



ONIONS ON THE left were attacked by the stubby-root nematode, severely reducing the growth. Those on the right were from a fumigated area. (Photo courtesy of H. J. Jensen.)

A Hazard to Many Arizona Crops

PARASITIC NEMATODES

E. L. Nigh, Jr.

Nematodes are considered by many scientists to be the most abundant form of life found in the animal kingdom. They are found wherever there is sufficient moisture for their development.

Some exist in soil and fresh water, feeding on primitive plants and animals, while other species are found inhabiting our seas and oceans. Little is known of their importance in the ecology of these areas and few have been studied in detail. Scientists have estimated that an acre of soil one foot deep may yield 300 to 600 million nematodes.

Prey on Man, Too

Probably the nematodes best known to us are those which are parasites of plants and animals, including man.

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EDITOR'S NOTE: This is first of two articles on nematodes and the damage which they do. The second, dealing primarily with citrus nematodes and prepared by two U. S. Department of Agriculture plant pathologists, will appear in an early issue.

More than 32 species, of which the small pin worm is an example, find human beings to be a choice food supply. None of the nematodes which attack animals can attack plants and vice-versa, although the parasites of higher animals probably arose from the lower forms that existed one time as free-living species.

The eel-like shape of most nematodes and their serpentine movements are responsible for their being called eelworms in many countries of the world. Some species deviate from the eel-like shape as they mature, and distend into bean, lemon or pear-like forms. In this condition many are often observed with the unaided eye, although the majority are so small that microscopes must be employed to see them. The size range of most plant parasitic nematodes is usually between 1/50th to 1/5th of an inch long.

Small — But Complex

While small in size, nematodes have very complex structures. They have well developed nervous, digestive, excretory and reproductive systems. While the majority are short-lived, their ability to produce great numbers of eggs assists them in surviving unfavorable climatic conditions or predation by other animals or disease.

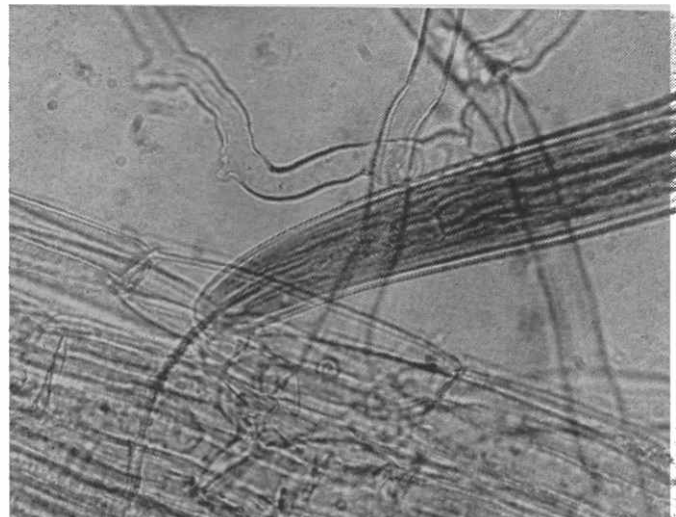
The fact that some species complete their life cycle from egg to egg in 3 to 5 days, and others are capable of laying 500 eggs or more, makes it evident that these minute forms of life can become serious pests of our crops in very short periods of time.

Identification by damage — For a matter of convenience, the common names of nematodes which attack plants, have been derived from the types of damage they cause to the host or the part of the plant attacked. Several species are capable of attacking above-ground parts, such as stems or foliage. The alfalfa stem nematode is an example of this pest, and its destruction is well known by alfalfa growers in several areas of Arizona. Research is now under way by scientists at the University of Arizona to develop alfalfa varieties which will be resistant to the nematode, and acceptable to this state's growing conditions.

The bulb nematode is a close relative of the stem nematode but attacks onions, garlic, potatoes and various

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IN GREATLY MAGNIFIED photo below, one can see the head and feeding tube (stylet) of a nematode imbedded in the root hosts. (Photo courtesy of H. J. Jensen.)



MATHEMATICS OF THE CATTLE

BUSINESS MERITS ATTENTION

(Mrs. Abbie Keith, in ARIZONA CATTLELOG, reporting on the Denver meeting of State Cattle Association Secretaries)

The total income from cattle in this country in 1962 was 8.2 billion dol-

lars. 2.6 billion was money that changed hands from one cowman to another — buying from and selling to each other. 4.4 billion was outside money — paid by beef packers, processors and consumers. 3.9 billion was income from fed cattle. 1.7 billion was paid for cattle from outside the country.

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flowers with tuberous-like roots. On onion and garlic the bulb nematode feeds in the area where the roots protrude from the bulb. They may be found by the thousands and, upon becoming dry, resemble small balls of wool. Once established in the soil they are difficult to control if a susceptible crop is grown.

Clean Seed Important

Clean seed is an important factor in reducing damage by the bulb nematode. Arizona growers interested in onions or garlic should demand certified nematode-free seed, thus reducing the need for costly soil fumigation or perhaps crop rotation. In the few cases where the bulb nematode has been found in Arizona, the infestation has been traced to contaminated seed imported from other states.

The seed nematode attacks grains such as wheat and barley and attacks grasses in the Pacific Northwest, where a large quantity of the Fescue and bentgrass seed is produced for the United States markets. It is not known to attack Bermudagrass. That, plus the high temperatures in the areas of Arizona where the production of the seed has become a major industry, probably reduces the danger of this nematode.

Most plant-parasitic nematodes attack roots, feeding both externally and internally. They may be sedentary or they may travel throughout the roots, causing destruction. Frequently, the attack by nematodes is followed by fungus and bacterial diseases. In this manner their economic importance is increased, and controlling them becomes a greater necessity.

Attack Cotton, Citrus

Two of the most common and best known nematode pests to Arizona growers are the root-knot nematode,

which has an extremely wide host range, and the destructive citrus-root nematode whose economic damage is primarily restricted to the citrus industry. Both species feed on the roots and retard growth; yellowing and decline indicate their presence.

Cotton is a favorite host of the root-knot nematode in Arizona, causing an estimated 15,000 bale reduction in the total crop. Fortunately, economic controls are available for this nematode and their use is increasing each year. In sandy fields, heavily infested, yields may be increased as much as 100% although 25% increase is sufficient to give a good economic return.

The citrus-root nematode, which is widespread throughout Arizona groves, can be effectively and economically controlled with nematocides. Excellent results have been obtained in both trial experiments and commercial treatments in the Yuma and Salt River areas. Nurserymen are now interested in insuring that their nursery stock is free of the pest, and are taking all precautions to make it possible that it may be certified "nematode-free".

Investigations are under way by the Department of Plant Pathology at the University of Arizona to determine the extent of nematode damage to other crops throughout the state. Because of their role in disease complexes, their ability to transmit virus diseases, and the direct damage caused by these microscopic eel-like worms, their study is one of the most interesting and important phases of Plant Pathology.

While the study of nematology is comparatively new, it is advancing rapidly. As a result, growers today are given a better chance to reduce their operational cost and realize more profit from their operation.

This is the 6th year we have been on the up-leg of the cattle cycle. We are approaching very close to the peak in this cycle, but nobody knows for sure just where or when that will be. There are three things you can expect:

1. You can expect no general increase in the level of cattle prices in the next few years. If you are having trouble operating now, under present prices, you'll not get bailed out by prices going up.

2. The over-all cattle numbers are so high you are no longer masters of your fate. Weather is a very unpredictable factor; a severe drought could trigger liquidation in no time at all.

3. You have effective market competition. Under conditions existing in the last few years, even with increased inventories, your situation has been favorable for you have had three buyers for your cattle:

- (a) The rancher who wanted to expand his operation.
- (b) The feedlot operator who needed cattle to justify his investment.
- (c) The butcher, or whoever slaughtered your cattle.

Cattle inventories increased 3½ million head during the last year. So long as cattlemen are in a position of increasing inventories, you have other ranchers as buyers, but when you start down the other side — when inventories start liquidating, then you will lose the rancher, and he will in fact become your competitor, for he will be selling cattle too. Oh! there might be a market for a few replacement heifers but for the most part every one will be fully stocked with breeding cattle and will need to sell.

There is no current nor immediate prospective shortage of fed beef. Beef is its own best competitor; it competes against itself, so we must have demand for beef.

In the last 20 years per capita consumption has gone from 50 pounds in the 1940's to 90 pounds in the 1960's. And this year it looks like we will push it up to 93 pounds per person. In the last 12 months choice steers ranged from 22c to 30c at some of the big markets. Nobody is sure what kind of price structure you can maintain when we push beef consumption over 90 pounds per person in this country. These conditions cause a very nervous cattle market.