6. Refrigeration for preserving the quality and enhancing the safety of foods; Shelf-life prediction and food quality evaluation.

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# SIMULATING PEACH QUALITY IN REFRIGERATED SUPPLY CHAINS

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## ABSTRACT

Peaches like other fresh produce pass through various links of the refrigerated supply chain from the farmer's field to the consumer's plate. There are recommendations for ideal storage temperatures to increase shelf life of the peaches. However, those conditions are seldom met fully in real life conditions, thereby decreasing the shelf life. It is difficult to know the residual shelf life at any one stage in the supply chain.

To tackle this problem computerized simulation models for predicting peach quality during distribution were developed from storage studies. The models were then applied to each link in a typical refrigerated supply chain. The initial mass and firmness at harvest and the time and temperature in the field were the values used for calculating the percentage change in quality parameter for the first link. Inputs to subsequent links were the outputs from the previous links.

Computations were made in a computerized spreadsheet for a "reference" refrigerated system and a "typical" chain. The times and temperatures entered for "reference" system represent ideal temperature histories for peach distribution chains. The conditions for "typical" system are the field conditions for temperature. The temperature profile, percent firmness and percent mass for the two systems are simulated and plotted upon data entry. The two horizontal lines on the percent firmness plot give the quality threshold when the peaches are "ready to sell" and "ready to eat".

A noteworthy result of the plot is the visibility of rapid mass and firmness losses for the short times at high temperature at a dock and in a car. Also, the rapid initial increase in "typical" system indicates the importance of reducing delays before cooling. Finding the horizontal distance between the two curves shows the benefit of low temperatures. The model can simulate the quality of peaches during its journey through the various links of the refrigerated chain.

**POSTHARVEST QUALITY SIMULATOR FOR PEACH SUPPLY CHAIN**

**Input time and storage temperatures for various links of the Postharvest Chain System.**

| CHAIN LINKS | TIME (HOURS) | REFERENCE TEMP.(F) | TYPICAL TEMP.(F) |
|---|---|---|---|
| FIELD | 8 | 34 | 95 |
| PACKHOUSE | 48 | 34 | 36 |
| TRANSPORT | 24 | 34 | 45 |
| WAREHOUSE | 96 | 34 | 36 |
| DOCK | 4 | 34 | 90 |
| RETAILER | 96 | 34 | 50 |
| CAR | 4 | 34 | 100 |
| HOME | 48 | 34 | 45 |