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Reviewed Research Paper

The Marshall McIntosh Apple

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Abstract

The Marshall strain of McIntosh apple was evaluated in comparison with six other McIntosh strains in a replicated block of trees planted in 1979 in a commercial orchard. Based on two years of evaluation we consider Marshall to be an earlier and more intensively coloring strain which ripens slightly earlier than the other strains and appears to have good storage quality.

The Marshall McIntosh is a non-spur strain that originated as a branch mutation in a commercial orchard in Massachusetts (2). Initial observations indicated that it colored earlier than conventional McIntosh strains. Based on firmness and soluble solids measurements of fruit from a small planting of young trees, it appeared to ripen no earlier than conventional strains (2). Due to its early coloration, Marshall McIntosh is being extensively planted, and a thorough evaluation of its properties is needed.

In 1979 we established a planting of Marshall and 6 other strains, including the spur types Morspur and Macspur and the semi-spur type Gatzke (Starkspur McIntosh) (1). The planting was replicated 8 times in a randomized complete block design. It is located in a commercial orchard in Wilbraham, Massachusetts, and is cared for by the grower in a conventional commercial manner.

In 1983 the trees for the first time bore sufficient fruit for some evaluations. On 3 dates (September 1, 7, and 14) fruit on trees of all 7 strains were visually evaluated for red color. In that year August and early September were very hot and red coloration was slow. Nevertheless, on September 1 and 7 two-thirds of the Marshall McIntosh had sufficiently intense red color for U.S. Extra Fancy grade, far more than any other strain (Table 1). On September 14, 84% of the Marshall were Extra Fancy while only 1 other strain approached that degree of coloration.

On September 7 and 14, 10-fruit samples were picked from these trees

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Table 1. Differences among McIntosh strains in red color, firmness, and starch score in 1983.

Strain	Percentage of fruit with sufficient color for Extra Fancy grade[z]			Firmness (lbs pressure)		Starch score (1-9)[y]	
	9/1	9/7	9/14	9/9	9/17	9/9	9/17
Morspur	17b[x]	20b	57bc	15.5ab	14.5ab	1.9ab	2.5a
Marshall	64a	67a	84a	15.5ab	14.9a	1.9ab	2.8a
Imperial	15b	23bc	68ab	15.3ab	14.4abc	1.7ab	2.7a
Macspur	8bc	33b	56bc	14.7b	13.8cd	1.9a	2.6a
Eastman	1c	6c	25d	14.8b	13.6d	1.36b	2.8a
Gatzke	9bc	17c	53bc	15.3ab	14.0bcd	1.8ab	2.3a
Rogers	8bc	28b	39cd	16.0a	14.5abc	1.5ab	2.3a

[z]At least 50% of fruit surface with red color typical of the variety.
[y]Based on Starch-Iodine test: 1-immature; 9-overmature.
[x]Means in a column not followed by a common letter are significantly different at the 5% level.

and measured for firmness and starch disappearance (3). At the first picking Marshall McIntosh were neither firmer nor softer than those of any other strain. At the second picking they were firmer than Macspur, Eastman, and Gatzke McIntosh, none of which was as red as Marshall. At neither picking did Marshall have either more or less starch than any other strain.

In 1984 fruit set was quite variable within this block, with Eastman trees being barren. Yet, there were sufficient fruit on enough trees of the other strains to extend our evaluations. On 3 dates (September 4, 11, and 18) fruit on the trees were visually evaluated for red color and 10-fruit samples were taken from 6 replications for determination of starch, firmness, and size (which could influence other readings). In addition, another 10-fruit sample was taken from each of 6 replicate trees of Marshall and Rogers McIntosh for ethylene measurements. These fruit were kept at 20°C and daily, for 7 days, a 1 ml sample of internal atmosphere was extracted with a syringe inserted through the calyx opening and measured for ethylene concentration using a gas chromatograph. On September 18, the fruit remaining on the trees were all harvested and stored in 0°C for approximately 4 months, then kept at 25°C for 1 week, and examined for the presence of physiological disorders and rot.

On September 4, half of the Marshall fruit had sufficiently intense color for U.S. Extra Fancy grade; the other strains required nearly 2 more weeks to reach this level of color intensity (Table 2). The difference between Marshall and the other strains was primarily in color intensity, as there were only marginal differences among the strains in the percent of surface showing some red color at all harvest dates. The Marshall trees could easily be identified within the block by independent observers.

All fruit were large but Macspur and Gatzke tended to be the largest (Table 3); there were not sufficient Gatzke for a third harvest. Marshall was no softer than any other strain and was firmer than Macspur. There was no consistent difference in starch score among strains.

Determinations of firmness, soluble solids, and starch (2, and Tables 1 and 3) have suggested that there is no maturity difference between Marshall and other strains. However, ethylene production is a more sensitive index and showed clearly that Marshall ripened earlier than Rogers within this block (Figure 1). At all 3 harvests Marshall fruit began the ethylene climateric ahead of the Rogers fruit. In

Table 2. Differences among McIntosh strains in the percent surface of fruits showing some red color, and in the percent of fruits showing sufficient intensity of color to be classified as U.S. Extra Fancy grade. 1984.

Strain	Percent surface showing red color			Percent fruits with red color "typical of the variety"		
	9/4	9/11	9/18	9/4	9/11	9/18
Morspur	58ab[z]	67bc	78b	13b	23b	72b
Marshall	62a	81a	88a	51a	89a	90a
Imperial	57ab	70b	76b	23b	13bc	72b
Macspur	57ab	67bc	75b	9b	23b	67b
Gatzke	55b	63c	—	8b	8c	—
Rogers	53b	66bc	75b	7b	8c	63b

[z]Means in a column not followed by a common letter are significantly different at the 5% level.

comparing the first-day readings of each harvest date it appeared that Marshall ripened between 1 and 7 days sooner than Rogers McIntosh.

Because the numbers of trees with sufficient fruit for storage and the quantities of fruit per tree were quite variable, the storage data did not warrant statistical analysis and must only be considered as tentative evaluations. However, they provide the first indication of the relative storage quality of Marshall McIntosh (Table 4). All 5 strains developed approximately equal amounts of scald, breakdown, and rot, but Marshall appeared to develop less brown core (4), possibly due to being riper at harvest than the other strains.

Because we intended to store only the fruit remaining after our third harvest, which would thus be somewhat overmature (Fig. 1) for long-term storage, we obtained some Marshalls from commercial plantings to secure an indication of the storage quality of early picked fruit. From 3 different orchards we sampled Marshall and another strain planted at the same time and grown adjacent to the Marshall trees. From 2 orchards the second strain was Rogers and from the third it was Cornell. At harvest (September 7-9), 10-fruit samples were measured for internal ethylene concentration as described above, and approximately 250 fruit of each strain and orchard were stored at 0°C in air until January 21 and assessed as above. Ethylene readings in each case showed that Marshall samples were riper than those of the comparable strain; after storage the Marshalls developed substantially less scald and brown core than their comparisons (data not

Table 3. Differences among McIntosh strains in size, firmness and starch score. 1984.

Strain	Fruit diameter (inches)			Firmness (lbs pressure)			Starch score (1-9)[x]		
	9/4	9/11	9/18	9/4	9/11	9/18	9/4	9/11	9/18
Morspur	2.93bc[y]	3.01b	3.13ab	16.6a	15.3ab	14.7b	2.55ab	3.18abc	4.67a
Marshall	2.89c	2.98b	3.03b	16.3ab	15.5ab	15.3ab	2.23ab	3.40ab	4.08b
Imperial	2.97bc	3.03b	3.16a	16.1ab	15.5b	14.8ab	2.20ab	3.23abc	4.12b
Macspur	3.02ab	3.11ab	3.16a	15.7b	14.6c	14.2c	2.23ab	3.55a	4.52ab
Gatzke	3.13a	3.19a	—	15.6b	15.0bc	—	2.15ab	3.07bc	—
Rogers	2.89c	3.03b	3.07b	16.5a	15.7a	15.3a	1.98b	2.88c	4.08b

[x]Based on Starch-Iodine test: 1-immature; 9-overmature.

[y]Means in a column not followed by a common letter are significantly different at the 5% level.

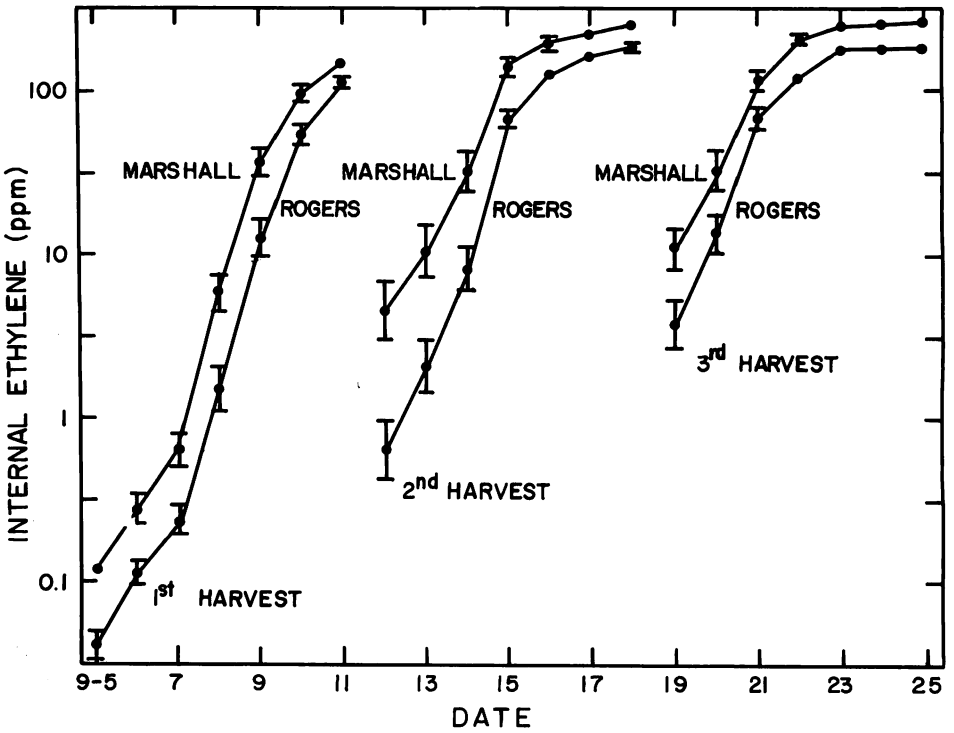

Figure 1. Internal ethylene concentrations in Marshall and Rogers McIntosh apples harvested September 4, 11, and 18, 1984 and kept at 20° for 7 days.

shown), which again might be attributable to the riper condition of the Marshalls.

Marshall McIntosh developed color typical of the cultivar earlier than any other McIntosh strain to which we have compared it. It also should be emphasized that Marshall is solid-red in color, and the color became more intense than in the other strains. It is possible that Marshall may develop too deep a color in growing areas that are cooler than Massachusetts.

Our results in 1984 showed clearly that Marshall ripened somewhat earlier than the Rogers strain. However, the red coloration was more advanced than ripening, and it may be that the dark color absorbed enough additional solar energy to raise fruit temperature and produce earlier ripening. If so, the extent of early ripening would likely vary with light intensity after red coloration has begun.

Fruit quality of Marshall appears to be at least equal to that of the strains to which we have compared it. In 1984, storage quality of Marshall appeared to be, if anything, superior to

Table 4. Disorders of McIntosh apple strains harvested September 18, 1984, stored in 0°C air to January 21, 1985, and then kept at 25°C for 1 week.

Strain	Scald (%)	Brown Core (%)	Senescent breakdown (%)	Rot (%)
Morpsur	6	78	31	6
Marshall	4	19	31	5
Imperial	7	53	32	6
Macspur	2	46	42	10
Rogers	8	73	38	4

that of the other strains since Marshall tended to develop less scald and brown core.

We therefore consider the Marshall strain of McIntosh to be an earlier and more intensively coloring strain, which ripens slightly earlier than other strains and appears to have good storage quality.

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Reviewed Research Paper

A Preliminary Trial of Some Exotic Stocks for Apricots

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Abstract

Trees of 'Alfred' apricot on BBX-1, a *Prunus besseyi* X *P. maritima* hybrid, were slightly more than half standard size, but most trees were killed by low temperature in the 8th year. A *P. cerasifera* X *P. spinosa* hybrid also showed promise as a stock for apricot, although there was little dwarfing. 'Manson' and 'Sapa' were not satisfactory stocks. Amphidiploid selections from (*P. cerasifera* X *P. spinosa*) X *P. domestica* showed little promise.

In the northeastern United States and southern Ontario, apricots have excellent potential for the "pick-your-own" market (PYO). The ideal tree for PYO should be dwarf or semi-dwarf, should begin bearing early, and should produce large, uniformly ripening fruits. Trees on apricot seedling stocks are larger than desirable for PYO, and apricots on peach roots have been short-lived. Some nurseries propagate apricots on myrobalan *(Prunus cerasifera)* seedlings, but there are serious incompatibility problems. For the home gardener, nurseries produce "dwarf" trees by propagating on *P. besseyi* seedlings, but a high frequency of delayed incompatibility has made such seedling stocks unacceptable for commercial operations.

A preliminary trial of 'Alfred' apricots was set at Geneva in 1973 to screen a number of stocks for compatibility, productivity, and dwarfing potential. Soil in the test site is a heavy Collamer silt loam, pH 6.4. Systematic tiling provides good internal drainage.

Eight vegetatively propagated selections, all interspecific hybrids, were compared with 'Sunglo' apricot seedlings as rootstocks. Virus-free 'Alfred' budwood was provided by Dr. Paul Fridlund, IR-2 Clonal Repository, Prosser, WA. The clonal rootstock candidates tested were 'Manson,' 'Sapa,' BBX-1, and 5 introductions from the USSR: PI 304921, 304928, 304929, 304930 and 304931. 'Manson' and 'Sapa' are *P. besseyi* X *P. salicina* hybrids. BBX-1 is a hybrid of *P. besseyi* 'Brooks' X *P. maritima* 'Patricia,' bred by Dr. H. C. Barrett. PI 304921 is a triploid hybrid of *P. cerasifera* X *P. spinosa.* The other 4 selections from the USSR are amphidiploids produced by colchicine doubling of chromosomes of PI 304921, followed by crossing with hexaploid *P. domestica* (2).

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