Observations on Firmness in Storage of 8 Strains of Delicious Apples Frozen Prior to Harvest

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Ambient air temperatures at Smithfield were below 0°C (32°F) on 9 separate occasions prior to and during the 1972 'Delicious' apple harvest (table 1). Non-harvested fruits were solidly frozen 5 times, but after thawing on the tree appeared to be essentially unharmed.

To observe the influence of these preharvest freezing temperatures on storage life of the fruit, samples of each of 8 strains of 'Delicious' were harvested on October 17th, 7 days after the first but just prior to a predicted second freeze. Additional samples were collected on October 20th after the second, third and fourth freezes, and again on October 25th after the fifth freeze (table 1). In each instance apples were permitted to thaw completely before harvest, and were placed in 0°C storage immediately after. At approximately monthly intervals pressure test readings were taken using an Effegi Fruit Tester, 10 mm head) on 10 fruits per sampling unit taking 2 readings per fruit.

In general, apples exposed to the single freeze on October 10th tended to be firmer throughout the 5 month storage period than those exposed to 4 or 5 nights of freezing conditions (figure 1). This was particularly evident in the composite values for 6 strains (figure 1, bottom left). Fruits exposed to repeated freezing failed to show signs of deterioration (browning of flesh beneath the skin) until late February. In samples of repeatedly frozen fruits examined February 21st, breakdown occurred in only 10% of 4 strains ('Hi-Red', 'Royal Red', 'Bridgham' and 'Earlired'). No breakdown was evident in samples from the once frozen group. By early April, samples of all repeatedly frozen strains showed 10 to 40% breakdown, whereas only 2 strains ('Hi-Red' and 'Excells Red') showed breakdown in samples harvested after the single exposure to freezing temperatures.

It is both difficult and unwise to draw firm conclusions from these limited data, since variations in one or more aspects of environmental growing conditions, and variations in maturity of different strains, markedly modify storage life of any apples. However, these observations do suggest a guide of approximately 2 to 3 months as a feasible commercial cold storage life expectancy for 'Delicious' apples exposed to similar, repeated preharvest freezing conditions.

Table 1. Ambient air temperatures (4 ft. level) for selected dates during October 1972.

Date	Temperature (°C) Minimum	Maximum	Hours at or below 0°C	Hours at or below −2.2°C
October 1	−0.6	13.9	1.7	0
10	−5.0	6.1	10.0	5.0
11	−1.1	15.6	7.0	0
13	0	9.4	1.5	0
15	−0.6	7.8	3.0	0
17*	1.7	6.7	0	0
18	−5.6	4.4	12.0	9.8
19	−3.9	4.4	13.4	8.3
20*	−5.6	6.7	15.3	10.4
21	−6.1	8.3	10.5	6.5
22	5.0	9.4	0	0
23	7.2	11.1	0	0
24	2.2	3.9	0	0
25*	1.1	4.4	0	0
26	−1.7	9.4	2.2	0

*Denotes Harvest Dates.

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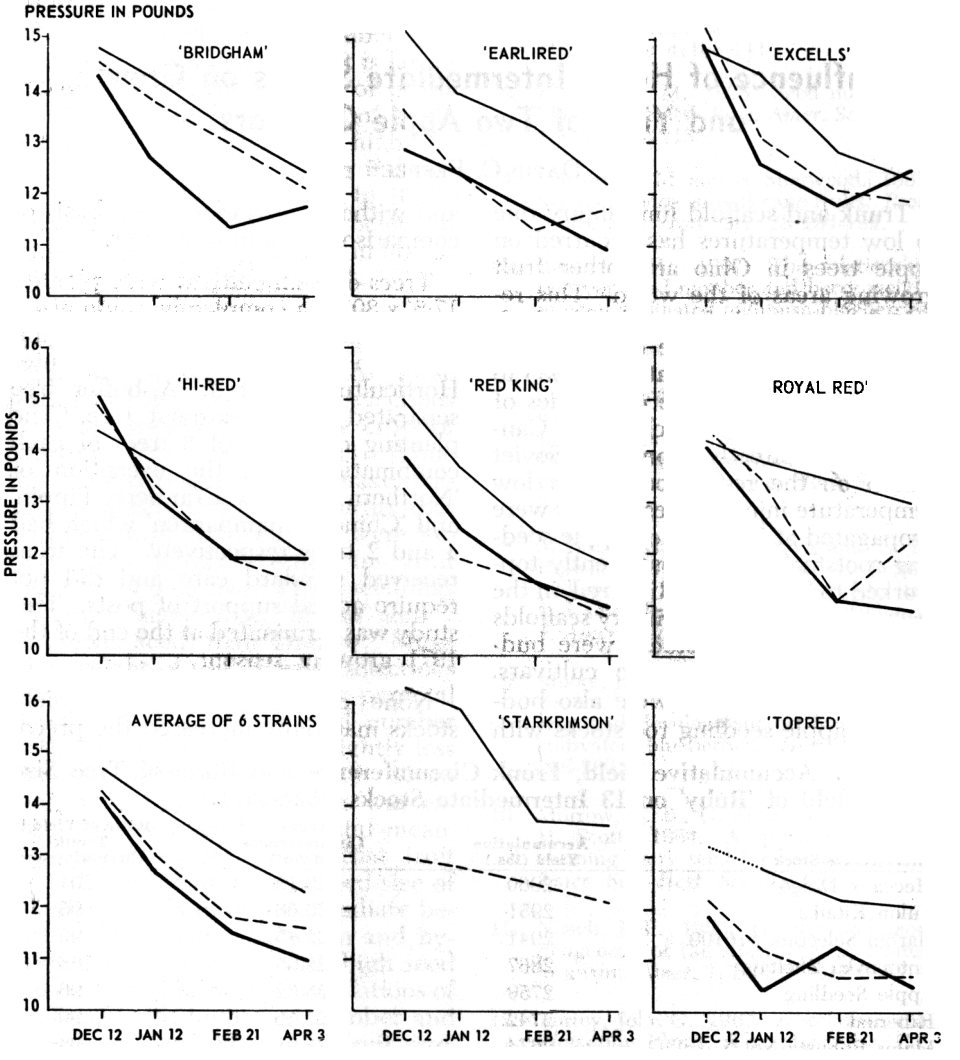

Figure 1. Variations in firmness of 8 strains of 'Delicious' apples frozen once (regular line), 4 times (broken line), or 5 times (heavy line) prior to harvest. 'Starkrimson' and 'Topred' were not included in the composite graph, bottom left.