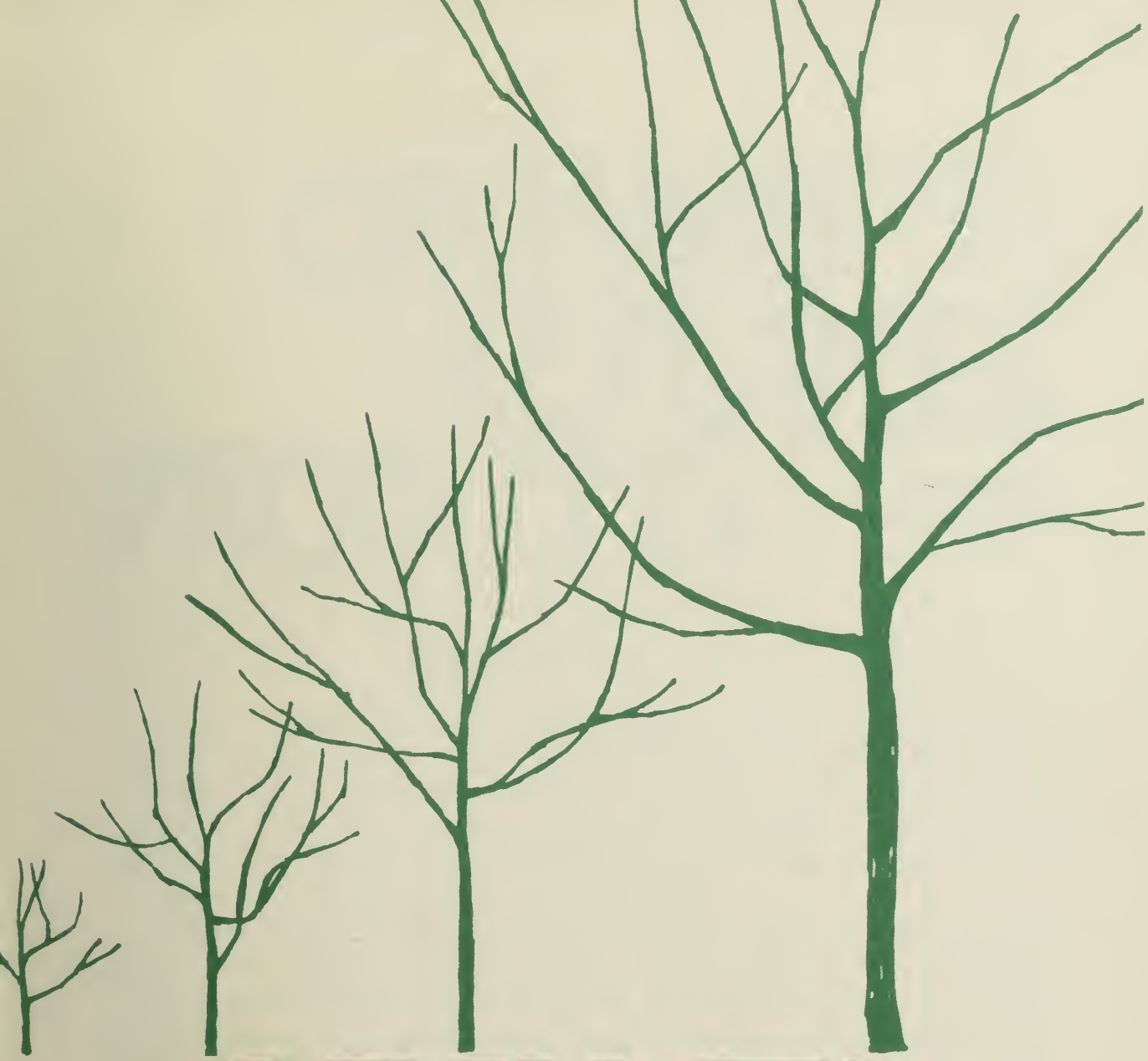

ORCHARD REPLANT PROBLEMS

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ORCHARD REPLANT PROBLEMS

G. W. BIRD[1]
Research Station, Harrow, Ontario

Land on which fruit trees have produced profitable yields will often not support adequate growth when replanted. Fortunately, replant problems can be controlled with considerable success even though their causes are not completely understood. Control measures are expensive, but are essential for long-term orchard investments. This publication explains the concept of orchard replant problems, and presents a detailed procedure for their control.

Replant problems can be persistent and specific. They can persist for at least 5 years in the absence of their host. They usually occur only when the same or closely related species are replanted. Peaches, apples, and cherries are most severely affected; plums, pears, and quince are affected to a lesser extent. Peaches are more likely to be affected if they are replanted after peaches than after apples or plums, whereas apricots and sour cherries often grow normally after peaches. Apples are more likely to grow well after cherries than after apples.

SYMPTOMS

Poor growth of replanted trees is the most striking symptom. The aboveground portions of affected plants are small and have short internodes and small leaves. Root systems are small and discolored and have few fine roots. Growth retardation is most severe during the first year after planting. If the trees survive the first year they usually improve with time, but are not likely to be as large or productive as healthy trees.

CAUSES

The cause of orchard replant problems is considered to be a disease complex. Many of the complicating factors in this complex have been studied in detail. Soil

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[1] Resigned. Revision prepared by R.N. Wensley.

structure, fertility, acidity, toxins, fungi, bacteria, nematodes, and weeds play important roles in the retardation of growth, and any of these may cause a specific replant problem. Generally, however, replant problems are caused by a combination of several of these factors.

Plant-parasitic nematodes are of particular concern to orchardists. Some species live and feed in the roots of orchard trees; other species live in orchard soil and feed only on the surface of the roots. Both types move through the soil from root to root. They can be carried longer distances on cultivation equipment, in rootstocks, or in irrigation water. Root-lesion, dagger, ring, and pin nematodes are often found in orchards that have replant problems.

Microbial decomposition of peach roots or peach root residues produces toxic substances. These toxins may add appreciably to the severity of a peach replant problem. The amount of toxins formed may make up 5% of the dry weight of roots, or even more if many roots are left in the soil. These conditions occur in old tree sites, where the amount of roots and number of microorganisms decomposing the roots are highest. Toxicity to replants is most severe during the first year after removal of old peach trees.

CONTROL

Remove all old trees from the orchard site so that potential problems can be solved before replanting. Carefully remove as many of the old roots as possible. After old trees have been removed, it is advisable to wait at least 18 months for the biotic factors to reduce to a tolerable level and for the soil condition to be suitable for replanting. Make complete analyses of soil acidity, fertility, structure, and nematode populations. Plant a cover crop to condition the soil, and allow time for old roots to decompose and for populations of microorganisms involved in the disease complex to reduce.

Preplant soil fumigation is an important aspect of the control of replant problems. Steam treatment of soil has given best results, as shown by plant growth responses, but fumigation has proved to be an acceptable and cheaper alternative. Several fumigants can be recommended by specialists (see section on fumigation). Follow closely all directions on the fumigant label. This attention will avoid most disappointing results.

When replanting old orchard soils, do not set out the young trees in the old tree sites. The amount of toxins and the number of microorganisms are lower at points midway between old rows and former tree sites. Young trees grow more rapidly and survive better when they are planted in intersites than in old tree sites.

Postplant soil fumigation may be helpful in the control of some replant problems. If growth retardation occurs several years after replanting, and if soil and root examinations show that nematodes are a cause of the problem, soil fumigation may be beneficial. However, before an entire orchard is fumigated, it is best to try the treatment in a small area.

PROCEDURE FOR CONTROL OF ORCHARD REPLANT PROBLEMS

First Summer

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

- Examine the general top vigor and root condition of the trees.
- Examine the soil structure for problems such as faulty drainage and hardpans.
- Make a complete chemical analysis of the soil to serve as a basis for adjusting soil pH and fertility (refer to your fruit extension specialist for procedure). Send samples of soil to the Department of Soil Science, University of Guelph, Guelph, Ontario.
- Examine the soil and roots of old trees for plant-parasitic nematodes (refer to your fruit extension specialist for procedures). Send samples to the Nematode Diagnostic and Advisory Service, Canada Department of Agriculture, Research Station, P.O. Box 185, Vineland Station, Ont.

First Fall

In the late summer or early fall, remove all the trees and as many roots as possible.

Next Spring

Plow the orchard and remove as many of the remaining roots as possible. Apply lime as needed and work it well into the soil. If required add fertilizer, and plant a cover crop. Consult your local fruit extension specialist for current recommendations on cover crops that are poor hosts of root-lesion nematodes.

Second Fall

In early September, plow the soil and remove any roots that remain.

In late September, cultivate the soil and work it into seedbed condition.

When soil is moist but not wet and is above 50° F (10° C), treat with a preplant soil fumigant. Immediately after the chemical is applied, seal the soil by compressing the top layer with a cultipacker.

Second Spring

Cultivate the soil thoroughly to release the fumigant.

Plant with certified trees produced in fumigated nursery soils.

Plant a cover crop between the rows.

Cultivate in the rows to prevent competition for soil moisture and nutrients during the first year.

Third Spring

To suppress growth of weeds in the row, apply a recommended herbicide. Weeds compete with trees for water and nutrients. They can also be alternate hosts for organisms involved in replant problems.

CAUTION

Soil fumigants are dangerous, and prolonged breathing of vapors is harmful. Wash contaminated skin immediately with soap and water and remove contaminated clothes or shoes. If a fumigant contacts your eyes, flush it out with water and call a doctor immediately. Store soil fumigants in clearly labeled, closed containers and keep them out of reach of children and animals. Keep storage areas dry, well ventilated, and locked.

FUMIGATION

If you suspect a peach replant problem, first consult your local fruit extension specialist. In Ontario, further information may be obtained from the Ontario Nematode Diagnostic and Advisory Service, Canada Department of Agriculture, P.O. Box 185, Vineland Station, Ont.

Information may be obtained from publications such as provincial *Fruit Production Recommendations,* and the Canadex-628 publications *Nematode Control—Some Principles of Soil Fumigation,* and *Selection and Use of Soil Fumigants,* published by the Canada Department of Agriculture.

CONVERSION FACTORS FOR METRIC SYSTEM

Imperial units	Approximate conversion factor	Results in:	
LINEAR			
inch	x 25	**millimetre**	**(mm)**
foot	x 30	**centimetre**	**(cm)**
yard	x 0.9	**metre**	**(m)**
mile	x 1.6	**kilometre**	**(km)**
AREA			
square inch	x 6.5	**square centimetre**	**(cm^2)**
square foot	x 0.09	**square metre**	**(m^2)**
acre	x 0.40	**hectare**	**(ha)**
VOLUME			
cubic inch	x 16	**cubic centimetre**	**(cm^3)**
cubic foot	x 28	**cubic decimetre**	**(dm^3)**
cubic yard	x 0.8	**cubic metre**	**(m^3)**
fluid ounce	x 28	**millilitre**	**(mℓ)**
pint	x 0.57	**litre**	**(ℓ)**
quart	x 1.1	**litre**	**(ℓ)**
gallon	x 4.5	**litre**	**(ℓ)**
bushel	x 0.36	**hectolitre**	**(hℓ)**
WEIGHT			
ounce	x 28	**gram**	**(g)**
pound	x 0.45	**kilogram**	**(kg)**
short ton (2000 lb)	x 0.9	**tonne**	**(t)**
TEMPERATURE			
degree fahrenheit	°F-32 x 0.56 (or °F-32 x 5/9)	**degree Celsius**	**(°C)**
PRESSURE			
pounds per square inch	x 6.9	**kilopascal**	**(kPa)**
POWER			
horsepower	x 746	**watt**	**(W)**
	x 0.75	**kilowatt**	**(kW)**
SPEED			
feet per second	x 0.30	**metres per second**	**(m/s)**
miles per hour	x 1.6	**kilometres per hour**	**(km/h)**
AGRICULTURE			
bushels per acre	x 0.90	**hectolitres per hectare**	**(hℓ/ha)**
gallons per acre	x 11.23	**litres per hectare**	**(ℓ/ha)**
quarts per acre	x 2.8	**litres per hectare**	**(ℓ/ha)**
pints per acre	x 1.4	**litres per hectare**	**(ℓ/ha)**
fluid ounces per acre	x 70	**millilitres per hectare**	**(mℓ/ha)**
tons per acre	x 2.24	**tonnes per hectare**	**(t/ha)**
pounds per acre	x 1.12	**kilograms per hectare**	**(kg/ha)**
ounces per acre	x 70	**grams per hectare**	**(g/ha)**
plants per acre	x 2.47	**plants per hectare**	**(plants/ha)**

Examples: 2 miles x 1.6 = 3.2 km; 15 bu/ac x 0.90 = 13.5 hℓ/ha

INFORMATION
Edifice Sir John Carling Building
930 Carling Avenue
Ottawa, Ontario
K1A 0C7

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