NEMATOLOGY

Work on plant parasitic nematodes at this Station is conducted in cooperation with the Division of Nematology, Bureau of Plant Industry, Soils and Agricultural Engineering, Agricultural Research Administration, United States Department of Agriculture.

Control of Root Knot by Methyl Bromide Mixtures

Previous experiments at this Station have shown that methyl bromide is a very effective chemical for control of the root-knot nematode (*Heterodera marioni*) in soil. But, as methyl bromide has a very low boiling point (40°) it is a gas at ordinary temperatures and difficult to handle and apply. Mixtures of methyl bromide with other chemicals are available commercially. One of these mixtures contains 10% methyl bromide, 67.5% ethylene dichloride, and 22.5% carbon tetrachloride, and is sold under various trade names such as Dowfume G (formerly Dowfume Br-10) and Iscobrome. The mixture is a colorless liquid which can be easily measured and is not unpleasant to handle, though prolonged breathing of the fumes must be avoided.

Tests of this material as a soil nematocide have indicated that it is effective against the root-knot nematode under Tifton, Georgia, conditions when used at the rate of about 500 pounds per acre.

In experimental work, sandy loam soil was prepared for planting, and the chemical was then applied by placing carefully measured amounts at measured intervals about 6 inches beneath the soil surface by means of a special applicator. Equally good results were obtained when 5 cc applications were placed at 14-inch intervals in staggered rows 12 inches apart or when 2.5 cc applications were placed at 10.5-inch intervals in rows 9 inches apart. Immediately after the chemical was applied, the soil was sprinkled with enough water to wet the top inch or two of soil. The purpose of this was to form a "water seal" to hold the fumes in the soil as long as possible. After treatment, the soil was allowed to remain undisturbed for one week before planting.

This treatment reduced root-knot infection in squash from an average of 66% in untreated plots to an average of less than 5% in treated plots.

Applications of 2.5 cc spaced as mentioned above require 479 pounds of chemical per acre, costing $71.85 at the present market price of 15 cents per pound. Applications of 5 cc with 12 by 14-inch spacing require 542 pounds of chemical per acre at a cost of $81.30. To this must be added the cost of application, which will vary considerably according to the facilities available.

Where the crop is to be planted in widely spaced hills, considerable saving is possible by the use of the spot treatment technique. In this procedure, the chemical is applied only to the spots on which the hills are to be placed. In trials of this method, best results were obtained by the use of a single 20 cc application followed by a water seal on about one square yard centered on the application point. Cost of this treatment is about $8.60 per 1000 hills for chemical alone.

When crops are planted in rows, it is often possible to apply the chemical only to the rows. Good results were obtained in experiments when rows were treated with 5 cc of methyl bromide mixture per foot of row. Cost of this treatment is about $2.15 per 1000 feet of row or about $25 per acre for crops in four-foot rows.

A Practical Method for the Control of Root Knot in the Home Garden

Because home gardens occupy the same space year after year and because all of the vegetables usually grown are highly susceptible to root knot, many garden plots become heavily infested with root-knot nematodes. The typical symptom of attack is conspicuous knots or galls on the roots of the vegetables. These are most easily seen on tomato, squash or cucumber roots, but may be found on other vegetables as well. On beans, they may be confused with the nodules formed by the beneficial nitrogen-fixing bacteria, but may be easily distinguished if it is remembered that root-knot galls are enlargements of the root tissue, while nitrogen nodules are attached to the side of the root and may be detached without breaking the root. Often vegetables are so heavily attacked by the nematodes that they become sickly and stunted and fail to produce a good crop.

While it is difficult to eliminate the nematodes entirely from a garden, it is possible to reduce them to a tolerable factor in the growth of the plants. Control methods are based on the fact that the root-knot nematode is unable to live indefinitely or reproduce unless it can reach a suitable plant on which to feed (generally referred to as a host plant). Also, the nematode is unable to travel more than a few feet through the soil in search of a host plant. It is obvious that, if the garden plot is kept free of host plants, the nematodes in the soil will eventually starve to death. Experiments have shown that many of the nematodes will die if the soil is kept free of host plants for one year and that none are able to survive as long as two years. As weeds and grass can also serve as host plants for the nematodes, it is seldom practical to attempt to keep a garden plot free of all vegetation for the required time.

A much better system is to occupy the soil with a cover crop which is not susceptible to attack and which will grow large enough to shade the soil and keep down weed growth. For this purpose, the only cover crop which can be recommended without reservation is *Crotalaria spectabilis.* In southern Georgia, crotalaria can be planted in early summer after the vegetables are harvested, allowed to grow until fall, and turned under. A second planting of crotalaria is made the following summer and the next spring the soil is again ready for garden. If a winter cover crop is desired, oats may be planted and turned under while still green in the spring or allowed to mature. Farther north, the rotation might start with fallow or oats in the winter, followed by crotalaria for two summers. If it is not practical to plant all of the space available to crotalaria at one time, the garden plot might be divided into three sections. The first year, the cleanest of these is used for vegetables, and crotalaria is planted in the other two. The second year, the garden is moved to the second section and the first and third sections planted to crotalaria. The third year, the last section is used for garden. In the fourth year, both the first and third sections will be available for garden, since each will have had two successive years of crotalaria. The fifth year, the whole area will have been treated and will again be ready for garden use.

While this system has the apparent disadvantage of rendering unavailable a large part of the often limited space for the growing of vegetables for several seasons, it will probably pay in the long run in increased production of vegetables from the soil which has been freed of nematodes and has at the same time been enriched with humus and nitrogen from the crotalaria.

It should be emphasized that, if rotation with crotalaria is to be a success, weeds must be kept out, for root-knot nematodes can feed on weeds as well as on vegetables. This means that the crotalaria must be planted in rows and that it will probably have to be weeded during the early stages of growth at least. If scarified crotalaria seed is available, it should be used, since it germinates better than unscarified seed.

Once the nematodes have been eliminated from a part of the garden, every effort should be made to keep them out. The most common sources of infestation are drainage water flowing from infested soil, and root debris and soil clinging to garden tools. Drainage can be controlled by a system of ditches. Garden tools can be made safe by scraping off the soil, washing the tool, and allowing it to dry. Root-knot nematodes are easily killed by dessication.

Another common source of reinfestation is plants intended for transplanting. Always examine plants for nematode galls and reject any which appear to be infected. Root-knot nematodes are not carried on seed.

There is some evidence that other species of crotalaria and peanuts may be used in the rotation schemes in place of *Crotalaria spectabilis,* in the southeastern Coastal Plain.

ROOT-KNOT-REDUCING COVER CROPS IN PEACH ORCHARDS

The experiment on root-knot-reducing cover crops in peach orchards has been continued. This experiment was designed to compare four practices as follows:

1. Root-knot-susceptible cover crops at all times. Cowpeas in summer and Austrian winter peas in winter.
2. Root-knot-resistant cover crops at all times. *Crotalaria spectabilis* in summer and oats in winter.
3. Reduction of root knot by means of clean cultivation. No cover crops and no weeds.
4. Reduction of root knot by trap crops. Several plantings of cowpeas are made each year but destroyed before the nematodes which enter the roots have time to reproduce.

Fertilization, spraying, and other practices are uniform in all sections of the experiment. Four plots, each originally containing six trees of the Elberta variety on ordinary root-knot-susceptible rootstocks, are included in each treatment.

Considerable differences in growth and yield of the trees have been observed during the five years since the planting of the orchard as is shown by the following table of averages for all trees in the experiment:

	Susceptible cover crops	*Resistant cover crops*	*Clean cultivation*	*Trap crops*
Trunk diameter increase	2.47 in.	4.32 in.	3.94 in.	4.08 in.
Yield of peaches Three crops	23.0 lbs.	133.5 lbs.	78.1 lbs.	84.7 lbs.

The most interesting comparison is shown between the susceptible cover crops and the resistant cover crops. It will be noted that the resistant cover crops have much larger and healthier trees as shown by the increase in trunk diameter and by the photographs. Also, the resistant cover crop plots have averaged more than five times as many peaches per tree as the susceptible cover crop plots. Clean cultivation and trap crop plots have been about equal, with three times as many peaches as the susceptible cover crop plots. Apparently, where nematodes are present, no cover crops at all are better than the root-knot-increasing cowpeas and Austrian winter peas used in the experiment.