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Comparison of Early Performance and Fire Blight Susceptibility of 12 Early Season Apple Cultivars[1]

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Abstract

In 1981, 12 cultivars of early season apples on M.9/MM.106 or M.9/MM.111 interstems were established at 2 locations in southern Ohio. The influence of the rootstocks on tree performance were minimal, with trees on M.9/MM.111 being slightly smaller and having lower yields and yield efficiency at Ripley. No rootstock differences were expressed at Jackson. 'Discovery' and 'Akane' were tardy in coming into production and had low yields compared to other cultivars. Highest yielding cultivars were 'Ozark Gold,' 'Gala,' and 'Earliblaze' and these cultivars also tended to have relatively high productive efficiecy by yield per trunk cross-sectional area. 'Jonamac' in both plantings tended to be small, efficient trees with good fruit quality. Severe fire blight infections occurred in both plantings. While 'Viking' showed very little infection, the following cultivars exhibited severe infection in one or both plantings: 'Tydemans Red,' 'Discovery,' 'Paulared,' 'Earliblaze,' and 'Jonamac.'

Introduction

Much of the fruit in the midwest and eastern United States is marketed by direct sales through farm markets or u-pick. Generally, these operations are interested in extending their marketing season with early season apple cultivars that may overlap with vegetables or small fruit. Although summer or early season apple cultivars have been described in the past (2, 7, 8, 9), few direct comparisons of performance have been published to assist in making cultivar decisions. As expected, early season cultivars vary widely in susceptibility to pests and are often considered relatively sensitive to fire blight (1, 5).

Materials and Methods

In the spring of 1981, plantings of 12 early ripening cultivars were established at the Ohio Agricultural Research and Development Center branches at Jackson and Ripley. The following cultivars were included in the planting: 'Akane,' 'Discovery,' 'Earliblaze,' 'Gala,' 'Jerseymac,' 'Jonamac,'

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'Ozark Gold,' 'Paulared,' 'Quinte,' 'Viking,' 'Vista Bella,' and 'Tydemans Red.' The trees were planted in 15 cm interstems of M.9 on either MM.106 or MM.111 and spaced 3.0m × 3.5m. The treatments were arranged as a split plot design with rootstock as the whole plot and cultivar as the split plot with 6 replications. The trees were trained as central leaders and dormant pruned annually. Annual copper and streptomycin sprays were used as commercially recommended for fire blight control. Trees were rated for degree of fire blight infection using the USDA rating system of 10 points with the lower the score, the greater the amount of infection (6).

Results and Discussion

In 1986 a severe freeze in late April eliminated the crop from both plantings. At Ripley, the trees did not crop until the fourth growing season (Table 1), while at Jackson, they cropped in the third year (Table 2). No interaction occurred between the rootstock and cultivar so only main effects are presented. Trees on M.9/MM.111 were smaller and had lower yields and yield efficiency at Ripley, but there was no difference between rootstocks at Jackson except that trees on M.9/MM.111 produced more root suckers.

In the Ripley planting (Table 1), 'Akane,' 'Discovery,' and 'Tydemans Red' had low early yields and tended to be lower in yields than most of the other culitvars. The highest yielding cultivars were 'Gala,' 'Earliblaze,' 'Jerseymac' and 'Ozark Gold,' while the lowest yielding were 'Akane,' 'Discovery,' and 'Viking.' Yield efficiency, as judged by the fruit produced per unit of trunk growth, were highest for 'Earliblaze,' 'Gala,' and 'Jonamac.' Generally the lowest yielding cultivars also were lowest in productive efficiency. Trunk cross-sectional area through the fifth growing season indicated that 'Vista Bella,' 'Tydemans Red,' and 'Discovery' produced the largest trees, while 'Jonamac,' 'Earliblaze,' and 'Paulared' produced the smallest trees.

Table 1. Performance and fire blight susceptibility of 12 early cultivars of apples on Interstems (Ripley, OH).

	1984			1985						
Cultivar	TCA cm^2	Yield lbs.	Yield TCA lbs/cm^2	TCA cm^2	Yield lbs.	Yield TCA lbs/cm^2	Change TCA 81-85 cm^2	Total Yield lbs.	Total Yield/ TCA lbs/cm^2	1986 Fire-blight* rating
Tydemans Red	25.2	3.1	.15	37.7	39.7	1.1	35.5	42.9	1.2	5.66
Jonamac	11.8	8.6	.70	17.7	39.1	2.1	16.4	47.8	2.5	5.84
Quinte	18.7	14.9	.79	33.8	27.6	.8	32.3	42.5	1.2	7.66
Akane	16.5	.5	.03	27.9	6.3	.2	26.1	6.8	.2	7.08
Discovery	22.1	.5	.02	3.65	3.3	.1	34.5	3.9	.1	7.14
Earliblaze	13.0	14.4	1.15	18.4	49.1	2.6	16.8	63.6	3.3	5.56
Gala	18.2	15.4	.81	27.9	50.4	1.8	26.0	65.8	2.3	6.64
Jersey Mac	18.3	20.8	1.12	29.4	35.3	1.1	27.3	56.1	1.8	6.82
Paulared	12.1	12.9	.90	20.1	12.5	.7	18.5	25.5	1.2	6.25
Viking	13.8	6.1	.40	22.9	12.7	.5	21.2	18.8	.8	8.73
Ozark Gold	18.5	11.5	.70	28.4	41.0	1.5	26.6	52.6	1.9	6.91
Vista Bella	22.9	16.8	.70	41.1	21.9	.5	39.4	38.8	.9	7.15
LSD 5%	3.1	5.5	.36	5.0	10.3	.4	2.2	11.8	.4	.67
Rootstock										
M9/MM106	18.3a	12.5a	.74a	30.0a	31.6a	1.1	28.3a	44.2a	1.65a	6.8
M9/MM111	16.9b	8.4b	.52b	26.0b	24.9b	1.0	25.2b	33.3b	1.35b	6.7

*USDA Fire blight scoring system: 9 = 1-3% blight to 1 = 100% blight.

Table 2. Performance and fire blight susceptibility of 12 early season apple cultivars on M.9 interstems (Jackson, OH).

Cultivar	1983			1984				1985				Total Yield (lbs)	Total Yield/ TCA lbs/cm²	Fire-blight* rating 1987
	TCA cm²	Yield (lbs)	Yield/ TCA lbs/cm²	Suckers	TCA cm²	TCA kg	Yield/ TCA lbs/cm²	Suckers	TCA cm²	Yield lbs.	Yield/ TCA lbs/cm²			
Tydemans Red	16.5	7.6	1.01	.4	28.2	14.8	.53	.1	39.9	44.2	1.1	66.7	1.6	5.39
Jonamac	8.4	8.9	1.01	3.0	13.5	17.4	1.4	5.5	18.8	34.8	1.7	61.2	3.2	8.33
Quinte	16.8	6.3	.38	.5	25.1	22.3	.9	3.0	40.7	23.7	.6	52.4	1.3	8.62
Akane	10.3	2.1	.18	4.6	17.3	2.7	.13	6.7	28.0	10.6	.3	15.5	.5	8.15
Discovery	16.9	1.3	.07	2.1	28.4	7.1	.2	4.1	42.6	14.4	.3	22.9	.5	5.66
Earliblaze	8.6	11.3	1.28	1.2	13.2	13.5	1.3	3.9	18.0	35.0	1.9	59.9	3.3	8.50
Gala	14.0	7.8	.55	.2	21.6	36.3	1.6	1.4	31.1	63.4	1.9	107.6	3.4	7.04
Jersey Mac	15.0	7.8	.50	1.1	22.4	33.4	1.5	1.4	33.0	38.6	1.2	79.9	2.5	6.91
Paulared	9.6	2.7	.29	4.5	13.3	14.8	1.1	9.2	20.1	7.1	.3	24.8	1.2	5.75
Viking	9.3	2.3	.25	1.4	14.7	7.4	.5	5.7	22.0	11.2	.5	20.9	.9	8.46
Ozark Gold	13.5	12.4	.94	2.3	23.3	18.8	.8	4.1	30.6	82.5	2.8	113.8	3.8	7.91
Vista Bella	16.7	7.7	.47	.9	27.3	20.8	.7	2.9	43.1	23.7	.5	52.3	1.2	7.57
LSD .05	1.9	3.2	.25	2.2	3.0	7.2	.5	4.8	4.8	13.5	.4	17.7	.5	.82
Rootstock														
M.9/MM.106	16.7	7.1	.59	.7b	21.1	18.7	.9	1.8b	31.1	35.3	1.2	61.2	2.2	7.3
M.9/MM.111	13.5	6.8	.54	2.5a	20.9	18.8	1.0	5.7a	30.7	33.5	1.2	59.2	2.9	7.3

*USDA fire blight scoring system: 9 = 1-3% blight to 1 = 100% blight.

The following cultivars were very susceptible to the fire blight epidemic with nearly 50% of the canopy showing symptoms: 'Tydemans Red,' 'Jonamac,' and 'Earliblaze.' The fire blight outbreak occurred following the loss of the crop in 1986 following a spring freeze and appeared to start mostly as shoot-tip infections. 'Viking' appeared much less susceptible than the other cultivars to fire blight. Other cultivars such as 'Quinte,' 'Discovery,' and 'Vista Bella' exhibited a few strikes. The blight was so severe with some trees that major limbs and the central leader were lost. Thus, the decision was made to remove the entire planting in the fall of 1986, as direct comparison of future yields would be invalid because of the major amount of the canopy lost. Although significant fire blight occurred in the top of the canopy, the disease did not appear to spread to interstem or rootstock. In past fire blight epidemics, major losses of interstem trees occurred on interstem trees utilizing either M.9 or C6 (3, 41), and were especially heavy when the trees were infected during the early cropping years (3).

In the Jackson planting (Table 2), 'Discovery,' 'Akane,' 'Viking,' and 'Paulared' had lower early (1983) yields, while 'Earliblaze' and 'Ozark Gold' had the highest yields the first season of production. In considering total production over the first 3 years, 'Ozark Gold,' and 'Gala' had by far the highest yields of all the cultivars. 'Akane,' 'Discovery,' 'Viking' and 'Paulared' had lower yields and yield efficiency than the other cultivars. Highest yield efficiencies judged by yield/trunk cross-sectional area occurred with 'Ozark Gold,' 'Gala,' 'Earliblaze' and 'Jonamac.' 'Jonamac' in both plantings tended to produce small efficient trees and fruit quality was good. The largest tree size occurred with 'Vista Bella,' 'Discovery,' 'Quinte' and 'Tydemans Red,' with 'Discovery' being the least efficient producer of this group. Interstem trees with 'Paulared' and 'Akane' as the scions appeared to produce more rootsuckers than with other cultivars, while when 'Tydemans Red,' 'Gala,' and 'Jerseymac' were the scions few suckers were produced.

In 1987, a severe infection of fire blight occurred at Jackson as well as in other orchards in southern Ohio. 'Tydemans Red,' 'Discovery,' and 'Paulared' were most severely infected with 25-50% of the tree showing symptoms and often the central leader and 3-year and older wood showing infection (Table 2). 'Jonamac,' 'Quinte,' 'Akane,' 'Earliblaze,' and 'Viking' exhibited only a few strikes. None of the trees in the planting completely escaped infection. The severity of symptom expression among cultivars differed between the plantings at Ripley and Jackson with the Ripley planting showing the most severe infection. At Ripley, 'Jonamac' and 'Earliblaze,' particularly, had severe infections, while at Jackson infection was less. 'Viking' exhibited little infection in either planting. These findings clearly point out that weather conditions, as well as the condition of the trees at the time of infection, have a great influence on the degree of infection exhibited by various cultivars.

The relative order of maturity in 1985 (Table 3) indicates that 'Quinte' is the earliest, followed closely by 'Vista Bella' and 'Viking.' 'Ozark Gold' and 'Gala' are the latest of these 12 cultivars. This selection of cultivars provided a continuous supply of apples from the third week of June until the first of September in southern Ohio. All the cultivars in this trial required multiple harvests, which is typical of early season cultivars. The shelf-life of 'Quinte,' 'Vista Bella,' and 'Viking' were very short, while the cultivars after that would last several weeks in cold storage if picked and handled properly. General observation indicates that 'Earliblaze,' 'Jonamac,' 'Ozark Gold,' and 'Gala' appeared to hold well until Christmas, although no controlled storage tests were conducted. Certainly

the main benefit of the cultivars in this trial would be to provide a supply of quality apples until traditional fall apples are harvested. When selecting early season apples, in addition to evaluating their quality and productivity, growers are encouraged to also consider their sensitivity to fire blight, as significant differences occur as illustrated by this report.

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Relative Susceptibility of Certain Peach Cultivars to Summer Infection of Leaf Curl

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Peach and nectarine trees planted at Northwestern Washington Research and Extension Center, Mount Vernon, including some 40 different cultivars, suffered an unusual infection of peach leaf curl (Taphrina deformans) in the summer of 1986. The infection occurred as a consequence of a severe rainstorm on July 16, which resulted in nearly 1½" of rainfall in a 24-hour period. The onset of the infection was not anticipated and so no preventive spray had been applied. The range of susceptibility shown by the different cultivars (Table 1) thus gives a fair indication of those cultivars with some degree of natural resistance, at least to summer infection under conditions similar to those described above.

It is curious to note that a cultivar like the 'Cole' seedling, which has a very high resistance to the early spring infection of leaf curl, was considerably more susceptible (40%) to the summer infection. Other cultivars, e.g. 'Velvet' and 'Stark Sweet Melody' often show moderate to severe susceptibility to the early infection of leaf curl but remained relatively unaffected by the summer infection. Differences in leaf physiology between the early and the mature leaf, or the weather conditions

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