

STATUS OF ROOT KNOT NEMATODES IN THE COLUMBIA BASIN

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Root knot nematodes are undoubtedly the most important nematode pests of potato in the Columbia Basin. Prior to the 1965 season, Meloidogyne hapla the northern root knot nematode, was the only root knot nematode species recognized in the irrigated areas of Washington. This nematode is known to be widely spread in Grant, Adams, and Franklin Counties where it was probably introduced by infected potato seed and mint planting stock. Host range studies have shown that it may infect a wide variety of broadleaved crop and weed plants but does not reproduce on plants belonging to the grass family.

During the 1965 season, two additional root knot nematode species were found in the Quincy area, these were the southern root knot nematode, Meloidogyne incognita and Thames root knot nematode, Meloidogyne arenaria Thamesi. Insofar as the growers are concerned these nematodes differ from the northern root knot nematode in one important way, i. e. they may feed and reproduce on cereals and grasses as well as on broadleaved plants. Just how widely these nemas are distributed in the Columbia Basin is not presently known. However, their presence precludes the use of crop rotation as a means of root knot control.

Symptoms

The gross symptoms produced by these species of root knot nematodes are virtually identical. On potato symptoms are usually not observed until harvest or during storage since vines of infected plants do not show diagnostic 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, somewhat smaller than a pinhead, surrounded by brown necrotic tissue may be observed. These spots are the swollen lemon-shaped bodies of mature female nematodes and are usually found less than a quarter of an inch below the tuber's surface.

Root knot infections of potatoes in which no tuber galling occurs are also often observed. In these cases the tuber must be peeled before the characteristic necrotic areas centered by white spots can be seen. This lack of galling is probably due to soil temperature and/or the stage of tuber development at the time of infection.

Life Cycle

Root knot nematodes overwinter by means of eggs in roots (including those of weed hosts), tuber galls, or the soil. When temperature and moisture conditions are favorable for hatching the young nematodes or larvae emerge and penetrate the root tips of host plants. 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 mouthpart, called the 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 sucked back through the stylet into the body of the nematode in order to complete the ingestion. The salivary juices cause a stimulation of cells around the feeding area. Some of the root cells increase in size and coalesce while other surrounding cells divide rapidly and produce the characteristic gall. While feeding the larvae start to swell throughout the middle of the body. Several molts take place, i. e. shedding of the skin. Not until during the last molt can sex be determined. The mature male reverts to the typical eelworm shape and leaves his feeding area in search of the female. Females at this time are pear-shaped. After mating takes place, eggs are deposited in a gelatinous matrix exterior to the female's body. The female remains in her original feeding position throughout her life. Each female produces from 400 to over 1,000 eggs and two or three generations may be produced during the growing season.

Control

It is difficult if not impossible to eradicate root knot nematodes from an infested field. No potato varieties are known to be immune. In addition to potato a great many crop and weed plants are subject to attack by root knot nematodes. These nemas may be spread in infected tubers or plant roots, in clumps of soil or machinery, and apparently by irrigation water. The use of certified potato seed to prevent the spread of root knot nematodes can hardly be overemphasized. Also care should be taken that no vegetatively propagated plants (mint, trees, etc.) which have galls on their roots are brought on to the farm. A good sanitation program, including the steam cleaning of machinery which has been used in fields where known infestations occur, should be followed.

Soil fumigation has provided a satisfactory means for controlling root knot nematodes. Among the soil fumigants, the chlorinated hydrocarbons, including Telone, DD and Vidden D, are commonly used on potato land. These chemicals should be used at the rates recommended by the manufacturers. The soil should be worked to a fine texture, free from lumps and undecomposed organic matter such as straw. Soil temperature at the 6-8 inch depth should be between 50 and 80° F. at the time of application and soil moisture should be sufficient for the soil to form a loose ball when grasped in the hand. If these soil conditions are not met, fumigation may do little good. Chisel applicators have been designed for the application of soil fumigants and a number of commercial applicators are now operating in the Basin. The chisels are spaced at no more than 1 foot intervals and are set to inject the chemicals at depths of 6-8 inches. The applicator should be followed immediately by drag or cultipacker.

to provide a seal of the soil surface and prevent rapid escape of chemicals from the soil. The amount of fumigant required depends on the type of material used, the soil type, and the amount of soil humus present. Clay and organic soils require higher application rates than do light sandy soil.

Soil fumigation is not recommended except where high value crops are grown. Precaution should always be employed when handling fumigants. The manufacturer's recommendations on safety should be followed. It is always advisable to consult with your County Agent and/or other persons having experience in soil fumigation before treating nematode-infested fields.