

Research Report

Sugarbeet Conference, Fort Collins, Colorado

February 5, 6, 1974

Prepared by Arnold E. Steele, January 8, 1974

- A. Location of Project: Western Region
Northern California-Nevada Area
U. S. Agricultural Research Station
Salinas, California
- B. Work Reporting Unit Title: Control Nematodes--Field Crops
- C. Work Reporting Unit: 16080
- D. SMY's for Past Year at Location: 1 SMY
- E. Names of Scientists in Project at Location: Arnold E. Steele
- F. Mission of Research:

To develop information on the taxonomy, biology and pathology and host range of nematodes attacking sugarbeet and vegetables; methods of evaluating and measuring nematode susceptibility, resistance and tolerance of plant species, cultivars and breeding lines to plant parasitic nematodes; interactions of nematodes and other plant diseases; chemical and cultural methods for control of nematodes of sugarbeet and vegetables.

- G. Objectives of Research:

To investigate the taxonomy, biology and host-parasite relationships of nematodes attacking sugarbeet and vegetables, to measure quantitatively and qualitatively susceptibility, resistance and tolerance of plants to nematodes; to determine the effects of various cultural practices on population dynamics of nematodes; to evaluate the effects of chemicals on hatching, emergence, penetration and development of nematode larvae in sugarbeet and vegetables by laboratory, greenhouse and field investigation.

- H. Research Accomplishments:

Host-range studies established that of 283 genera and 535 species reported, 218 species within 95 genera were hosts. Microplot studies established that growing certain legumes significantly decreased soil populations of the sugarbeet nematode. A biotype of the sugarbeet nematode which increased 194.6 fold on tomato was isolated. Of six non-host plant species tested, all were invaded by larvae of the sugarbeet nematode. Experiments established that the sugarbeet nematode can develop and reproduce on cut surfaces of tap root of large-rooted host plants. All stages of male sugarbeet nematode

were found external to parasitized sugarbeet roots. Within the temperature range of 49-94 C, the minimum lethal temperature was proportional to the log times of treatment. Cumulative hatch from cysts is proportional to the log of the concentration of sugarbeet root diffusate. The hatch factor in diffusate is not affected by freezing or drying but activity is slowly lost by boiling.

I. Impact of Research Accomplishments on Science and General Public:

Information on host-range calls attention to numerous weed host species in beet growing areas and expands the list of known susceptible wild Beta species and provides a basis for cultural control practices. Studies which established that physiologically distinguishable biotypes of sugarbeet nematode occur should be of significant impact to development of resistance breeding programs. Thermal death curve for the sugarbeet nematode provides information for developing control methods using heat sterilization. In vivo culture of the sugarbeet nematode on root fragments suggests that the nematode may increase on post-harvest root debris. Investigations of factors influencing the development and population dynamics of the Heterodera schachtii contribute to the general knowledge of the biology of this nematode.

J. Obstacles to Achieving Objectives:

Efforts to find genetically transmissible nematode resistance have not yielded a source of resistance in Beta vulgaris. Exploration of the nature of resistance of crop plants to sugarbeet nematode and progress in isolation and identification of hatch factor is limited by inadequate staffing of professional and technical personnel. Chemical control of nematodes of sugarbeet is not yet economically feasible in California.

K. Future Plans and Needs:

Present studies on the qualitative and quantitative evaluation of resistance in trisomic and diploid interspecific hybrids and in tomato, chemical control of nematodes of sugarbeet, and attempts to isolate and identify the hatch factor in sugarbeet will be continued. Cooperative investigations into the chemical nature of resistance, and isolation and evaluation of nematicides of plant origin will be initiated if these projects can be adequately funded. Reproductively isolated populations obtained from widely separated foreign and domestic localities will be investigated for occurrence of resistance breaking biotypes.