Blackberries Resistant to Wilt

certain varieties of the trailing berry resistant to Verticillium wilt may be grown in infested soil

Stephen Wilhelm and H. Earl Thomas

Boysen, Nectar and Young, the trailing blackberry varieties most widely planted in California are highly susceptible to the Verticillium wilt disease.

Verticillium wilt is perhaps best known to berry growers as the disease which follows the planting of berries on land previously cropped to tomatoes, potatoes, or cotton, crops which are commonly affected by Verticillium wilt and which serve to perpetuate and increase the causal fungus in the soil. Because these crops have been grown over large areas of the state for many years, the Verticillium wilt fungus is widespread.

The common practice of growing tomatoes in the home garden likewise serves to introduce and increase this fungus there.

Recently the Brazilian nightshade weed, *Solanum sarachoides*, has been added to the list of plants susceptible to the Verticillium fungus. Though commonly infected and quite extensively pervaded by the fungus, this widespread weed shows no outward symptoms of the disease, but is another important means of perpetuating and increasing the fungus in soils.

Most irrigated land, especially in coastal California—which includes much orchard land without a known history of potato or tomato—is infested to some extent with the Brazilian nightshade. Therefore, because the disease may be difficult to avoid with a susceptible variety, knowledge as to sources of resistance, even in brambles otherwise of little value, becomes of importance to the berry grower and breeder.

Resistance Determined

The trailing berry varieties listed below are resistant to Verticillium wilt—so resistant that they may be planted on old tomato, potato, or coton land, or even intercropped with these for the first year without sustaining the losses from the disease to be expected in susceptible varieties.

This fortunate resistance is, no doubt, attributable to the fact that present trailing blackberry varieties have come from a number of diverse parents among the several species of the large genus Rubus, among which certain of the parents still available have proved to be highly resistant. For instance, the recent Ollalie variety which is resistant, is a seedling of a cross between the Black Logan variety and the Young. Black Logan, no longer grown commercially but still available in some experiment stations, is resistant. Young is susceptible. Seedlings of Ollalie segregate for susceptibility and resistance as is shown in the illustration.

Resistance to Verticillium wilt has been determined *1*, by severe inoculations carried out in a greenhouse, of which the illustration is an example; *2*, by field tests conducted at the University of California Deciduous Fruit Field Station in Santa Clara Valley, in which a high soil potential of the Verticillium wilt fungus was maintained by repeated plantings of tomatoes, and *3*, by observations in commercial plantings on land known from previous experience to be infested with the Verticillium wilt fungus.

The wilt fungus is composed of a considerable number of strains which sometimes vary in the severity of disease produced by them in a given crop plant. For this reason, a variety may occasionally prove to be more susceptible than the ratings below would indicate. However,

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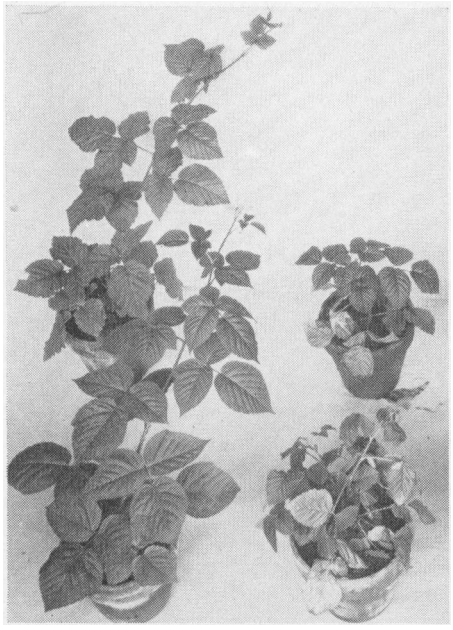
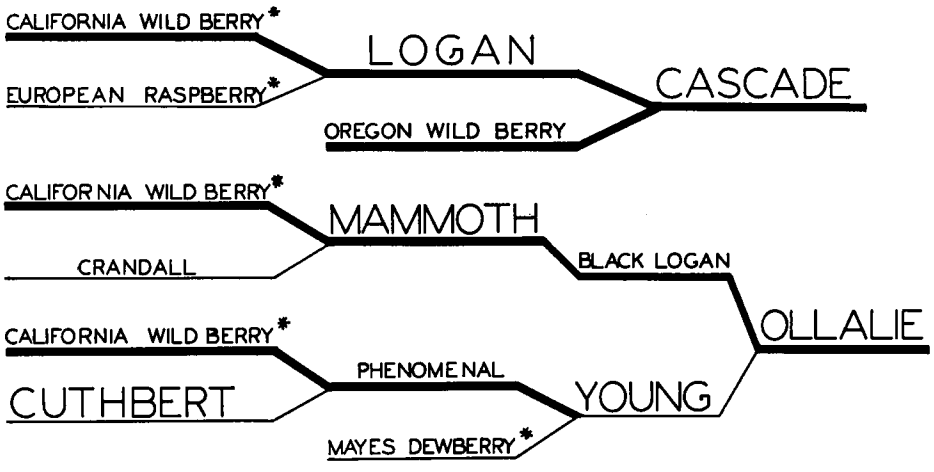


Seedlings of the resistant Ollalie—a cross between the resistant Black Logan and the susceptible Young—showing segregation for resistance and susceptibility. All have been uniformly inoculated with the Verticillium fungus in a greenhouse test. Susceptible individuals are on the right, resistant ones on the left.



Parentages of several important trailing blackberries. The *wide line* indicates Verticillium resistance; the *narrow line*, Verticillium susceptibility. Varieties in large letters except Cascade are cultivated today.

Note resistance crossed with susceptibility has given resistant individuals as in Logan, Mammoth, Phenomenal, and Ollalie, as well as susceptible individuals as in Young.

*** Indicates *R* or *S* has been inferred from behavior of closely related types.**

Infiltration Rates

effect of wetting agents in water on infiltration rates into soils

O. R. Lunt and M. R. Huberty

Laboratory and field studies indicate there is little, if any, increase in the water infiltration rate into soils because of decreased surface tension of water treated with wetting agents.

In an attempt to solve the problem of poor water penetration in some potato fields of Kern County a wetting agent was used in an irrigation basin—without causing any apparent change in the rate of water entry into the soil.

Later laboratory tests were made using a water solution containing 0.1%, 1.0%, and 10.0% of Aerosol MA. The surface tension of the liquid was not determined, nor were the measurements made under precisely controlled conditions, the water level in the columns having been maintained by inverting the bottles containing the various solutions over the column containing the soil. The data obtained showed that the wetting agent had made no significant changes in infiltration rates.

In recent laboratory studies, soils varying in texture from sands to clays were packed into tubes and the infiltrates were measured under an approximately constant head after equilibrium conditions had been established. Infiltration rates in the same soil column were measured for water and for the wetting solution.

To change from water to solution of wetting agent, or vice versa, about two thirds of the liquid was allowed to drain from the tube, then the new liquid was carefully introduced down the side of the tube. When equilibrium was again established, infiltration rates were measured with the new liquid.

In soils with high infiltration rates, structural changes in the soil column frequently developed during the tests, resulting in considerable variability of the measurements. Reproducibility of measurements was good in soils with low infiltration rates.

Deviations of infiltration rates of wetting agent solutions from those of water were not statistically significant.

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Summary of Laboratory Studies on the Effect of Various Wetting Agents on Infiltration Rates in Soil Columns.

(Based on four or more separate determinations for each wetting agent on at least two soil types.)

Wetting Agent	Concentration by Weight Per cent	Surface Tensions of Sol. in dynes/cm.	Av. % Deviation from Infiltration Rate of Water
Fire Wet	0.1	51.5	12
PR51	0.1	31.3	–29
PR78	0.1	32.2	–24
AY	0.1	48.0	25
MA	0.1	42.3	7
OS	0.1	38.7	9
Solvoid	0.1	63.0	–9
Liquinox	0.1	50.2	7
Citric Acid	0.2	...	25

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only one case of this sort was observed in these tests.

In some instances, as in the Logan and Mammoth varieties, where the exact parental clone—Aughinbaugh—of the California wild trailing blackberry has been lost, resistance tests were conducted on other individuals of the same species. The resistance or susceptibility of the lost parent was inferred from the behavior of the other members of the species tested.

Resistant Varieties

Black Logan—Similar to the better known Mammoth blackberry is now nearly extinct.

Burbank Thornless—Essentially the same as the wild thornless berry of Europe—*Rubus inermis*—but is no longer cultivated.

Cascade—A new hybrid of the resistant—*R*—Oregon wild blackberry and the resistant—*R*—Logan. Flavor is of the finest quality but the fruit is too soft for shipping. This variety is expected to succeed in most home gardens in coastal California.

Chehelem—The result of the Oregon wild blackberry—*R*—crossed with the Himalaya—*R*. It is a new bright blackberry of fine flavor and reported to be good for freezing. It has a vigorous, thorny plant which seems to have a low winter chilling requirement to break dormancy.

Himalaya—A form of the European species—*Rubus proceras*—vigorous, long-lived and productive.

Logan—A hybrid of the California wild blackberry—*R*—and Red Raspberry of Europe which is susceptible—*S*. It has a distinctive tart flavor. The plant is vigorous and has thorny and thornless forms. It is often grown without irrigation but better yields are obtained with irrigation.

Mammoth—A hybrid of the California wild blackberry—*R*—and the Crandall—*S*. Like the Logan it has vigorous, thorny and thornless forms and produces long black fruit. Generally the yields are low.

Merton Thornless—The result of crossing *Rubus rusticanus inermis* with *Rubus thyrsiger*. It is an entirely thornless, vigorous plant, late maturing and with low yields.

Ollalie—A new hybrid of the Black Logan—*R*—and the Young—*S*. It is a recently introduced, promising variety for which high yields have been reported.

Oregon Evergreen has both thorny and thornless forms of the European species—*Rubus laciniatus*—and is late maturing with low yields.

Phenomenal—A cross between the California wild blackberry—*R*—and the Cuthbert Raspberry—*S*. Somewhat like the Logan, the Phenomenal is no longer cultivated.

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The above progress report is based on Research Project No. 981.