Control of Nematodes in Arizona Vineyards

By Edward L. Nigh Jr.

The importance of plant parasitic nematodes in Arizona grape production has been overlooked by many growers. Seldom are problems concerning poor fruit set, lowered fruit quality and general decline of the vine attributed to these small worm-like organisms. Galls resulting from the common root-knot nematodes are easily detected and recognized.

However, damage from other species of nematodes is not as easily distinguished. Only through examination of roots and soil removed from a weakened plant is it possible to ascertain if species which penetrate deeply into the tissue or feed externally are present.

Grape roots having darkened-sunken lesions, which lack feeder roots or have a proliferation of small roots producing a "hairy-root" appearance, may well be suffering from such plant-feeding nematodes. Growers who experience difficulty in maintaining their vineyards, and who encounter such symptoms, should suspect the damage to be caused primarily by nematodes. In such cases, soil and root samples should be taken and an analysis made by a competent plant pathologist.

Types of Nematodes

Personnel of the Department of Plant Pathology, in this college, assisted by county agents throughout the state, have been taking soil samples from Arizona vineyards for the past two years. Such samples represent the principal grape-producing areas and many small home plantings. After proper processing of the samples, nematodes have been identified and our knowledge about the occurrence of these pests on grapes has been vastly increased.

All samples have yielded at least one species of nematode known to be parasitic on grapes, and it has not been uncommon to encounter as many as five species which are known to feed on grape roots. While the root-knot nematodes (*Meloidogyne* spp.) was recovered from all major grape areas, its severity was not as great as had been anticipated. This was attributed to the use of rootstocks resistant to the species, to good summer fallowing and/or effective fumigation with standard nematocides before the vines were set out.

One of the most consistent nematodes recovered has been the root-lesion nematodes — *Pratylenchus* spp. More than one species has been found, but each penetrates deeply into the roots, causing the root surface to darken. Lesions are produced which follow the course of the nematodes feeding. They are considered to cause serious injury, but their major importance may be in combination with fungi and bacteria which alone are considered to be weak pathogens of grape. There is no apparent resistance to the nematode since they were encountered on roots of all grape varieties grown commercially in the state.

External Nematodes

Nematodes which feed externally have also been found in many vineyards. These parasites attack the plant by inserting their spears into the roots and injecting saliva into them. The saliva consists of various enzymes which break down the tissue and makes it possible for the food to be taken into the nematodes in a liquid form.

The plant is able to survive when a few nematodes are involved, but this pest's ability to reproduce into populations numbering in the thousands leaves the host plant with little defense against such odds. Declining vines and poor growth response to fertilizers and irrigation result from these attacks.

The pin nematodes — *Paratylenchus* spp., stylet nematode — *Tylenchorhynchus* spp., ring nematode, *Criconemoides* spp., American dagger nematode, *Xiphanema americanum* and the needle nematode, *Longidorus elongatus* are all external feeding species recovered during the present survey. Neither the citrus nematode, *Tylenchulus semipenetrans*, nor the dagger nematode, *Xiphinema index*, which cause diseases in California grapes, have been identified in soil samples from Arizona vineyards. This should be good news to Arizona growers, since the latter species is a known vector of the fan leaf virus of grapes.

Controlling Nematode Diseases

While use of rootstocks normally is not recommended, presence of nematodes and phylloxera may warrant their consideration. Where nematode-infested vineyards are to be replanted with grapes, rootstocks of the variety Dogridge may be used with wine and raisin varieties of grapes. It should be planted in light, sandy soils, and has good root-knot resistance. For table grapes, rootstock of the Hybrid 1613 has been recommended. Harmony (1613 x Dogridge) is a recent introduction from the U. S. Department of Agriculture Horticultural Field Station, Fresno, Calif. It has shown greater resistance to root-knot nematodes and phylloxera than its parents, and is currently the recommended rootstock.

The reaction of these rootstocks to all nematode diseases unfortunately is not known, but experience under California conditions has demonstrated that such vines grow and produce well in soils infested with mixed populations of nematodes.

Chemical Control Effective

Chemical controls have been successful in many cases when the nematocides are applied correctly. In established vineyards, 1,2-dibromo-3-chloropropane (DBCP) sold under the trade names Nemagon or Fumazone, may be side-dressed or applied in the early spring or fall irrigation water. For best results, DBCP should be applied at the rate of two gallons of active material per acre (34.4 pounds of active ingredient per acre). Sufficient water should be applied to carry the material to the total root system. Some growers have applied half a gallon of active material per acre each year with reasonable success. However, such dosages on older, well established vineyards may be insufficient if soils tend to be loamy.

Growers should be cautioned to buy vines only from reputable nurserymen who will guarantee their stock to be nematode free. Vines produced on the ranch for local planting should be propagated in nematode free soil. Remember, roots on young vines are more susceptible to nematode attack

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The nation's largest cactus is vanishing from parts of its Arizona range, and botanists believe the often despised coyote might help save it.

The Saguaros stand like lonely sentinels overlooking the desert. They are so spectacular and scientifically interesting that President Hoover created the Saguaro National Monument near Tucson in 1933 for their protection.

Studies indicate that rodents are the major enemy of young Saguaros, according to the National Park Service.

In one test at the Monument, 1,600 plants were set out on the desert; within two years all but 30 were dead. Ground squirrels, wood rats, rabbits, and other rodents killed them. Wire cages placed around the plants merely delayed death; the animals tunneled under the wire to get at water stored within them.

Park Service botanist Robert M. Linn recently suggested the possibility of reintroducing predators, such as coyotes, the National Geographic Society says. But he warned that ecologists would have to determine whether coyotes might harm domestic farm animals in the area. Significantly, Saguaros are reproducing much better at Organ Pipe Cactus National Monument in southwestern Arizona, which has a sizable predator population, than in the preserve set aside for the large species.

Another problem is grazing by cattle. The young cacti aren't devoured, but they perish when cattle eat the nurse plants that shade them.

Though the Saguaro may reach a height of 50 feet, it grows very slowly in its early years. The plant needs a decade to reach the unimpressive height of one inch. Growth later speeds up, but a 30-year-old plant may be no more than three or four feet tall. A 75-year-old sapling measures perhaps 15 to 20 feet. Before dying at 200 years or so, the Saguaro may have grown as tall as a four-story building and weigh 10 tons.

The plant is an engineering marvel, especially adapted to its blazing hot environment. It can live three years without a drop of water.

Like other cacti, it has no leaves, their function being assumed by the tough, green stem covering. Spines provide appreciable shade from the desert sun and also discourage hungry desert animals.

The stem is a cylindrical framework of long vertical ribs fused at the base. This skeleton supports the pulpy tissue that stores water. During long dry spells, the plant shrinks as it uses up its water supply. When rain comes again, the stem swells like an accordion. Through its huge mat of roots, spreading out just under the desert surface, the plant may absorb a ton of rainwater at one time.

Sometimes the thirsty Saguaro drinks so much that it splits open. It is the water supply, rather than the plant itself, that primarily attracts rodents.

The Saguaro blossom is the state flower of Arizona; the cactus grows in no other state but California. Each spring buds appear in crowded clusters at the tip of each arm. The waxy white blossoms bloom for a night only, closing by forenoon.

Egg-shaped fruits mature in June and July. On ripening, the fruits split open, revealing juicy red pulp with tiny black seeds. Pima and Papago Indians still harvest the fruits. The plant was so important to the Papagos' economy that they designated Saguaro harvest time as the start of the year.

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than those of older vines, so all possible precaution should be taken to prevent their becoming infested in the nursery or immediately after being transplanted to the field.

Investigations Continue

Although our information concerning nematodes associated with Arizona vineyards has advanced, surveys are still in progress to broaden our knowledge about the diseases they cause in grapes. Investigations under controlled greenhouse conditions seek to establish the role of nematodes alone and in complexes with other pathogenic organisms. We are also studying the efficiency of nematodes as vectors of grape virus diseases.

As our information increases, it is hoped that the Arizona grape industry will benefit.

NEW WRINKLE IN PLANTS

A natural chemical in plants that makes them "grow old" faster has been isolated and identified by United States Department of Agriculture researchers. If this hormone-like substance can be synthesized, it may someday be used to defoliate plants in any stage of growth and in any weather, thin fruit at blossom stage, and eliminate after-harvest growth of perennial crops such as cotton. It might also be used to delay flowering or to keep buds dormant to escape winter damage.

SOYBEAN IN MANY ROLES

Many people wouldn't recognize a soybean if they saw it—but this farm product appears frequently in the everyday life of nearly everyone. Soybean oil, for example, is an ingredient in mayonnaise, margarine, candies, frozen desserts, sandwich spreads, salad and cooking oils, and high-protein low fat liquid diet foods. Soybean oil goes into many non-food items — soaps, shaving creams, paints, varnishes, lacquers, pharmaceuticals and vitamins, leather dressings and linoleum.