Sugar-Beet Nematode

identification and recommendations for control of the pest in California fields

D. J. Raski and M. W. Allen

The only control for the sugar-beet nematode—that is known to be effective in California—is a four-point program based on crop rotation.

The recommended control measures are rotation with nonsusceptible crops; clean cultivation to avoid weed hosts of this pests; early planting to establish the beets before the attacks begin, and the protection of uninfested land by preventing the movement of soil from one field to another.

In fields with moderate infestation the usual recommendation is to plant sugar beets once in four years with three years of nonsusceptible crops intervening. This length of time is necessary because the larvae can persist for years in the soil and because each year only a portion of the larvae hatches when no susceptible plants are present.

Eradication is not possible under such a program but the number of viable eggs remaining in the soil after a three year rotation is reduced to a point where beets can be grown without serious injury. It is not good practice to grow two successive crops of sugar beets on land that has just come out of rotation. Severe damage will result in the second year.

Crops not attacked by this nematode and that can be used in a rotation program include carrots, beans, tomatoes, onions, celery, alfalfa, peas, potatoes, clover, corn, wheat, barley, oats and any not specifically mentioned as hosts.

Host Crops

The sugar-beet nematode is able to develop on a number of other crops besides sugar beet. Such host crops reported in this country include mangel-wurzel, table beet, cabbage, cauliflower, rape, turnip, rutabaga and radish.

Experiments indicate that spinach also may serve as a susceptible host and adult female nematodes full of eggs have been reared on this host. Preliminary work in California has shown the nematode also capable of developing to the adult stage on at least one variety of tomato. However, it has not been definitely established that they are able to reproduce and multiply on this host.

The host crops sometimes may be seriously damaged if grown on heavily infested soil and should not be included in any program of rotation designed to control this nematode.

Host Weeds

Some weeds serve as suitable hosts for sugar-beet nematode and may be important at times in maintaining them over periods when nonsusceptible crop plants are grown. These weeds include saltbrush, mustards, lambsquarters, purslane and dock.

In a rotation program special effort should be made to eliminate susceptible weed hosts.

Another very important factor in reducing the severity of attacks on infested land is early planting.

This enables the beets to become established before the nematodes attack in large enough numbers to cause serious reductions in yield.

Once established in a locality the nematodes are further distributed by irrigation water, farm implements, on the feet of livestock and by moving soil from one field to another.

The early practices of carrying tare dirt back from the factories to the fields and of running waste waters from the sugar factories out over the fields are undoubtedly important factors in the present widespread distribution of the sugar-beet nematode.

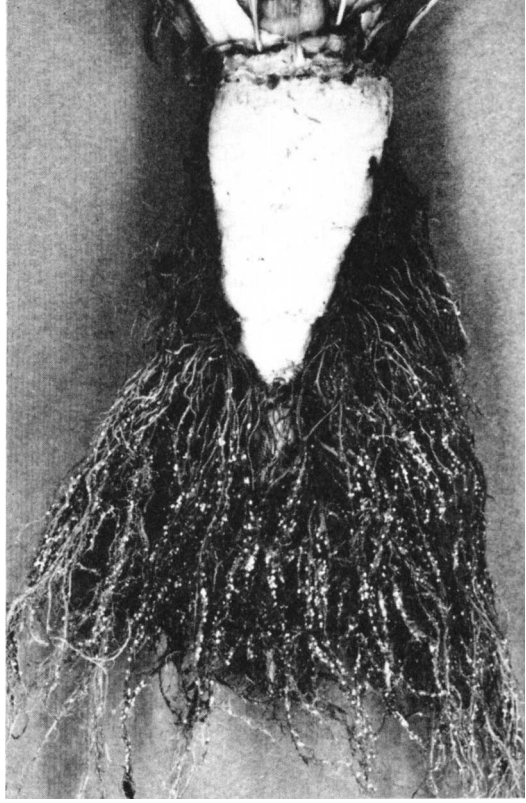
Identifying Symptoms

Field symptoms usually show a spotted distribution where failure of the beets results in small bare spots. In some cases, entire fields may be severely damaged.

Lightly infected plants may show no symptoms but plants more heavily infected will not make thrifty growth and often are undersized. Wilting on hot days—which may be due to other severe root damage or to lack of adequate moisture—is also a common symptom of sugar beets infected with this nematode.

The roots of heavily infected beets usually present a hairy appearance caused by the production of numerous lateral rootlets which are in turn attacked and killed by the nematodes.

Mature white female nematodes and brown cysts—which are dead females containing eggs—can be seen readily with the unaided eye. The females attached to the roots appear as tiny, white objects which are lemon-shaped and smaller than the head of a pin.



Heavily infected sugar-beet root showing hairy appearance. The small white bodies are mature female nematodes attached to the rootlets.

Fields can be checked for infestation by carefully digging some of the plants and examining the roots for the presence of the female nematodes.

Fields in which no host plants are growing may be checked for nematodes by thoroughly mixing a sample of the soil in a glass of water. Many of the brown nematode cysts will float to the top and collect on the sides of the glass along with other debris.

The cysts appear as shiny, brown lemon-shaped objects that may be confused with weed seeds but can be distinguished easily with a little practice. The cysts can be crushed whereas the weed seeds are hard and firm.

Cysts Resistant

The nematode survives the winter and other periods of adverse conditions in the egg stage inside the brown cyst formed by the dead body of the adult female.

The thick-walled cyst serves as a protective shell for the enclosed eggs and increases their resistance to control methods.

When temperature and moisture conditions are favorable the larvae hatch and emerge from the cyst. If no suitable host plants are present only a few larvae will hatch from the cyst each year for five or six years or more.

Attempts at chemical control of the

Continued on page 16

PRUNING

Continued from page 11

or towers in some districts. It seems practical to do some cutting back of limbs to allow passage of the equipment, as some growers are now doing, provided too much fruiting area does not have to be sacrificed.

In future plantings trees may well be spaced a little wider in one direction than the other to allow for mechanization. This also would help in hauling out fruit. The difficulty of operating the equipment in muddy soils may be partially answered by light weight and wide, mud-grip tires or multiple-drive wheels.

Good platform and tower equipment now being developed for pruning is also finding use in other orchard operations such as thinning, knocking and harvesting.

Rig has platform nine feet high, 7½ feet wide; slip-boards, 2" by 12", 12 feet long, iron reinforced.

Two-stage pruning platform for pears with slipboards on upper deck. Compressor is mounted on tractor.

In addition to certain savings, results show better timing of work for regularly employed crews, easier and more desirable employment for more highly skilled help, fewer troubles in labor training and management, and better control of quality work.

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ORANGES

Continued from page 4

at all involved in the small size problem as it occurs in the orchards some other factors also bear on it, especially microorganisms, soil structure and other environmental factors.

Extensive experiments are being carried on in Riverside and Ventura counties studying the effect of soil fumigation on soil organisms, the growth of trees replanted on such soil, and a search is being made for soil fumigants which can be used in orchards without harmful effects on the trees.

The symptoms of poor feeder root systems under trees producing small size fruit have been observed rather generally.

The presence of nematodes on roots of both decadent and healthy trees has been generally observed wherever citrus is grown in various parts of the world. There also are usually several other microorganisms closely associated with the nematodes.

Enlarged studies of this complex association during the past three years consider the possibility of relationship to slow decline of citrus trees which has gone hand-in-hand with small sizes. This study is important also to the problem of replanting land again to citrus.

Work is well underway studying the effect of rootstocks and varietal bud selections on fruit sizes.

A comprehensive plant breeding project also is underway to produce new varieties and to rejuvenate old varieties by means of nucellar seedlings.

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NEW PUBLICATIONS

A copy of the publications listed here may be obtained without charge from the local office of the Farm Advisor or by addressing a request to Publications Office, College of Agriculture, University of California, Berkeley 4, California.

THE PEACH TWIG BORER, by Stanley F. Bailey. Bulletin 708, September, 1948.

Written for the grower, pest-control operator and the entomologist, this bulletin describes the life history and cycle of this pest. A control program based upon the latest research information is outlined.

CONSTRUCTION OF FARM REFRIGERATORS AND FREEZERS, by James R. Tavernetti. Station Circular 386, September, 1948.

This circular suggests several designs to fit farm refrigeration needs. It discusses construction, materials, equipment and costs.

MAKING A COAT, by Ethelwyn Dodson and Frances Reis. Extension Circular 145, August, 1948.

Pictorial illustration of tailoring techniques and a step-by-step simplified work plan for construction of the garment are given in this booklet.

SUGAR-BEET

Continued from page 8

sugar-beet nematode in California have not been successful. The reasons are not known but preliminary experiments have been started in an attempt to determine whether soil conditions, or the time of treatment in relation to the stage of the life cycle of the nematode present may account for the failure of chemicals to control the nematode in California.

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