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YELLOW RUST OF RED RASPBERRY

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The disease known as yellow rust of red raspberry occurs wherever raspberries are grown in Western Oregon. It is to blame not only for the damage it causes directly to the affected plants but also for the opportunity which is afforded for infection by other diseases through rust-infection spots on the canes. The yellow rust is caused by a fungus known as Phragmidium Rubi-idaei, a name given to it in Europe late in the eighteenth century. Just when this disease was introduced into the United States is not known, but it is distributed throughout the northern part of the United States. Although occurring in these other parts of the United States, it has not become of economic interest except in the western part of Oregon and Washington. Here the rust disease develops to damaging proportions, particularly in seasons when the spring rains continue late. Under such conditions the infections become so numerous on the leaves that partial defoliation in badly infected plantings is frequently observed, and often more severe defoliation is recorded. These leaf infections in the spring and summer months cause a yellowish spotting of the leaf tissues and become very dusty yellow above and below because of the millions of yellow spores of the rust fungus. Berry pickers frequently have their clothing almost covered with this yellow dust. The infected leaves, especially those lower down on the canes, turn yellow and drop off during the early summer. In seasons of severe leaf infection the disease has a devitalizing influence upon the current season's crop and upon the production of canes which will bear the crop of the following year. The actual amount of loss from this source, of course, would be difficult to ascertain.

The black winter spores, which are hardy enough to carry the rust through the severest winter weather, appear during the autumn on the under sides of the same leaves which showed the yellow stages during the summer. The under-surface of infected leaves become sooty black. These leaves drop to the ground in the fall and early winter and become the main source of infection the following year.

All parts of a plant are subject to infection during succulent growth. The leaves, leaf stems, fruiting laterals, and new canes are often found infected.

The greatest economic loss from this raspberry rust is caused by the infections on the canes. During the spring and early summer months when infection of the canes takes place, the spots on the green succulent canes do not present a serious aspect, except where they are so close together and so arranged as almost completely to girdle the stem.

Comparatively few canes wilt or die from this cause during their first year. Losses of canes from rust usually occur during the second or fruiting year. The infections near the ground are most frequent and present the most serious aspect on the canes. These usually have become deep and cankerous by the second year. If they are numerous, they not only hinder the normal rise of sap, resulting in wilting, but also produce brittleness in the canes. Many of the brittle canes are accidentally broken off when the old fruiting canes are thinned out and many more are broken out when the canes are trellised. Frequently also berries dry on the bushes before they reach maturity. In such cases the fruit of the whole cane suffers, while in the case of infections on the fruiting laterals the fruit of the individual laterals is damaged. Leaves having their leaf stems infected usually wilt and dry up during the heat of summer, particularly if they are borne on the second-year fruiting canes, the fruit robbing them of some moisture.

#### CANE BLIGHT SOMETIMES ASSOCIATED

As stated above, infection on the canes may afford opportunity for other fungi to infect through the wounds caused by the rust. The most serious of these subsequent diseases in some berry growing districts in Oregon is known as cane blight. Cane blight attacks all of the important varieties of raspberries and is found in all of the chief raspberry sections in the United States and Canada. Cumberland black raspberry and Cuthbert red raspberry seem to be injured more than other varieties. In most berry growing sections of the United States the cane blight is usually considered a relatively minor disease, and we perhaps could consider it such in Western Oregon and Washington were it not for its effective forerunner, the yellow rust. Unlike rust, the cane blight organism infects only through wounds, and the rust provides the right kind of wounds in the most propitious place, near the base of the green canes. The small oval cankers caused by the rust are enlarged by the blight organism into long cankers which extend up and down the sides of the cane. These areas are usually bluish flattened placed which become sunken and often split open on the second-year, fruiting canes. The canes become very weak in these places and two or more such cankers on one cane are ruinous to the cane. In some plantings in the lower Willamette Valley and in eastern Multnomah County over 40% of the canes have been killed out by this combination of the two diseases. The fungus causing cane blight produces two types of spores. The first are produced late in the summer and during the first winter after infection. The second type or more hardy type of spores are produced on the cankers harbored by the dead last-year's fruiting canes and old stubs.

#### CONTROL MEASURES

Rust infection on the canes occurs rather early in the year when the new canes are three to twelve inches high. Nearly all of these infections are within eight inches of the ground, more rarely higher up. At this stage of growth of the canes the bark of the short canes would be difficult to reach with a spray because the leaves well cover the canes. A pressure strong enough to reach the cane itself will also wash the soil and lodge the tender canes. For the most part, rust fungi in general are not controlled by sprays but are kept in check through the use of varieties of plants which are not susceptible to the disease. On the other hand, in England it is said that this raspberry rust is prevented by sprays such as dilute Bordeaux mixture or sulphide solutions. We have not had success with sprays for

the control of yellow rust, and their application is rather impracticable so early in the spring as would be necessary to control the rust infections on the very short canes.

In Western Oregon and Washington it would seem that the most practical and satisfactory means of control of yellow rust on the Cuthbert variety are to be found through extreme sanitary methods. These measures consist of the removal of all the sources of infection which can be eliminated. Late fall or early spring plowing to cover fallen leaves and refuse before the leaves come out offers the most practical method of control, since the chief source of infection is from the old leaves. The old fruiting canes should be removed as soon after harvest of the fruit as practicable because this will remove much of the late summer infection from the leaves. Old stubs should be removed flush with the ground and all of the canes cut in the future should be removed so as to leave no stubs. The stubs catch the infected leaves and other refuse and this dead wood and leaves in the hills become the chief source of infection during the spring. When plowing the soil should be thrown towards the rows and worked down into the hills in such a way as to completely cover all remaining leaves and stubs. When the plowing suggested above is impracticable because of wet weather all the leaves, canes, and stub refuse should be cleaned completely from the ground and burned or buried. This can be done in small garden patches.

The enforcement of all these measures in one planting will not only keep the rust down to a minimum but will also eliminate the infection courts through which cane blight gains entrance.

Almost all of our commercial plantings in Western Oregon are of the Cuthbert variety of red raspberry. This variety is extremely susceptible to yellow rust. There is being introduced, however, a new variety known as the Lloyd George. We have tested out this variety and find that it apparently is extremely resistant to yellow rust; in fact, we have never seen it infected in the field and have been unable to artificially infect this variety with yellow rust.

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