

Performance of 15 Apple Cultivars on MM106 and M26^{1,2}

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Past research has shown that apple cultivars do not perform equally on all rootstocks. For this reason, the growth and production efficiency of various stock scion combinations were evaluated during the past 10 seasons. In 1966 a planting of 15 cultivars on MM106 and M26 was established at the Eastern Ohio Research and Development Center near Caldwell, Ohio. The trees were planted in contoured rows with M26 spaced 12' x 18' and MM106 18' x 18'. The trees were staked and trained to a central leader and maintained with standard orchard practices. The planting contained 12 to 20 trees of each cultivar on each rootstock, arranged in 20 incomplete blocks with each block containing both rootstocks. Yield and trunk circumference were taken annually, and, in 1976 canopy height and spread were determined.

Trunk circumference of trees on MM106 averaged 10% larger than trees on M26 at 10 years of age (Table 1). Generally cultivars on MM106 required more pruning during the last 5 years to contain them in their allotted space, particularly height. In 1971 and 1973, frost reduced the yields in this planting. Franklin out-produced all cultivars on both rootstocks. Golden Delicious, Ruby, McIntosh, Jonathan, and Melrose were very productive with little difference in the relative ranking of their yields on either rootstock. The early cultivars, Close and Melba, and the Delicious strains, Starking, Red Prince and Chelan Red, had significantly lower yields than the other cultivars. Jonathan, Ruby, Gal-

lia Beauty, and Franklin were more efficient than most of the other cultivars in converting photosynthate into fruit as opposed to wood. The early cultivars and Delicious strains were very inefficient in this regard with no difference among strains. No interaction existed between the rootstocks and cultivars in production efficiency as evaluated by yield per cross sectional area.

Sundale was 28 to 37% smaller than Golden Delicious on both rootstocks. Sundale's smaller tree size resulted in significantly lower yield per tree, but production efficiency of both cultivars was similar as judged by the pounds of fruit per square inch of trunk cross sectional area. If yields per acre were calculated, based on actual tree size at 10 years of age, Sundale on M26 (9' x 17') would produce 2123 bu/a compared to 1757 bu/a on MM106 (10' x 18'), or a 17% advantage for M26. Accumulative yields per acre of Golden Delicious on MM106 at 16' x 24' (2002 bu) and M26 at 14' x 22' (1977 bu) were similar to each other and to Sundale on M26. However, the better fruit finish of Golden Delicious would make it the preferred strain.

Trees on MM106 were 17% taller with 11% more spread than trees on M26 (Table 2). However, it is important to note that trees on both stocks were large and recommended spacings based on actual tree size for M26 would be 14' x 22' and for MM106 15' x 23'. These spacings are much wider than recommended by many researchers and indicate the general vigor induced by this soil. The slightly

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Table 1. Average growth and production of 15 cultivars on M26 and MM106, 1966 through 1976, at the Eastern Ohio Research and Development Center.

Cultivar	MM106 planted 18' x 18'						M26 planted 12' x 18'					
	No.* of trees	Trunk Circu. (in)	Ht. (ft)	Spread (ft)	Accum. Yield (lbs/t)	Effic.** (lbs/in ²)	No. of trees	Trunk Circu. (in)	Ht. (ft)	Spread (ft)	Accum. Yield (lbs/t)	Effic. (lbs/in ²)
Early												
Close	16	18.9	16.0	16.2	239	10	12	17.7	13.5	15.4	212	9
Melba	20	17.8	15.9	14.7	411	17	16	15.1	14.3	13.1	407	22
Fall												
McIntosh	12	17.7	16.4	15.4	701	29	12	14.7	13.0	13.8	533	32
Franklin	14	18.7	17.7	18.4	841	30	12	17.0	15.4	16.5	766	34
Jonathan	12	15.2	13.7	13.6	726	40	15	12.9	9.7	12.2	453	35
Holiday	2	15.0	17.6	14.0	580	26	14	11.9	11.6	12.7	426	31
Delicious												
Starking	11	15.3	16.5	16.5	481	27	12	15.5	14.3	15.0	330	18
Red Prince	13	16.7	16.4	16.5	447	19	14	16.1	14.7	15.4	503	24
Chelan Red	10	16.4	16.2	17.4	396	19	10	17.0	15.9	16.3	473	20
Golden Del.	15	17.8	17.0	16.1	744	29	16	15.1	12.6	13.5	589	33
Sundale	15	11.3	11.2	9.8	305	25	16	10.7	9.1	9.1	314	33
Late												
Melrose	11	17.2	17.1	16.8	703	29	13	15.9	12.4	13.9	429	22
Ruby	18	16.3	17.2	14.2	687	33	16	13.8	12.7	12.0	576	39
Idared	17	16.4	12.8	13.8	512	24	16	15.7	12.1	12.8	550	28
Gallia Beauty	15	14.8	13.6	13.7	569	34	14	13.2	12.3	11.6	486	35
LSD .05		1.9	2.0	2.0	169	8		1.8	1.9	1.9	163	8

*Number of trees and tree size data in 1976.
 **Yield/trunk cross sectional area.

Table 2. Performance of MM106 and M26, 1966 through 1976, at Eastern Ohio Research and Development Center.

Rootstock	No. of Trees Set	No. of Trees Lost	% Loss	Accumulated Yield		Efficiency* (lbs/in ²)	1976 Circ. (in)	Tree	
				lbs/tree	bu/a*			Ht. (ft)	Spread (ft)
MM106	319	99	31	556	1655	26	16.4	15.6	15.1
M26	279	61	22	470	1658	28	14.8	12.9	13.6
LSD .05				43		2	0.5	0.5	0.5

*Calculated using spacing based on actual tree size with 8' aisle.
 **Yield/trunk cross sectional area.

larger tree size on MM106 resulted in a 16% greater yield per tree. Precocity was very similar on both rootstocks with the more precocious cultivars beginning to bear in 1969, three years after planting. Production efficiency evaluated by per acre yields calculated with actual tree size or pounds of fruit per square inch of trunk cross section indicate no difference in the efficiency of these rootstocks.

The Gilpin Westmore clay loam soil at this site has a very high soil moisture holding capacity, a fragipan at about 18-24 inches in some locations, with less than desirable internal soil drainage. Significant tree loss began to occur in 1972 and pathologists were able to isolate *Phytophthora cactorum* from several trees on both rootstocks. Evaluation in 1972 indicated that only 3% of the MM106 and 12% of the trees on M26 had died. However,

in 1976 these figures had risen to 31 and 22%, respectively. Although tree losses were spread over many cultivars, the greatest losses occurred in the following cultivars (with the first figure being % loss on MM106 followed by the % loss on M26): Holiday (60%, 35%), Chelan Red (33%, 29%), Starking (23%, 11%), Idared (18%, 10%), Melrose (17%, 28%) and Red Prince (15%, 9%). Much of the loss with Holiday occurred with the trees breaking at the union. It should be noted that all 3 strains of Delicious had significant losses with many trees showing collar rot type symptoms. The excessive tree loss and the weak nature of the root systems at the conclusion of the study indicated that neither MM106 or M26 are tolerant of the less than desirable internal soil drainage encountered in this study.

'Cullinan' and 'Havis' Peach Cultivars

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Two peach cultivars, named for the peach breeders who conducted the U.S. Department of Agriculture breeding program at Beltsville, Maryland from its inception in 1932 until 1962, were released in June, 1977. On July 22, 1977, a Peach Day, featuring ripe fruit of 'Cullinan,' honored Dr. Frank P. Cullinan and the widow and son of the late Dr. Leon Havis. Among the 45-50 persons attending the ceremony were nurserymen, growers, research and extension workers, and the press.

'Cullinan' was named for Dr. Cullinan, who initiated the peach breeding program at Beltsville and later served as Associate Director of the

Crops Research Division. Among his many accomplishments, Dr. Cullinan was President of the American Society for Horticultural Science, the American Society of Plant Physiologists and the American Institute of Biological Sciences; member of the governing board of the National Research Council; and member of the Science Manpower Commission. He was awarded the Wilder Medal in 1964 by the American Pomological Society.

'Havis' was named for Dr. A. Leon Havis, who was the peach breeder at Beltsville as well as leader of stone fruit investigations for USDA from 1943 until his untimely death in 1962 (1). He was President of the Ameri-

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