Field susceptibility of scab-resistant apple cultivars and selections to frogeye leaf spot

J. Warner[1]

The susceptibility of scab-resistant apple cultivars and selections to frogeye leaf spot, the foliage symptom of black rot caused by *Botryosphaeria obtusa* (Schwein) Shoemaker, was evaluated in a fungicide-free orchard planting from 1988 to 1990. The cultivars and selections most susceptible to frogeye leaf spot were Redfree, 0-591, 0-533, 0-664 and 0-667. These had from 6 to 50 lesions per leaf depending on cultivar and year. Cultivars and selections which had very low frogeye leaf spot ratings (less than 5 lesions per terminal shoot) included Jonafree, Richelieu, Co-op 6, Co-op 9, Co-op 12, Co-op 15, 0-638, 0-648, 0-661 and 0-662.

Can. Plant Dis. Surv. 71:2, 165-167, 1991.

La susceptibilité des cultivars de pomme resistant a la tavelure et des selections pour la tache ocellée (un symptôme foliaire de la pourriture noire cause par *Botryosphaeria obtusa* (Schwein) Shoemaker), furent evalues dans un verger sans fongicide durant les annees 1988 a 1990. Les cultivars et lesselections les plus susceptibles à latache ocelleefurent Redfree, 0-591, 0-533, 0-664 et 0-667. Ceux-ci ont montres 6 à 50 lesions par feuille selon le cultivar et l'annee. Les cultivars et les selections qui ont montre de faibles repartitions de la tache ocellee (*i.e.* moins que 5 lesions par pousse terminale) sont Jonafree, Richelieu, Co-op 6, Co-op 9, Co-op 12, Co-op 15, 0-638, 0-648, 0-661 et 0-662.

Introduction

Apple scab caused by *Venturia inaequalis* (Cke.) Wint. is the most serious disease affecting apple, *Malus domestica* Borkh., in apple growing areas of northeastern North America and may require 12 or more fungicide sprays for control. Growing cultivars resistant to apple scab eliminates the need for fungicides for scab control. However, when fungicide programs are reduced or eliminated, other diseases may become more prevalent on apple.

Black rot caused by *Botryosphaeria* obtusa (Schwein.) Shoemaker has caused serious fruit losses in southeastern United States (Jones and Aldwinckle 1990) but is not considered a serious problem in northeastern growing areas (Jones and Sutton 1984). The leaf spot phase of the disease, known as frogeye leaf spot, and the limb canker phase are more common in northeastern growing areas.

This paper reports the field susceptibility to frogeye leaf spot of scab-resistant apple cultivars, and selections derived from the Ottawa (O) breeding program and Co-op selections from the Purdue, Rutgers, and Illinois Agricultural Experiment Station Cooperative Apple Breeding Program.

[1] *Agriculture Canada, Research Branch, Smithfield Experimental Farm, P.O. Box 340, Trenton, Ontario, Canada K8V 5R5.*

Accepted for publication April 15, 1991.

Methods

A planting of scab-resistant apple cultivars and selections was established at the Smithfield Experimental Farm, Trenton, Ontario, in the spring of 1978 consisting of three trees of each cultivar and selection on each of M.26 and Ottawa 3 rootstocks. Some trees were added to the planting in later years. Trees were spaced at 2.5 x 4 m without randomization. McIntosh and Delicious, both scab-susceptible, were planted as guard trees along the periphery of the orchard. No fungicides were applied in this orchard. Insecticide and miticide sprays were applied as necessary to control insects and mites.

In late July or early August of 1988, 1989 and 1990, the three most severely infected leaves on each of 10 terminal shoots per cultivar and selection were rated for frogeye leaf spot infection. The number of frogeye leaf spot lesions per leaf was estimated using a scale of 0 to 3 (0 = no lesions; 1 = 1 to 5; 2 = 6 to 25; 3 = 26 to 50 lesions per leaf) and tr (less than 5 lesions per terminal shoot after all leaves on the shoot were examined). The mean rating for each cultivar and selection was recorded. The source of inoculum was likely from overwintering cankers on dead bark and twigs from within the orchard. Wetting periods in May and June provided suitable conditions for B. obtusa leaf infection (Arauz and Sutton 1989; Foster 1937).

Results and discussion

Frogeye leaf spot symptoms were observed on many of the cultivars and selections from 1988 to 1990, however, fruit infection from B. obtusa was not observed. Limb cankers were also observed in the orchard. The scab-resistant cultivars and selections differed in their susceptibility to frogeye leaf spot. The level of infection was generally lower from 1988 to 1990 than previously reported for 1985 (Warner 1986). The cultivars arid selections which were reported resistant to frogeye leaf spot in 1085, Co-op 15,

Table 1. Susceptibility of scab-resistant apple cultivars to frogeye leaf spot, *Botryosphaeria obtusa*, at the Smithfield Experimental Farm, 1988 to 1990.

Cultivar or selection	Leaf spot rating[x]		
	1988	1989	1990
Britegold	0	tr	1
Co-op 6	0	0	tr
co-op 7	2	1	1
Co-op 8	0	1	1
co-op 9	0	tr	0
co-op 10	0	1	1
co-op 11	tr	tr	2
co-op 12	0	0	0
CO-OP 14	1	tr	1
Co-op 15	0	tr	0
Delicious[y]	0	tr	1
Jonafree	0	0	0
Macfree	1	tr	1
McIntosh[y]	tr	tr	1
Moira	2	tr	1
Murray	0	0	2
Nova Easygro	tr	1	1
Novamac	1	2	1
0-521	0	1	tr
0-533	2	2	1
0-546	1	1	1
0-5410	tr	1	1
0-591	2	2	2
0-625	0	tr	2
0-634	0	1	2
0-637	1	1	1
0-638	0	tr	0
0-641	0	1	1
0-644	1	1	2
0-645	0	tr	1
0-648	0	tr	0
0-6410	1	tr	1
0-6413	tr	1	1
0-6414	1	tr	1
0-6415	1	1	1
0-6416	0	tr	1
0-6417	1	1	1
0-653	2	1	1
0-654	2	1	1
0-655	tr	tr	1
0-656	tr	1	1
0-661	0	tr	tr
0-662	0	tr	0
0-663	tr	1	1
0-664	1	2	2
0-667	2	1.5	2
0-669	1	tr	1
Priscilla	0	1	1
Redfree	3	2	2
Richelieu	0	tr	0
Sir Prize	0	1	tr
Trent	tr	1	1

[x] 0 = no lesions, 1 = 1 to 5, 2 = 6 to 25, 3 = 26 to 50 lesions per leaf and tr = less than 5 lesions per terminal shoot.

[y] Scab susceptible.

Jonafree, 0-661 and Richelieu, had zero or tr ratings (less than 5 lesions per terminal shoot) for frogeye leaf spot in the present study. In addition, Co-op 6, Co-op 9, Co-op 12, 0-638, 0-648, and 0-662 had ratings of zero or tr in the present study and ratings of 1 (less than five lesions per leaf) in 1985 when frogeye leaf spot infection was more severe. The most susceptibile cultivar and selection to frogeye leaf spot were Redfree and 0-591, respectively. Ratings of 2 or 3 (6 to 50 lesions per leaf) for each year were observed for these. The selections 0-533,O-664 and 0-667 had ratings of 2 (6 to 25 lesions per leaf) for at least two of the three years evaluated. Where several lesions occurred in close proximity, (2 or 3 rating) the spots tended to coalesce forming a larger necrotic area. A rating of 2 or 3 was sufficient to cause leaf abscission.

Frogeye leaf spot is normally controlled by a combination of cultural practises and fungicide control sprays (Jones and Aldwinckle 1990; Jones and Sutton 1984). When fungicide sprays are reduced or eliminated as is the case when growing scab-resitant apple cutivars, diseases such as frogeye leaf spot may become more prevalent. This report helps to identify cultivars and selections which are susceptible to frogeye leaf spot. Susceptible cultivars should be avoided in areas where high disease pressure occurs or fungicide sprays may be required for control.

Literature cited

1. Arauz, L.F. and T.B. Sutton. 1989. Temperature and wetness duration requirements for apple infection by ***Botryosphaeria obtusa.*** Phytopathology 79:440-444.
2. Foster, H.H. 1937. Studies of the pathogenicity of ***Physalospora obtusa.*** Phytopathology 27:803-823.
3. Jones, A.L. and H.S. Aldwinckle. 1990. Compendium of apple and pear diseases. APS Press, St. Paul, MN 55121, USA. 100 pp.
4. Jones, A.L. and T.B. Sutton. 1984. Diseases of tree fruits. North Central Region Extension Publication No. 45., Co-op Ext. Serv. M.S.U. 59 pp.
5. Warner, J. 1986. Susceptibility of apple scab-resistant cultivars to ***Gyrnnosporangiurn juniperi-virginianae, G. clavipes*** and ***Botryosphaeria obtusa.*** Can. Plant Dis. Surv. 66:27-30.