



# Orchard Site Preparation for Avoidance of Replant Problems

*G. W. Bird, Extension Nematologist, Departments of Entomology and Botany and Plant Pathology*

Orchard sites that have previously produced profitable yields may not support adequate tree growth when replanted. This condition is known as the "orchard replant disease complex." Fortunately, many replant problems can be controlled with considerable success even though the cause is not completely understood. Control measures necessary to avoid replant problems require long-term planning and an increase in initial financial investment. The avoidance of replant problems however, is essential for the establishment of uniform stands of healthy trees. This publication describes the nature of the orchard replant disease complex, and presents a detailed outline for its prevention.

Microscopic plant parasitic nematodes are of particular concern to many orchardists. Some live and feed in roots of orchard trees, while others live in orchard soil and feed on the surface of roots. Both types migrate through soil from root to root and can be moved longer distances on mechanical equipment, in rootstocks or irrigation water. Plant parasitic nematodes inhibit root development and prevent the absorption of water and nutrients necessary for good growth of young trees. The presence of nematodes also hinders the development of beneficial fungi that may be necessary for normal tree growth. Large populations of root-lesion, dagger, and ring nematodes are frequently found in young orchards with replant problems.<sup>1</sup>

## SYMPTOMS

Poor growth of replanted trees is the most obvious symptom. Above ground parts of plants are stunted, have short internodes and small leaves. Root systems are small, discolored and have poorly developed feeder roots. Trees may die after the first or second growing season, or they may remain in a severely stunted condition for many years. In some cases, surviving trees may improve with age, but they are not likely to be as large or productive as trees that grew well during the first few growing seasons. While some tree fruits have the reputation of being more susceptible to replant problems than others, most tree fruits have been shown susceptible to the problem.

## PURCHASING NURSERY STOCK

High quality nursery stock produced on nematode-free, fumigated or nematicide-treated soil is essential for the development of a healthy young orchard. Since many plant parasitic nematodes live in root tissue, they can be introduced into orchard sites in nematode-infested nursery stock produced on non-treated soil. While there are no existing certification programs to assure that nursery stock is free of plant parasitic nematodes, the small additional cost of purchasing high quality nursery stock grown on treated soil should be considered as an important first step towards the prevention of orchard replant problems.

## CAUSES

The orchard replant disease is considered to be a "complex" because no single factor has been shown to be the cause and it is usually the result of a combination of several factors. Many of the factors involved have been studied in detail. Soil structure, fertility, acidity, toxins, fungi, bacteria, nematodes, weeds and cultural practices have all been shown to play various roles in certain instances of the disease complex. All of these factors must be considered in orchard site preparation.

## ORCHARD SITE PREPARATION

### *Considerations prior to removal of old orchard*

Before removing an orchard, determine the severity of the potential replant problem as follows:

1. Examine the general top vigor and root condition of the trees.

<sup>1</sup>For additional information about plant parasitic nematodes, see Extension Bulletin E-701, "Nematodes and their Control."



2. Examine the soil structure for problems such as faulty drainage and hardpans.

3. Make a complete chemical analysis of the soil and foliage to serve as a basis for adjusting soil pH and fertility (information concerning the various soil and leaf tissue are available through the Michigan State University Soil Testing Laboratory, and may be obtained from your County Extension Office).

4. Examine the soil and roots of old trees for plant parasitic nematodes (information concerning the nematode assay available through the Michigan State University Nematode Diagnostic Service Laboratory may be obtained from your County Extension Office).<sup>2</sup>

#### *Soil preparation immediately after orchard removal.*

1. Work the soil and remove as many of the remaining roots as possible.

2. Fallow or plant a suitable covercrop (Sudan grass, sudax, rye or corn are suitable covercrops for controlling orchard replant problems).

3. Do not plant new trees until **at least one year** after removal of the old orchard.

#### *Soil preparation during fall before planting new trees.*

1. Work the soil and remove any remaining tree roots.

2. Subsoil if necessary.

3. If recommended, apply a soil fumigant or a nematicide (for fumigation, the soil temperature should be above 50°F and lightly sealed with a cultipacker or similar instrument after fumigating).<sup>3</sup>

4. Follow appropriate pH and fertilizer recommendations.

#### *Spring soil preparation and planting.*

1. Aerate soil to release the fumigant.

2. Follow appropriate fertilizer and planting recommendations.

3. Plant trees produced in nematode-free, fumigated or nematicide-treated nursery soils.

4. Plant trees in nematode-free, fumigated or nematicide-treated orchard soil.

5. Plant trees in holes designed to allow unrestricted growth and development of root systems.

#### *Maintenance of nonbearing trees.*

1. When appropriate, plant a covercrop between the rows.

2. Maintain the best possible weed control program.

3. Additional nematode control may be obtained with foliar applications of systemic nematicides, or soil treatment with a post plant fumigant or nematicide.<sup>3</sup>

---

<sup>2</sup>See Extension Bulletin E-800, "Nematode Detection."

---

<sup>3</sup>See Extension Bulletin E-154, "Fruit Spraying Calendar."