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Fire Blight Susceptibility of Apple Rootstocks in Arkansas

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Extensive evaluation of clonal apple rootstocks in Arkansas started in 1961 when a replicated planting of Lodi, Jonathan, Red Delicious and Golden Delicious each propagated on EM IX, EM VII, MM 106, and MM 111, was established at the Fruit Substation, Clarksville, Arkansas.

At the end of three growing seasons, the seriousness of tree loss due to fire blight *(Erwinia amylovora)* became apparent. The more precocious trees on EM IX and VII developed bloom and twig blight which extended into the scion trunk and, particularly in the case of EM IX, into the rootstock. At planting the graft union was placed 4-6" above the ground. Observations indicated that the stock was frequently dead while the infected scion was not. Other observations showed that with EM VII-trees where stock suckering had occurred, fire blight had infected the suckers and subsequently killed the stock beneath an otherwise healthy scion. Data in Table 1 show the percent of the original planting for each rootstock surviving after six years. While tree mortality was not always due to fire blight (apple measles and winter injury exacted a minor toll), a significant amount of tree loss can be attributed to fire blight, indicating variability in fire blight susceptibility among rootstocks. Unfortunately, no definitive record on mortality cause was kept in this planting.

In 1964, a planting of 51 plots containing two each of seven clonal apple rootstocks was established at the Maine Experiment Station, Fayetteville, Arkansas. The stocks consisted of grafting-size rooted layers obtained from a commercial source. Fire blight was observed in this planting of ungrafted stocks the first season. An inventory of all trees that died of blight through 1967 and those killed to the ground in 1968 (See Table II), points to the susceptibility of M-26, and, to a lesser extent, EM-IX.

To further examine the blighting tendencies of these rootstocks, a specific experiment was imposed on a portion of the previously mentioned rootstock planting. An additional purpose of this study was to investigate

Table 1. Survival record of apple trees[1] on four clonal rootstocks, Clarksville, Arkansas.

Root-stock	Set No. 1961	% of Trees Surviving each fall '63	'64	'65	'66	'67	'68
EM IX	48	33	31	19	19	Pulled	
EM VII	48	69	54	35	33	29	Pulled
MM 106	36	86	81	75	75	75	75
MM 111	36	100	100	100	100	100	97

[1]Lodi, Jonathan, Red Delicious, Yellow Delicious.

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Table 2. Susceptibility of seven clonal apple rootstocks to fire blight *(Erwinia amylovora)*. Fayetteville, Arkansas.

Rootstock	No. blight deaths 1964-67	Killed in 1968	Percent dead or severely damaged
EM II	22	4	25.4
VII	2	8	9.8
IV	27	30	55.9
M-26	62	21	81.4
MM 104	4	3	6.9
106	10	26	35.3
111	5	1	5.9

[1]102 rooted layers of each stock planted in 1964.

the danger to stocks from scoring trees which might subsequently be infected by inoculum originating from blossom or twig blight in the scion. Five scoring and inoculation treatments were established in May of 1967 (See Table III). The ungrafted stocks were scored, using a budding knife, about 8″ above the ground. Immediately after scoring, ¼ cc. of a concentrated suspension of *Erwinia amylovora* was atomized on the shaded side of the trunk, 6″ above the score. At intervals of 1, 24, or 72 hrs. later, the inoculum was washed down over the score. Each treatment was replicated 4 times. The inventory of dead and blighted stocks taken 3 months later (See Table III) indicates the extreme susceptibility of the M-26 rootstock and, by contrast, the relative resistance of MM 111. EM I and MM 106 appear to be moderately susceptible. Stock infection was greatest when the inoculum reached the wound after one hour. There was abundant natural inoculum in the block; and this may account for some infections, particularly on M-26, which occurred on non-scored or non-inoculated trees.

A replicated planting of Jonathan apples propagated on MM 104, 106, 111; EM I, II, and VII, and Alnarp-2 stocks was established in Fayetteville, Arkansas in 1967. Each rootstock variety combination was represented by 16 to 20 trees, spaced 10 ft. x 10 ft. In 1969, a modest bloom occurred on all stocks, and fire blight soon reached epidemic proportions. The only trees lost in 1969 were four trees on

Table 3. Rootstock susceptibility to fire blight inoculation, expressed as percent of total. Fayetteville, Arkansas, 1967.

Treatment[1]		ROOTSTOCK							Percent of Total
		M	EM			MM			
		26	II	VII	IX	104	106	111	
1. INOC., NOT	DEAD	1	0	0	0	0	5	0	3.5
SCORED	BLIGHTED	0	0	0	0	0	0	0	3.5
2. SCORE +	DEAD	4	1	1	2	1	2	0	39.0
INOC. 1 hr.	BLIGHTED	0	1	2	2	1	1	0	25.0
3. SCORE +	DEAD	1	0	0	0	0	1	0	7.1
INOC. 24 hr.	BLIGHTED	2	1	0	1	0	1	0	17.9
4. SCORE +	DEAD	4	0	0	1	0	0	0	17.9
INOC. 72 hr.	BLIGHTED	0	0	1	0	0	2	0	10.7
5. SCORE, NOT	DEAD	3	1	0	0	1	0	0	17.9
INOC.	BLIGHTED	0	0	0	2	0	0	0	7.1
	DEAD	65	10	5	15	10	15	0	
PERCENT TOTAL	BLIGHTED	10	10	15	25	5	25	0	

[1]Scored 5/22/67; ¼ cc fire blight inoculum placed on north side of tree and allowed to dry; washed down over score at times indicated (4 trees/treatment).

Alnarp-2 rootstocks, although the greatest blight incidence occurred on MM 106 trees. The cause of death, noted in November, appeared to be fire blight cankers between the graft union and the ground line. By the fall of 1970, 70 percent of Alnarp-2 trees, 30 percent of EM I, 6 percent of MM 104, and 5 percent of EM VII had died. All the MM 106, MM 111 and EM II trees survived. While it is difficult to definitely determine whether tree death was due to winter injury to the stock, to fire blight, or to a combination of the two, these data point to a fire blight susceptibility characteristic of Alnarp-2 and the EM I rootstocks.

Several years' observations under Arkansas conditions which were highly favorable for fire blight development point to the fact that M-26, EM IX, Alnarp-2 and EM I are blight susceptible. MM 111 and MM 104 show the most tolerance to blight. MM 106 and EM VII appear to be intermediate in susceptibility.

Peach Cultivars That Set Fruit Under Wet, Cold Conditions

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Weather during peach bloom in southwestern Washington is often rainy and cold. This causes most peaches to set poorly and produce erratic yields. Forty-five commercial cultivars have been yield-tested since 1944 at the WSU-Southwestern Washington Research Unit of Washington State University** near Vancouver. Yields were compared over a minimum of 5 years of full production.

Those which gave the highest, most consistent yields in order of ripening were Lawrence, Redhaven, Ranger, Golden Jubilee, Rochester, Fairhaven, Pacific Gold, Slappy, Herb Hale, Redglobe, Halehaven, Earlihale, Valiant, Veteran, Vedette, Early Elberta (Gleason strain), Eclipse, and Elberta. Some have faults such as small size, late ripening, poor color, disease susceptibility, poor quality, or softness.

Taking into consideration all important horticultural characteristics, the following cultivars are recommended for western Washington: Redhaven, Ranger, Fairhaven, Redglobe, Herb Hale, Veteran, and Early Elberta (Gleason strain). Cardinal is also included, although yield data are limited, because it fills the need for an early ripening variety. Earlired is of the same season and has better quality, but develops too many split pits. There is a good probability that Early Redhaven will replace Cardinal on our list as we get more information on its ability to yield under adverse conditions. The harvest season for these recommended cultivars extends from July 20 through September 10 in southwestern Washington.

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**Crandall, P. C., D. F. Allmendinger, R. M. Bullock, and J. D. Chanberlain. 1970. Peach Varieties in southwestern Washington. Wash. Agric. Exp. Sta. Circ. 518.