Orchard Susceptibility of Some Apricot, Peach, and Plum Cultivars and Selections to Xanthomonas pruni

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ABSTRACT

Differences in the occurrence of bacterial spot *(Xanthomonas pruni)* were recorded on 55 apricot, 101 peach, and 55 plum cultivars or selections following a severe epidemic in 1972 at Beltsville, Maryland. Leaf infection ranged from none to severe. Serious defoliation usually accompanied extensive leaf infection. Clones with considerable resistance to bacterial spot were found in each fruit species. These offer promise as parents in breeding for increased resistance, but a rapid screening technique is urgently needed. This information may also be useful to apricot, peach, or plum growers looking for varieties with bacterial resistance.

INTRODUCTION

Extensive plantings of stone fruits are maintained by the United States Department of Agriculture at Beltsville, Maryland, to evaluate adaptation to local conditions of new cultivars and promising selections from North American breeding programs and to serve as parents in the Beltsville breeding program. Bacterial leaf spot, caused by *Xanthomonas pruni* (E. F. Sm.) Dows., varies from year to year in these plantings. In 1972 the disease occurred in epidemic proportions due to the occurrence of frequent rains and favorable temperature. The relative bacterial spot susceptibility of the clones was rated and the results are reported here.

MATERIAL AND METHOD

Trees in the test orchards are grown at 20 x 20 foot spacings with chemical weed control of a three foot strip in the row and sod between rows. The clones are represented by one to four trees, usually two trees, all of bearing age. Tree age varies from four to about fifteen years. The orchards receive standard fungicide, insecticide, and acaricide sprays, approximating commercial practice. None of these pesticides used control bacterial spot disease.

Estimates were made on each peach tree of (1) the percentage of the leaves on the tree showing bacterial spot lesions and (2) the percentage of defoliation. Because it was not believed that all defoliation was due to leaf spot, only estimates of infected leaves were made on plums and apricots. On peaches a scoring system of 5 categories was used: no disease, very mild, mild, moderate, and severe disease corresponding to 0, 1-5%, 6-15%, 16-35%, and 36-100% leaves infected respectively. Because of the difficulty in scoring the disease on apricots and plums with the same degree of accuracy as peaches the scores were modified for these plants in the mild (6-25%), moderate (26-60%), and severe (61-100%) categories. These estimates were made July 26 on peaches, August 24 on apricots, and August 29 on plums. Bacterial spot on fruit was not recorded because many trees had already matured and dropped their fruit at the time the estimates were made.

Many of the clones are promising selections from various North Ameri-

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can breeding programs. Those without a prefix are Beltsville selections, others with prefixes are selections from breeding programs identified as follows: F = Fresno, California; FV = Fort Valley (now Byron), Georgia; P = Prosser, Washington; Md = University of Maryland; SH or SHA = South Haven, Michigan; VPI = Blacksburg, Virginia; L = Louisiana; V = Vineland, Ontario, Canada; NJ = New Brunswick, New Jersey; S = Summerland, British Columbia, Canada; and PT = College Station, Texas. One hundred and one peach, 55 apricot, and 55 plum clones were evaluated.

RESULTS

Incidence of Bacterial Spot on Peaches

The peach collection contained some cultivars and selections which originated from areas where bacterial spot is not a problem. Generally the West Coast clones, such as 'Suncrest', 'Redtop', 'Flamingo', and most of the Fresno and Prosser selections showed over 16 percent of the leaves infected and were often as much as 50 percent defoliated (Table 1). However, from the same areas there were a few exceptions, such as 'Daroga Red', 'June Gold', 'Springtime', P62-92, P9-78, and 'Fayette' which showed a high degree of resistance. Conversely, some of the East Coast selections from areas where bacterial spot is commonly found, showed a high incidence of bacterial spot, presumably due to selection during years when field symptoms of the disease were not severe.

On the other hand, selections from breeding programs where bacterial spot resistance is a major objective dominate the three categories showing only mild to no infection. About one-fifth of the clones show no leaf infection. U.S. Department of Agriculture cultivars and selections from Beltsville and Fort Valley contributed three-fourths of these and about one-third of the very mild disease group which

Table 1. Rating of bacterial spot (*X. pruni*) on foliage of peach clones.

No leaf infection: Elberta/Nemaguard (1)*, Harrow 2019/RRL (0), McNeely (0), N.J. 178 (1), Ranger (0), Reliance (0), Vesper (0), Nemaguard (1), Nemaguard/Lovell (0), Nemaguard/Nemaguard (1), 53340 (1), 561774 (1), 57900 (0), 571654 (0), 582052 (2), 60607 (0), 601575 (0), 63318 (1), 65187 (1), 71059 (1).

Very Mild (1-5% leaves infected): Daroga Red (0), Earlihale (1), FV61039 (0), Sentinel (0), FV239-28 (0), Goldgem (0), Harbrite/RRL (0), Harrow 2045/RRL (0), Harken/RRL (0), Jefferson (0), June Gold (0), L3169 (0), Md 60-313 (1), Ozark (1), P9-78 (1), P62-92 (0), Redglobe (1), Richhaven (1), Raritan Rose x Ranger (1), SH 415 (0), Springtime (1), Summerqueen (1), Sunhaven (1), Washington (1), 3410 (1), 53625 (0), 56271 (0), 57914 (0), 572115 (1), 601559 (1).

Mild (6-15% leaves infected): Elberta/Okinawa (1), Fayette (1), F109-80 (1), Harrow 4219 (0), Illinois 7 (1), Johnson Elberta (0), Md 60-46 (1), P7-744 (1), 1-832 (0), 5447 (1), 9-573 (2), 325-30 (1), 56719 (1), 57677 (1), 57707 (1), 60599 (0), 541658 (1), 571138 (1), 571507 (1), 571754 (0), 571868 (1), 601746 (0), 691890 (0).

Moderate (16-35% leaves infected): Byser Seedling (1), Earligold (1), Flamingo (2), Redtop (2), F102-38 (1), FV241-4 (1), FV251-81 (1), FV306-49 (2), Harrow 2219/RRL (2), Md 60-12 (2), P2-19 (2), PO-766 (2), P5-646 (2), PO-1194 (1), Roza (2), VPI 50 (2), 325-5 (1), 7-1029 (2), 56113 (1), 59190 (2), 593902 (2).

Severe (36-100% leaves infected): F102-38 (1), FV6-826 (2), FV177-28 (1), Md 60-57 (2), Royal Hale (2), Suncrest (2), 57390 (3).

* = Defoliation rating in parenthesis: 0 = none, 1 = 1-25%, 2 = 26-50%, 3 = 51-75%, 4 = 76-100%.

showed only 1-5 percent of the leaves infected. However, several selections from these programs showed considerable bacterial spot, clearly indicating the need for better screening methods.

Incidence of bacterial spot on apricots

Apricot production is almost exclusively in western irrigated areas due to the hazards from early blossoming in Eastern States. Also, selection for new apricot cultivars has occurred primarily in these areas where bacterial spot is not a problem. These facts probably account for poor natural selection and the lack of conscious selection for bacterial spot resistance in cultivars originating in these areas. The large number of selections from the West falling into the moderate and severe disease classes Table 2) support this reasoning. However, it is also noted that occasionally a few selections such as P5-64, P8-246, and 'Newcastle' which originated in the same area fall in the very mild and mild classes.

Table 2. Bacterial Spot Rating for Apricots.

Very Mild (less than 5% leaves infected): Oklahoma 10114, P5-64.
Mild (6-25% leaves infected): Daybreak, Newcastle, P8-246, Stella, Superb, Viceroy, V51095, V60022, Wenatchee (Moorpark).
Moderate (26-60% leaves infected): F69-52, NJA-7, P4-36, Goldrich, V51043, V51166, V60011.
Severe (61-100% leaves infected): Blenril, Castleton, Deatrick, Earliril, Early Golden, F69-84, F69-85, F70-95, FV4-2757, FV4-2767, FV4-2800, FV-2994, NJA-1, NJA-13, Mandan 65-5, P2-10, P2-143, P2-185, P4-23, P4-24, P5-30, P5-45, P5-84, P7-70, P8-111, P8-233, P8-277, P63-13, P63-19, P63-30, P63-190, P63-274, Rival, S4E-55, SHA-50, Veecot, V510915.

Table 3. Bacterial Spot Rating for Plums.

Very Mild (less than 5% leaves infected): Bradshaw, Bruce, Edwards, Early Italian, Foremosa, Geneva 215, Geneva 430, Geneva 671, Geneva 731, Geneva 779, Mohawk, Geneva 799, Geneva 901, Geneva 902, Geneva 960, Geneva H-1, Geneva H-3, Geneva H-4, Geneva H-7, Great Yellow, Howard Miracle, Meredith, Myrobalan, Parson, PT20-242 (Texas), PT21-156 (Texas), PT21-202 (Texas), Shropshire Damson, Smith Late, V37012, Weatherspoon.
Mild (6-25% leaves infected): Abundance, Oneida, Geneva 929, Red June, Seneca, Stanley.
Moderate (26-60% leaves infected): Burbank, Geneva H-5, Geneva 90, Mammoth Cardinal, Ozark Premier, Oxheart, Queen Ann, Royal, Santa Rosa, Shiro.
Severe (61-100% leaves infected): Burmosa, Brilliant, Geneva 198, Methley, Redheart, Satsuma, Sierra, Stegmeier.

'Blenril', a highly susceptible variety, has proved a desirable test plant for studying resistance to bacterial spot. Typical lesions develop on leaves, fruits, and branches and considerable defoliation occurs in some years when susceptible peaches do not show marked symptoms. The use of this cultivar is suggested as an indicator of the relative level of field disease incidence.

Incidence of bacterial spot on plums

The plum collection consisted of *Prunus domestica* L clones (primarily prune-type plums) and other species (primarily *P. salicina* Lindl. or Japanese plums) listed in (Table 3). In general the *P. domestica* plums were found more resistant to bacterial spot than the other plums. Fifty-six percent of the clones fell into the very mild disease group (less than 5% leaves infected) and an additional

11% in the mild class (6-25% leaves infected).

Some of the Japanese types which are hybrids of *P. salicina* and *P. angustifolia* or other native plums, e.g., 'Bruce' and the Texas selections, appeared highly resistant to bacterial spot. Cultivars such as 'Satsuma' however, appeared highly susceptible.

DISCUSSION

Although the causal organism has been known for years and sources of partial resistance to the disease have been utilized, only limited progress is evident in increasing the resistance of stone fruits to *Xanthomonas pruni*. The ratings presented here are only estimates of the relative susceptibility of clones at one location in a single year when symptoms were expressed unusually well. Variation can be expected in their relative susceptibility at other locations and in other years. It is apparent, however, that resistance to bacterial spot exists to a considerable degree in some stone fruits. The ratings indicate that certain clones successfully used as parents in breeding programs pass on bacterial spot resistance to some of the progeny. 'Ranger', derived from open-pollination of 'Raritan Rose', a white-fleshed peach with known resistance, has transmitted resistance to some of its progeny. 'Loring', 'McNeely' and 'Sentinel', likewise, are parents of some of the resistant selections listed. An attempt should be made to ascertain the mode of inheritance of bacterial spot resistance. The rate of occurrence of individuals with acceptable levels of resistance in progenies would give guidelines for a combination of resistance with other desirable characters. Dominance of resistance, if found, would decrease the size of progenies to be evaluated.

Attempts to determine the biochemical nature of bacterial spot resistance have not been productive to date. However, techniques for assaying biochemical components developed in such studies should prove useful when more is known about the genetic basis of bacterial spot resistance.

We need a rapid screening technique similar to the method used on pears for fire blight (1). This would increase the efficiency of field plot use by eliminating susceptible seedlings before they are planted in the field.

Literature Cited

1. van der Zwet, T. and W. A. Oitto. 1973. Efficient method of screening pear seedlings in the greenhouse for resistance to fire blight. *Plant Dis. Reptr.* 57:20-24.

American Pomological Society Cites Two Members

At the annual meeting of the Society in August at Raleigh, N.C., certificates of appreciation were awarded to Dr. George M. Kessler, of Michigan State University, and to Dr. Harold P. Olmo, of the University of California at Davis.

Dr. Kessler was recognized for his distinguished service to the Society as Editor of *Fruit Varieties and Horticultural Digest* from 1955 to 1972. He also served as Secretary for a number of years and was President of the Society in 1967 and 1968.

Dr. Olmo was recognized for his contributions to the important register of new fruit and nut varieties in the United States. *The Register of New Fruit and Nut Varieties* has appeared in the form of two books of which he is co-author.