

LIBRARY
AGRIC. FACULTY
MOROGORO

NO. 8
LOCATOR 8 SEP 1975
CLASS 2, 3

V/12015



U.S. DEPARTMENT OF AGRICULTURE • FARMERS' BULLETIN NO. 2208

Controlling Diseases of

RASPBERRIES

and BLACKBERRIES

CONTENTS

	Page		Page
Raspberry diseases	1	Raspberry diseases—Con.	
Mosaic	1	Verticillium wilt	8
Leaf curl	2	Cane gall	10
Mild streak	3	Blackberry diseases	10
Ringspot	3	Sterility	10
Anthracnose	4	Anthracnose	10
Cane blight	5	Orange rust	10
Powdery mildew	5	Rosette	12
Fruit rots	6	Leaf and cane spot	12
Leaf spot	7	Crown gall	13
Orange rust	7	Nematodes	14
Spur blight	7	Precautions	15

Controlling Diseases of RASPBERRIES AND BLACKBERRIES

The most effective control measures for raspberry and blackberry diseases are those taken before the diseases become serious. Varieties adapted to a locality and resistant to the major diseases should be planted, if available. Plants certified as being substantially disease free by a State plant inspection service should be used.

Cultural practices that promote vigorous growth are also important in growing healthy raspberries and blackberries.

On black and purple raspberries, the tips of young canes may bend, turn black, and die.

Berries on badly infected canes are dry, seedy, or crumbly, and often worthless.

Control.—If available, plant State-certified raspberries that have been found to be free from the mosaic viruses. Do not plant healthy raspberries near diseased plants, and do not plant red rasp-

RASPBERRY DISEASES

Mosaic

Raspberry mosaic, a virus disease widespread except on the Pacific coast, causes more severe damage on black and purple raspberries than on red raspberries.

Leaves on mosaic infected canes show large, green blisters (fig. 1). Leaf tissue around the blisters turns yellowish. The leaves are abnormally small and sometimes deformed. Leaves that develop in hot weather show only faint symptoms or none at all.

Mosaic also causes progressive stunting of canes. New growth from mosaic-infected raspberries is shorter than growth of preceding seasons.



BN-22639
Figure 1.—Red raspberry leaves affected with mosaic. Curled leaves have large, green blisters.

berries near black raspberries, even when both varieties are disease free.

Remove and burn diseased raspberries; raspberries that leaf out late in spring are likely to be diseased. Certain leaf-feeding aphids spread mosaic rapidly.

Remove wild raspberries and blackberries from the vicinity of cultivated raspberries.

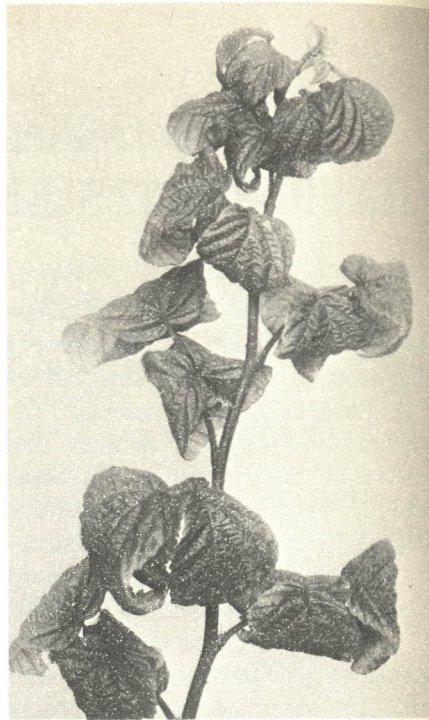
Parathion, diazinon, or malathion may be used to reduce the number of virus-carrying aphids on raspberries but will not protect plants from infection because insecticides on the plant do not act fast enough to prevent aphids from transmitting mosaic viruses. Follow directions and precautions on the insecticide label. Do not use parathion in the home garden. Before applying parathion in the field, be sure to read the "Precautions" statement carefully at the end of this publication.

Leaf Curl

Raspberry leaf curl is a virus disease that occurs most frequently in the Mountain States and from Minnesota east into the New England States.

Leaves on canes infected with leaf curl are rounded and curled. Tissue between veins of leaves is arched upward (fig. 2).

New canes are dwarfed and, each year, get shorter. The canes are yellowish at emergence, but they soon darken, become stiff and brittle, and frequently do not branch. As the disease progresses on black raspberries, canes will not bend to root at the tips.



BN-22634

Figure 2.—Leaf curl on red raspberry.

Symptoms often appear on a single cane during a growing season and may not spread to

CAUTION

If pesticides are handled or applied improperly, or if unused parts are disposed of improperly, they may be injurious to humans, domestic animals, desirable plants, and pollinating insects, fish, or other wildlife, and may contaminate water supplies. Use pesticides only when needed and handle them with care. Follow the directions and heed all precautions on the container label.

other canes until the following season.

After a cane shows leaf symptoms, its fruit usually is worthless for marketing.

Leaf curl viruses are spread by certain small leaf-feeding aphids.

Control.—Use control measures recommended for raspberry mosaic.

Mild Streak

Mild streak of black raspberries is a virus disease that occurs in the northeastern part of the United States.

Numerous purplish streaks develop on the lower parts of infected canes during summer. The streaks are faint (fig. 3) and usually less than 1 inch long.

Leaves on new canes that are infected with mild streak often are hooked and blotched.

The infected plants generally are vigorous and propagate well, but they produce small, poor-quality berries.

Control.—Get raspberry stock from a source known to be free from mild streak. Do not plant healthy black raspberries near black raspberries that are infected with mild streak.

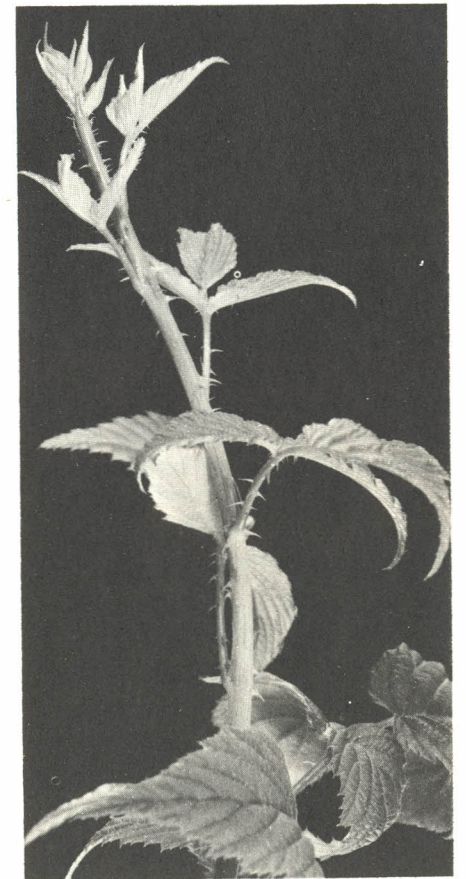
Remove wild black raspberries and blackberries from the vicinity of cultivated black raspberries.

Ringspot

Ringspot is a widespread virus disease that occurs in the major red raspberry producing areas of the Pacific Coast and in the northeastern United States.

In the spring a few leaves on infected red raspberry plants may show pale green rings that disappear as canes mature. Infected plants grow slower than normal, and become weak. Infected canes die back in the most susceptible varieties, or fruit may be crumbly in other varieties. Certain varieties show no noticeable damage when infected.

Ringspot in red raspberry is caused by tomato ringspot virus.



BN-22636

Figure 3.—Black raspberry cane showing mild streak. Streaks are purplish.

Tomato ringspot virus occurs in many hosts, including weeds, and is spread through the soil by the dagger nematodes (Certain *Xiphinema* species).

Control.—Plant stock certified to be free from tomato ringspot virus on land which is free from *Xiphinema* species. See section on control of nematodes.

Anthracnose

Anthracnose is a fungus disease that causes severe damage on black and purple raspberries throughout the United States. Although common on red raspberries, anthracnose does not seriously affect red raspberries.

Infected canes first show light-grayish spots about $\frac{1}{8}$ inch in diameter. As the disease progresses, the spots enlarge and develop purple borders and ash-gray centers (fig. 4). Badly infected canes may be girdled or cracked.

Anthracnose sometimes attacks the leaves of raspberries but it rarely defoliates the plants. Spots about $\frac{1}{16}$ inch in diameter appear on infected leaves. The spots have light-gray centers and purple margins. Leaf tissue that is infected with anthracnose may drop out, causing holes in the leaves.

Berries on canes infected with anthracnose ripen abnormally and fruit stems frequently are girdled.

Control.—Choose a planting site that has good air drainage. Plant anthracnose-free raspberries. After planting black raspberries cut

off the protruding canes (handles) at ground level.

Make two or three applications of fungicides as follows: For the first application, apply lime sulfur (1 part of active ingredient to 10 parts of water) in early spring when leaf buds begin to open and new leaves are exposed $\frac{1}{2}$ to $\frac{3}{4}$ of an inch.

Make the second application when flower buds appear and new canes are about 6 inches high. If

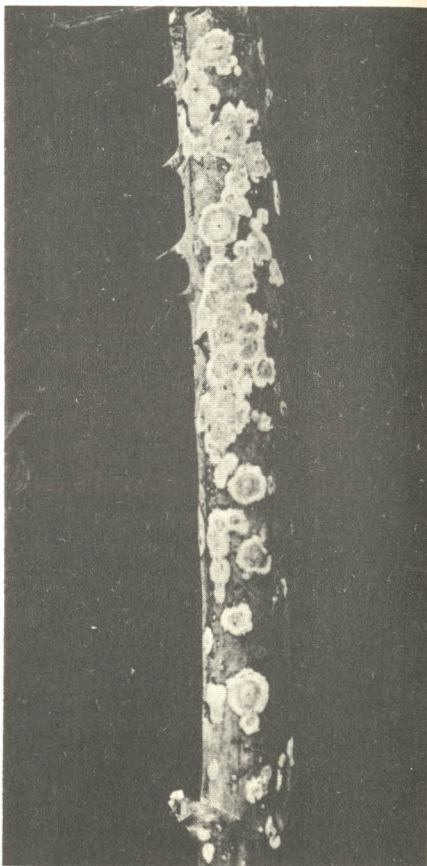


Figure 4.—Black raspberry cane showing symptoms of anthracnose. Spots have ash-gray centers and purple borders.

BN-22645

anthracnose is severe, make a third application after petal fall when new canes are 12 to 15 inches high.

Use captan at 1 pound, or ferbam at 1.5 pounds, of active ingredient per 100 gallons of water for the second and third applications.

Try to make fungicide applications before anticipated periods of rainy weather, and thoroughly cover the raspberries with fungicide.

After harvest, remove and burn fruiting canes and new canes that are badly infected.

Thin out healthy canes to allow good air drainage and keep rows free from weeds.

Remove wild raspberries and blackberries from fence rows and uncultivated land adjoining cultivated raspberries.

Cane Blight

Cane blight is a widespread fungus disease that enters raspberry canes only through wounds in the canes. Pruning wounds are frequently attacked by cane blight.

Dark-brown cankers appear on wounds and extend down the cane or encircle it (fig. 5). Lateral shoots of infected fruiting canes wilt and die in warm weather. Infected canes turn grayish in summer.

Control.—If possible, prune raspberries at least 3 days before an anticipated rain. Remove and burn infected canes, and keep rows free from weeds.



Figure 5.—Raspberry cane affected with cane blight. (Courtesy of Michigan Agricultural Experiment Station.)

BN-22652

Powdery Mildew

Powdery mildew occurs on susceptible raspberries and blackberries wherever they are grown. Infected leaves may be covered with whitish mealy growth of the powdery mildew fungus causing twisting and dwarfing of the leaves or the whitish mildew may not be apparent and the leaves may show mottled watersoaked spots. Infected shoot tips may become long and spindly (rat-

tailed) and shoot growth can be dwarfed in severe cases. Fruit may occasionally be infected with the whitish powdery mildew growth. Latham and Puyallup red raspberry varieties are very susceptible (fig. 6).

Control.—Use wide plant spacing to allow good air drainage so that plants can dry out fast after rain. Also avoid susceptible varieties in fields where powdery mildew is a major problem. Use three to four applications of lime sulfur spray (10 gallons of liquid lime sulfur in 90 gallons of water) when leaves begin to open in spring. Apply benomyl, three-fourths pound of formulation per acre, in 100 to 200 gallons of water at the onset of blossoming and at weekly intervals thereafter as needed but not closer than within 3 days of harvest.

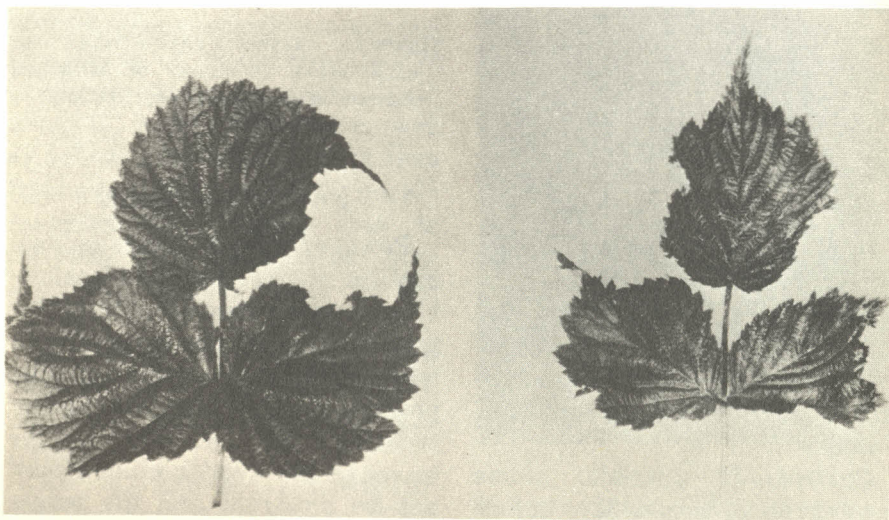


Figure 6.—Powdery mildew on red raspberry leaves. Note the light discolored areas and the curled margins. (After Fulton, 1960.)

Fruit Rots

Fruit rots are widespread and develop fastest on overripe and bruised raspberries.

Warm, wet weather at harvest favors the development of fruit rots (fig. 7).

Control.—Pick only sound, firm berries and handle them carefully to avoid bruising them. Pick raspberries early in the morning when they are cool.

Store raspberries under refrigeration (32° to 40° F.) or, if refrigeration is not available, in a place that is shady and well ventilated. Fungicide sprays aid in reducing fruit rots but are no substitute for frequent, thorough pickings and careful handling. Captan (1 pound of active ingredients per 100 gallons of water) may be used for this purpose during the period of fruit ripening and harvesting.

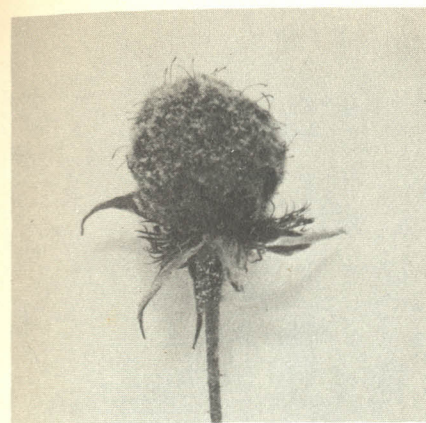


Figure 7.—Gray mold fruit rot on red raspberry.

BN-22643

Leaf Spot

Leaf spot is a fungus disease that attacks raspberries throughout the United States, but it is most prevalent in the southeastern part of the country.

Tiny greenish-black spots develop on the upper surfaces of infected leaves. As the leaves mature, the spots turn gray. Infected leaf tissue may drop out and cause holes in the leaves. Badly infected leaves fall prematurely.

Control. — Remove and burn fruiting canes after harvest. Thin out healthy canes to allow good air drainage, and keep rows free from weeds.

Apply sprays recommended for anthracnose.

Orange Rust

Orange rust is a fungus disease that attacks black and purple raspberries throughout the United States, but it is most common in

the northeastern part of the country. Orange rust does not attack red raspberries.

After entering a plant, this organism spreads throughout the entire plant.

New canes that are infected with orange rust are weak and spindly, and they lack spines.

Infected leaves are abnormally small and yellowish. Blisterlike pustules, which shed reddish-orange spores, develop on the undersides of infected leaves (fig. 8).

Symptoms on upper leaves disappear toward the end of June, but the canes are thoroughly infected and will not blossom the following year.

Control.—Plant rust-free raspberries. Remove and burn raspberries that show symptoms of orange rust in spring. Remove wild raspberries and blackberries from the vicinity of cultivated raspberries.

Thin out healthy canes to allow good air drainage, and keep rows free from weeds. Fungicide sprays and pruning are ineffective for control of orange rust.

Spur Blight

Spur blight is a fungus disease that severely damages red raspberries in the northern part of the United States.

Brown or purple spots appear at buds along infected canes (fig. 9). Tissue around the buds darkens; the buds shrivel, fail to branch, and, consequently, do not produce fruit. Buds near ground



Figure 8.—Orange rust on black raspberry. Blisterlike pustules are on undersides of leaves. BN-22635

level are affected more than buds that develop higher on the canes.

Leaves on diseased fruiting canes fall prematurely; the canes dry out and may crack.

Control.—Apply sprays recommended for anthracnose, but delay first application 7 days. Make the second application when canes are 9 or 10 inches high; and 14

days later, make the third application.

In early spring, remove and burn infected canes.

Verticillium Wilt

Verticillium wilt of raspberries is a soil-borne fungus disease that is widespread in the northern half of the United States and along the



Figure 9.—Red raspberry canes showing spur blight. Infected tissue is brown or purple. (Courtesy of Michigan Agricultural Experiment Station.) BN-22642

Pacific coast. It is particularly damaging to black raspberries.

Leaves on infected fruiting canes (fig. 10) turn yellow, gradually wither, and fall. These symptoms begin on the lower leaves and continue up the canes until the canes turn blue and gradually die.

Control.—Plant wilt-free raspberries in clean soil. Rotate raspberries with other crops, but wait at least 3 years before planting raspberries in soils that have grown potatoes, tomatoes, peppers, or egg-plants. Remove and burn diseased plants. Foliage applications of fungicides are ineffective for control of verticillium wilt.



Figure 10.—Black raspberry plant affected with verticillium wilt. (Courtesy of Michigan Agricultural Experiment Station.) BN-22637

Cane Gall

Cane gall, a bacterial disease of black and purple raspberries, occurs throughout the United States.

Tiny wartlike growths first appear on canes of infected plants (fig. 11). As the galls enlarge, the diseased canes crack, dry out, and produce berries that are small and seedy.

Control.—Plant gall-free raspberries in clean soil. Wait 2 or 3 years before replanting raspberries in locations where cane gall occurred.

Dig up and burn diseased plants. Do not injure plants when cultivating.

BLACKBERRY DISEASES

Sterility

Sterility is a symptom of a virus disease that occurs in all blackberry-growing areas of the United States. Infected blackberries usually grow more vigorously than healthy blackberries, but they either fail to set fruit or produce misshapen berries (fig. 12).

Control.—Remove and burn blackberries that fail to set fruit; dig up roots to prevent new shoots from appearing. Plant only State-certified blackberries that were propagated from fruitful stock.

Anthracnose

Anthracnose is a fungus disease that attacks blackberries throughout the United States, but the

disease is most severe in the southeastern part of the country.

Infected canes first show small purplish spots that are about $\frac{1}{8}$ inch in diameter. As the disease progresses, the spots enlarge and develop light-gray centers and brownish borders. Badly infected canes dry out and crack.

Infected leaves first show tiny purple spots. The spots gradually run together and turn white; the spotted tissue may drop out, causing holes in the leaves.

Infected berries are abnormally small and scabby.

Control.—Use control measures recommended for anthracnose on raspberries.

Orange Rust

Orange rust, a fungus disease, is common on blackberries throughout the United States.

Leaves of infected canes turn yellowish soon after they unfold in spring. As the disease progresses, undersides of the leaves show orange blisterlike pustules, which release spores.

Infected canes are spindly and clustered. Young canes that are diseased may appear to recover in late July or in early August when their upper leaves do not show rust symptoms. The canes are still diseased, however, and will not bear fruit the following year.

Control.—Plant rust-free blackberries; do not propagate cuttings from diseased plants.

Remove wild blackberries and wild black raspberries from the vicinity of cultivated blackberries.

Remove blackberries that show symptoms of orange rust; dig up roots to prevent new shoots from appearing. However, if rust symptoms appear in late August or

September, do not remove the plants, because the symptoms are caused by relatively harmless leaf rusts that commonly develop on old blackberry leaves.



Figure 11.—Purple raspberry canes showing cane galls.

BN-22641



Figure 12.—Blackberries at right are infected with sterility virus; those at left are normal. BN-22638

Rosette

Rosette, or double blossom, is a fungus disease that attacks blackberries mainly from New Jersey to Illinois and southward. Short, broomlike growths emerge along infected canes (fig. 13). Flower buds are larger, coarser, and redder than usual. Petals are wrinkled and twisted. Blossoms on infected canes fail to form fruit.

Control.—Remove wild blackberries from the vicinity of cultivated blackberries.

In Delaware and regions southward, cut *all* canes close to the ground after harvest and burn them. In northern regions, cut *fruiting* canes close to the ground after harvest and burn them;

handpick and burn infected blossoms in spring or make three applications of bordeaux mixture (8-8-100) at 10-day intervals during the flowering period.

Leaf and Cane Spot

Leaf and cane spot, a fungus disease of blackberries, is common in the Southeastern States and in the Pacific Northwest.

Spots with whitish centers and brown or purple borders show on infected leaves (fig. 14) and canes. If the disease is severe, leaves fall prematurely and canes suffer winter injury.

Control.—Remove and burn infected canes after harvest. In

Southern States, apply sprays recommended for anthracnose on raspberries. In the Pacific Northwest, spraying for leaf and cane spot usually is ineffective.

Crown Gall

Crown gall, a bacterial disease of raspberries and blackberries, is distributed throughout the United States. It is responsible for large

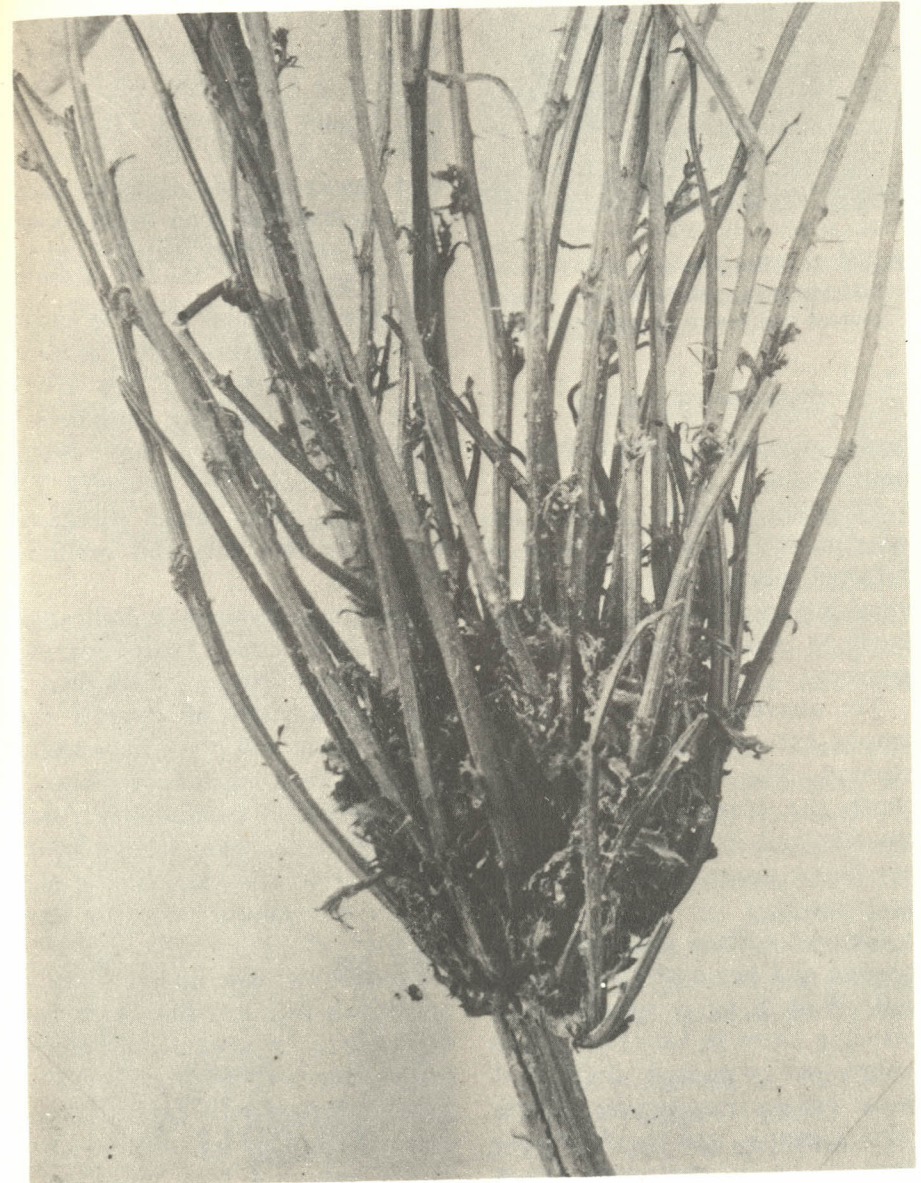
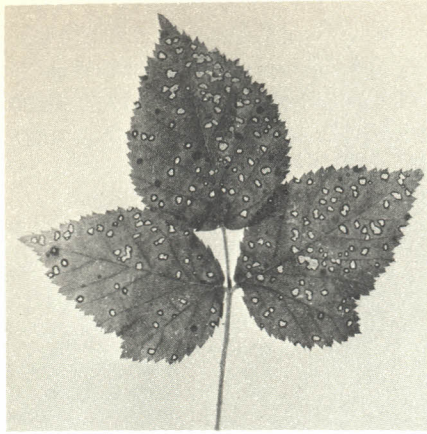


Figure 13.—Rosette on blackberry showing broomlike growths. BN-22640



BN-22633
Figure 14.—Blackberry leaves showing leaf and cane spot. Spots have whitish centers and brown or purple borders.

losses of salable nursery stock in both crops.

Wartlike growths (galls) appear on the roots and crowns of infected plants (fig. 15). Galls vary in size from that of a pinhead to several inches in diameter.

The above-ground parts of severely infected plants may be stunted. The disease organisms enter the plants only through wounds and growth cracks that are below ground level or slightly above it.

Control.—Plant gall-free raspberries and blackberries in clean soil. Wait 2 or 3 years before planting them in locations where crown gall occurred. Soils that have grown raspberries, blackberries, grapes, and tree fruits are likely to be infested with crown gall.

Dig up and burn diseased

plants. Do not injure plants when cultivating.

NEMATODES

Raspberries and blackberries are subject to attack by a number of nematode species. The most damaging types are root-lesion and dagger nematodes. Pin nematodes often occur in raspberry and blackberry plantings in high populations but good evaluations of the damage they actually cause are lacking.

Other nematodes found in raspberries and blackberries that may be locally important are root-knot, spiral, and ring nematodes. Nematode attacks on plant roots often increase the severity of other soil-borne plant diseases, especially root rots and verticillium wilt.

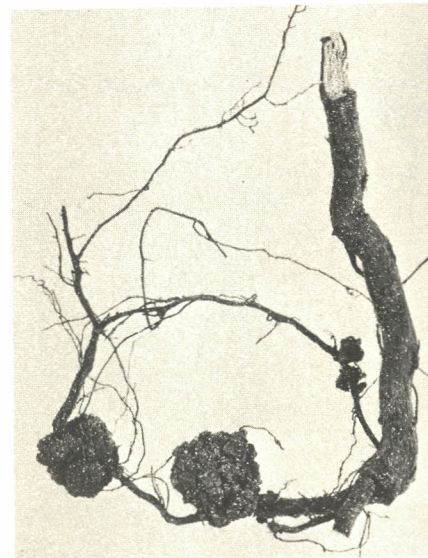
Nematode damage is indicated by spindly stands, small canes, and reduced fruit size and yields. The root systems of severely injured plants will often have galls and be rotted, matted, or reduced in quantity, particularly the smaller roots. The foliage may turn yellow and early leaf drop may occur especially during dry weather.

Control.—Clean nursery stock and clean soil are the basic requirements for nematode control in raspberries and blackberries. Resistant varieties are unavailable and satisfactory rotation programs have not been developed. Chemical control of nematodes infesting established plantings is

useful only in certain regions of the country.

Fields to be used for raspberry or blackberry nursery propagation should be tested for the presence of harmful nematodes before planting. Usually your county agricultural agent can arrange for such tests. The ground should be fumigated if these tests show a sufficient number of harmful nematodes.

Chemical treatments for the control of nematodes are best applied to the soil by injection. You may use dichloropropene, methyl bromide, dichloropropane-dichloropropene mixtures, or formulations containing these mixtures and other soil pesticides such as chloropicrin and methyl isothiocyanate. Treatments are best made in warm, moist, well-cultivated soil.



BN-22632
Figure 15.—Blackberry roots showing crown galls.

You should allow at least one month to elapse between the time of fumigation and transplanting. Only the highest quality plants known to be free from nematodes, viruses, and disease and insect pests should be used for nursery plantings.

The rates of application of these chemicals vary depending on types of formulations, uses, and methods of application. For specific materials and dosage recommendations for your area, contact your county agricultural agent and follow manufacturers' label directions.

PRECAUTIONS

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in original containers under lock and key—out of the reach of children and animals—and away from food and feed.

Parathion is highly toxic and may be fatal if swallowed, inhaled, or absorbed through the skin. This material should be applied only by persons who are familiar with its hazards, and who will assume full responsibility for proper use and comply with all the precautions on the labels.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or

other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear protective clothing and equipment if specified on the container.

If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label, and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicides from equipment, do not use the same equipment for insecticides or fungicides that you use for herbicides.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary land-fill dump, or crush and bury them in a level, isolated place.

NOTE: Some States have restrictions on the use of certain pesticides. Check your State and local regulations.



Use Pesticides Safely

FOLLOW THE LABEL

U.S. DEPARTMENT OF AGRICULTURE

Prepared by
Northeastern Region
Agricultural Research Service