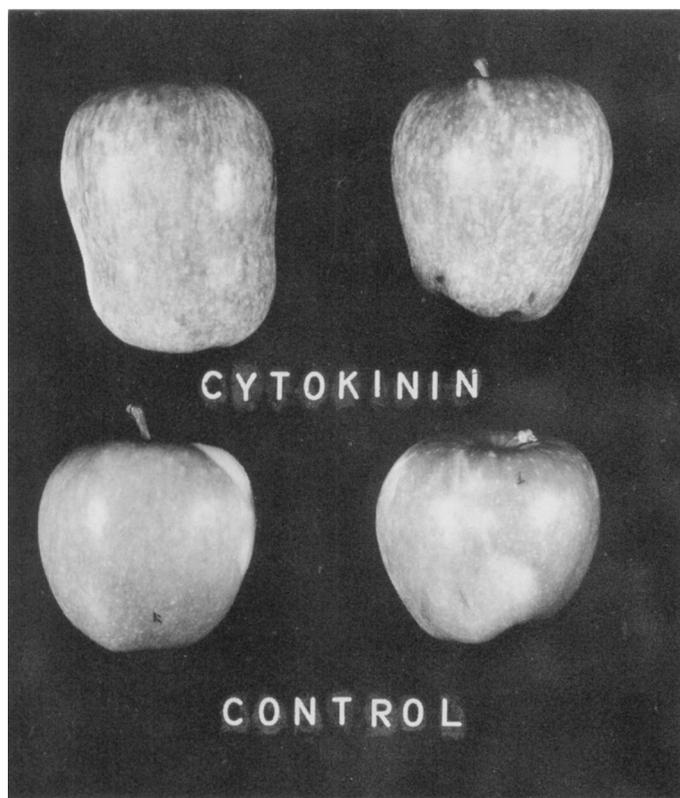


APPLE SHAPE CHANGING POSSIBLE with cytokinin and gibberellin sprays



Delicious apples treated for shape change with cytokinin (upper) and non-treated controls (lower).

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Treatment	Conc. ppm	Timing*	L/D ratio†	Percent fruit set‡
Control	—	—	0.94	44
Cytokinin	500	PF+3	1.04	60
Cytokinin	500	PF+14	0.94	44

* PF+3—Petal fall plus three days.

† Determined by dividing fruit length by fruit diameter.

‡ Determined by dividing the number of fruit set by

Advertising has encouraged the consumer to buy elongated apples, although the shape of the apple has no bearing on its ultimate quality. The effectiveness of the advertising campaign has resulted in a premium price for elongated fruit. Several investigators in the past 50 years have attempted to explain why apples from some areas are more elongated than apples from other areas. Most investigators now believe that elongated fruit are produced in areas where temperatures are cool for about

More recently, investigators from Oregon, Michigan, and Washington have shown that the chemicals gibberellin and cytokinin elongate apple fruits when applied from around bloom time to a few days after. These chemicals appear to eliminate the need for the cool post-bloom temperature normally required to induce elongated apple fruits. Since apples of all varieties in California tend to be flat, it was of interest to determine whether either gibberellin or cytokinin would elongate them.

The results of 1968 trials on Delicious apples are listed in table 1. It was evident that the cytokinin applied at petal fall plus three days, increased fruit set and elongated the fruit (the larger the length-diameter ratio [L/D], the longer the fruit). Later applications were not effective.

Differences between apples with L/D ratios differing by 0.02 can readily be observed without measurements. In the photo the control fruit (below) have L/D ratios of 0.94, as compared with 1.04 of the cytokinin-treated fruit (above). Differences of this magnitude are dramatic and are obvious without measurement.

A more detailed experiment was conducted in 1969 with the Delicious variety. All fruit were thinned to the "king" bloom prior to spraying at petal fall. Treatments included cytokinin and gibberellin A₃ or A_{4/7}. The results are listed in table 2. A₅ in the previous year, the major elongations of apples occurred after the cytokinin spray. The extent of difference was evident and uniform across the ten trees treated. Cytokinin was equally effective at 250 or 500 ppm. Less elongation resulted from the gibberellin than from the cytokinin sprays.

Treatments beyond petal fall were not included in 1969 because those close to petal fall gave the best results in 1968. Also, other experimental data show that apple shape is well established in the first 20 days after full bloom, during the intensive period of cell division. This phenomenon, plus the fact that there is a lag between the application of the chemical as a spray and its translocation to the fruit, necessitate early application

Treatment	Conc. ppm	L/D ratio*	Percent fruit set†
Control	—	0.91 a‡	30
GA ₃	50	0.94 b	32
GA ₃	5	0.95 b	23
GA _{4/7}	5	0.95 b	32
GA _{4/7}	50	0.95 b	32
Cytokinin	250	1.02 c	37
Cytokinin	500	1.02 c	35

* Determined by dividing fruit length by fruit diameter.

† Determined by dividing the number of fruit set by the number of blossoms.

‡ Ratios followed by the same letter are not significantly different at the 5% level.

of cytokinin, a compound which stimulates cell division. The gibberellins, on the other hand, cause cell elongation and perhaps could be applied at periods well after bloom and still be effective because cell enlargement occurs in the apple until harvest.

The dual effects of cytokinin in increasing set and elongating apple fruit may prove useful. However, the current cost of this chemical precludes its commercial application at present. The materials mentioned here are not registered for use at this time and this article is not to be considered a recommendation.

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