population density ratings and percentages of fields planted to a susceptible crop in each of the several years covered in the study.

the high point as only sugar beets were sampled. If proper rotations were being practiced the bars should drop to zero at 1955 then not ascend again until 1951.

Of the fields planted to sugar beets in 1956, 22.44 percent were planted to a susceptible crop in 1955. Percentages for other years are as follows: 1954—42.93 percent, 1953—28.78 percent, 1952—21.95 percent, 1951—14.15 percent, 1950—11.22 percent, and 1949—8.78 percent.

[3] Numbers in parentheses refer to literature cited.

When the average *H. schachtii* population density is plotted against the years since the last susceptible crop and a curve estimated, the fourth and fifth year population densities are approximately 145 and 100 larvae per quart of soil respectively

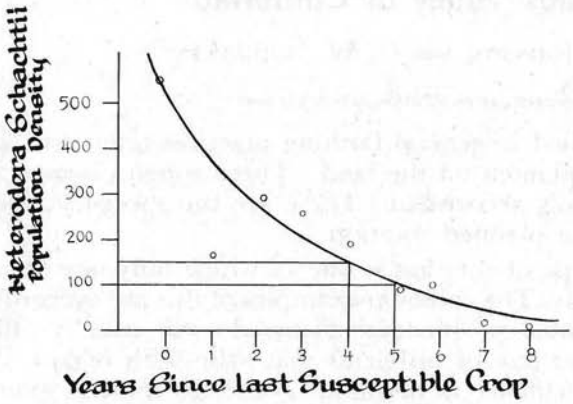

Figure 3.—The average of 205 sugar beet field *Heterodera schachtii* soil larvae populations at midseason correlated with the years since the last susceptible crop was grown.

(Figure 3). These larvae population densities reflect the infective potential of the larval population density at planting and the larvae that hatched in response to a sugar beet stimulus. Since the samples were taken at approximately midseason, these larvae hatched from eggs deposited in matrix from the current generation of females or from cysts of previous years.

The initial potential infective larval population would be difficult to estimate from these midseason population densities. The 145 and 100 larvae per quart of soil population density estimates would give at midseason a possible infective potential of 3,770 and 2,600 larvae per sugar beet respectively. These figures illustrate why a second sugar beet crop should not follow a successful yield on nematode infested soil without a proper period of rotation.

Summary and Conclusions

Growers of sugar beets in California, Colorado, and Michigan are not practicing satisfactory crop rotations for the minimum control of *H. schachtii*. Only 10.21 percent of the infested fields studied had received the generally recommended four or more years' rotation between susceptible crops.

Literature Cited

(1) CAVENESS, FIELDS E. 1958. The incidence of *Heterodera schachtii* soil populations in various soil types. Jour. Amer. Soc. of Sugar Beet Tech. X (2) :177-180.