Plant disease - black rot of stocks

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CROWN gall is a widespread bacterial disease which affects many different plants. It is most frequently noticed on fruit trees particularly pome and stone fruits, but it also attacks grapes, berry plants, and ornamentals, including roses.

In nurseries where fruit trees or other susceptible plants are propagated, the disease often becomes very troublesome, and as infected stocks have to be rejected, it may also prove very costly. In the orchard, the effects of the disease are variable. Young trees, which are diseased when planted out, or which become infected soon afterwards, usually make unthrifty development and eventually die, whereas older trees which contract the disease may remain vigorous for years. Serious damage from the disease has been noticed more frequently here on stone fruits, such as peaches, nectarines, almonds, plums, etc., than on pome fruits, such as apples and pears.

SYMPTOMS AND CAUSE
Crown gall is caused by a bacterial organism Agrobacterium tumefaciens,

Fig. 1.—Crown gall on rose bush
which inhabits the soil and apparently occurs naturally in many areas. It can only invade plants and cause infection, however, through the medium of wounds. The presence of the bacteria within the invaded plant cells stimulates abnormal cell division, leading to infection. This explains the frequent occurrence of galls in the crown region of fruit trees or at the base of cuttings, and also the prevalence of the disease in nurseries, or other places where vegetative propagation of susceptible plants is carried out.

Galls may also develop at other places where injuries occur. They are often noticed on lateral roots which are injured by implements or insects, etc., and more rarely they are seen on the aboveground parts. In one instance heavy infection was noticed on the stems of grape cuttings following a severe rain and hail storm which presumably splashed contaminated soil on to the hail-injured stems. True crown gall should not be confused with the burr-knots commonly seen on quinces and some varieties of apples. These are non-parasitic structures which are inherent to the variety.

**CONTROL OF CROWN GALL**

**A—In the Nursery.**

1. Every effort should be made to prevent a build-up of crown gall in the nursery, and to achieve this, the rejection and early disposal by burning of all stocks or worked trees on which galls are noticed, is of paramount importance.

2. Care should be taken to avoid undue wounding of roots or crowns, and grafts should be well made to give a close fit of stock and scion. Disinfection of stocks and scions, grafting

Fig. 2.—Crown gall on young apple trees.

the development of outgrowths or galls which range in size from half an inch or so up to several inches in diameter. The galls are more or less round with a convoluted surface and, on fruit trees, they become hard and woody in texture.

Wounds made by grafting or taking cuttings provide avenues through which the causal bacteria in contaminated soil commonly enter and cause
bench and knives will also give added protection.

3. Heavily contaminated soil may be disinfected with steam, or 2% formalin solution, but owing to high cost, disinfection is only applicable to small areas, such as seed-beds or beds used for callousing cuttings, etc. For larger areas rotation should be practised so that susceptible plants such as stone fruits are alternated with resistant kinds.

4. Alkaline soils favour infection, therefore, lime should not be used unnecessarily. Applications of sulphur at the rate of 5lb. per 100ft. of row, or 400 lb. per acre have been recommended for reducing infection. When peach pits are planted for seedling stocks, the young seedling is often injured at the root-stem junction during emergence from the stony shell. This explains the common occurrence of crown gall at this site (see Fig. 3). American workers report that infection may be reduced considerably by dipping the pits in a well stirred calomel suspension (4oz. calomel in 1 gal. water) for several minutes, then allowing them to dry before planting.

B—In the Orchard.

1. All planting stock should be carefully inspected and any young trees showing galls should be discarded. Surgical removal of galls before planting will not ensure disease freedom.

2. When trees are removed because of crown gall infection, replanting should not be made unless the soil is sterilised, or replaced with clean new soil. Soil may be sterilised by watering with 2% formalin solution (= 1 gal. commercial formalin in 49 gal. water) at the rate of 1 gal. per square foot.
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3. Methods of eradicating crown gall on established trees by disinfectants are at present being investigated. Promising results have been obtained on stone fruit trees by the following treatment: Remove the soil from the base of the tree and brush the gall free of soil with a stiff brush; paint the gall and an inch wide surrounding strip of live bark with a mixture containing three volumes of methanol and one volume of sodium dinitro ortho cresylate (sold commercially as Dinoc, Norweed D. etc.). If necessary the galls should be repainted once or twice at intervals of approximately four to six weeks.

BLACK ROT OF STOCKS

By R. F. DOEPEL, B.Sc. (Agric.), Plant Pathologist

STOCKS are easily grown plants deserving of a place in every garden. They are adapted to a wide range of cultural conditions and a colourful show of flowers can be obtained by planting suitable varieties. Black rot is a serious bacterial disease (causal organism Xanthomonas incanae) of these plants and is responsible for heavy losses in some plantings.

Recorded in this State for the first time in 1945, the black rot disease has been so named by other investigators because of its similarity to the black rot disease of cabbage.

The appearance of this disease in the seedbed or garden can be attributed in many instances to the planting of infected seed.

SYMPTOMS

The symptom first noticed is a yellowing of the lower leaves which hang down and readily fall from affected plants. A distinct blackening of the stem tissues occurs at the points of attachment of these leaves to the stem. On cutting the stem open lengthways this blackening can be traced in the water-conducting tissues.

BLACK ROT OF STOCKS: Note blackening of water conducting tissues in the stems (exposed in these specimens) and its extension to the points of attachment of the leaves to the stems.
If the infection is severe, young plants may wilt and die whereas older plants become stunted although still capable of producing blooms.

CONTROL MEASURES

Losses from this disease may be reduced by the adoption of the following control measures:

1. Save seed only from healthy plants.

2. If seed of unknown origin is to be used it should first be hot water treated, for the disease organisms may be carried internally in the seed tissues. Seed to be treated is tied loosely in a cheesecloth bag and immersed for ten minutes in water maintained at a temperature of 133 to 134 degrees Fahrenheit (56 to 56.5 degrees Centigrade). Following this treatment, the bag of seed is removed and plunged into cold water. The seed is then taken out and thinly spread out to dry on newspaper in the shade.

3. Sow seed thinly in new or sterilised seed bed soil. Soil may be sterilised by treatment with 2% formalin solution (1 part formalin to 49 parts of water) applied at the rate of one half to one and a half gallons per square foot two or three weeks prior to planting. Treated soil should be covered with wet bags for a few days to prevent the fumes escaping too rapidly and should be dug over prior to planting.

4. Adopt a rotation so that stocks are grown on the same land only once in two or three years.

5. Remove and burn diseased plant remains to reduce soil contamination.

Further information on these diseases may be obtained from the Plant Pathology Branch, Department of Agriculture, Perth.

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