ROOT KNOT NEMATODE ON POTATO

L. R. Faulkner
Assistant Nematologist
Irrigation Experiment Station, Prosser, Washington

Root-knot nematode is undoubtedly the most important nemic parasite of potato in central Washington. The species occurring here is commonly called the northern root-knot nematode. Thus far it has been found in the Yakima Valley, Columbia Basin and the Walla Walla area attacking potato, sugar beet, carrot, mint, clover, alfalfa, pig weed and lambsquarter.

On potato, root-knot infections are usually not observed until harvest or during storage since vines of infected plants do not show typical symptoms. Tuber infections are usually characterized by small raised areas giving the tuber a warty or galled appearance. By cutting across the galls small white spots, about the size of a pin head, may be observed. These spots are the swollen lemon-shaped bodies of the female nematodes and are found approximately $\frac{1}{4}$" below the tuber surface. Dark necrotic tissues may also be found and indicate the locations where males have fed or where a female has completed its cycle.

The nematode overwinters by means of eggs in roots (including weed hosts), tuber galls or in the soil. When temperature and moisture conditions are favorable for hatching, the young nematodes (or larvae) emerge and penetrate the root tips of the host plant. At this time the larvae have the typical eelworm shape and it is not possible to distinguish between the sexes. After penetration each larva establishes a feeding area near the vascular cylinder of the root. Feeding is accomplished by means of a spear-like tubular mouth part, called a stylet, which is forced into a root cell. Salivary juices are pumped into the cell and partially digest its contents. The plant juices are then pumped back through the stylet into the body of the nematode for complete digestion. The salivary juices from the nematode cause a stimulation of root cells around the feeding area. Some of the root cells increase in size while others start to divide rapidly and the characteristic gall is formed.

While feeding the larvae start to swell throughout the middle of the body. Several molts take place, i.e. shedding of the skin. It is during the last molt that sex can first be determined. The mature male reverts to the typical eelworm shape and leaves his feeding area in search of a female. Females at this time are pear-shaped. Mating takes place and eggs are produced. The eggs are deposited in a gelatinous matrix exterior to the female body. It is noteworthy that once a female has penetrated a host root and established a feeding area, she remains in the same position throughout the remainder of her life. As many as 500 to 1000 eggs may be laid by a single female. Two to three generations may be produced on potato roots and tubers during a growing season. Thus, a single fertile female would have a potential of giving rise to 20,000,000 or more infections during a growing season. Normally the second or third generations infect potato tubers.

It is difficult, if not impossible, to eradicate nematodes in an infested field. No potato varieties now known are immune. In addition to potato many crop plants and weeds are subject to attack by the northern root-knot nematode. The nematode may be spread in infected tubers or plant roots, in clumps of soil on machinery, tools and animal feet and in irrigation water.

Us of certified seed can hardly be over-emphasized. This is especially true in new areas such as the Columbia Basin. Also, care should be taken that no vegetatively propagated plants (mint, trees, etc.) which have galls on their roots are brought onto the farm.

Once an infestation has become established root-knot nematodes can be reduced in number by proper cultural practices and by soil fumigation. Crops which are harvested early in the season, e.g. small grains, are either non-hosts or limit the extent of population build-up. When fields planted to such early maturing crops are clean fallowed after harvest the nematode population declines. An application of nitrogen at this time will aid in the decomposition of straw and plant roots.

Soil fumigants have provided satisfactory means for controlling the root-knot nematode. Among these, dichloropropene-dichloropropane mixture and dichloropropene mixtures are commonly used on potato land. These chemicals are sold under several trade names and should be applied at the rates recommended by the manufacturer. The soil should be worked to a fine texture, free from lumps and undecomposed organic matter, such as straw. Soil temperature at a 6-inch depth should be between 50° and 80° F. at the time of application and soil moisture should be high enough for the soil to form a loose ball when grasped in the hand. If these soil conditions are not met, fumigation is of little or no value. Chisel applicators have been designed for application of fumigants. The chisels are spaced at 1 ft. intervals and set to inject the chemicals at a depth of 6" to 8". The applicator should be followed immediately by a drag or cultipacker to seal the soil surface and prevent rapid escape of chemicals from the soil. The amount of fumigant required for satisfactory control is dependent on soil type. Heavy soils require higher application rates than do light soils.

Soil fumigation is not recommended except where high value crops are grown. Caution should always be employed when handling fumigants. The manufacturer's recommendations on safety should be followed. It is always advisable to consult with a person having experience in soil fumigation before treating a nematode-infested field.