STUDY OF MEALINESS AND OTHER PHYSICAL PROPERTIES OF APPLE

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STUDY OF MEALINESS AND OTHER PHYSICAL PROPERTIES OF APPLE

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ABSTRACT

Quality is an increasingly important factor in the production and marketing of fresh fruit and vegetables. After harvesting, fruit and vegetables are placed in storage for a few days or a few months, serving as a means to extend the season and provide a reserve for more uniform retail distribution. Changes in texture, particularly the development of mealiness, will greatly affect fruit eating quality, and thus its acceptability to consumers. Mealiness occurs extensively in both pome and stone fruits. A special concern in this study was the problem of mealiness measurement of "Braeburn" apples. This cultivar was New Zealand's most popular export apple variety in the June 1996 year, valued at $102.2 million.

The objective of this study was to investigate the development of apple mealiness and to develop an apple mealiness indicator by (1) providing a detailed review of literature on fruit mealiness, (2) studying the changes in physical properties with the development of apple mealiness, (3) comparing the physical properties of mealy with non-mealy and aged apples, and (4) investigating the relationships between objective tests and subjective tests to develop good mealiness indicators.

A review of the literature showed that mealiness was not just the loss of water, but was related to the way water is bound or tied up chemically within the fruit, which can make it difficult to extract. Many studies have been done on the objective measurement of fruit mealiness, but until now there are no good indicators based on fruit physical properties which have been adopted by the fruit industry. Some parameters may be effective for measuring fruit mealiness, such as internal air space, extractable juice, but further research work needs to be done to correlate these parameters with subjective tests, to investigate the correlation with other physical parameters and to monitor changes in values with the development of fruit mealiness.

Experimental studies on the effect of storage conditions showed that high temperature hastened apple ripening and mealiness processes. Texture deterioration was a main quality concern in apples stored under high humidity conditions (>90% at 20°C and >

95% at 0°C), but shrivel was also a major quality factor in fruit stored at low humidity conditions (<90% at 20°C and <95% at 0°C).

By monitoring the physical property changes during the development of apple mealiness, the following results were obtained:

Mealy apple density was significantly lower than that of fresh apple. This decrease was mainly affected by the development of apple mealiness. However due to the wide variation in density change, it was not a reliable mealiness predictor.

In the initial stage of the experiment twist strength declined with storage time. Thereafter changes were related to humidity conditions. The value of mealy apples was significantly lower than that of aged, shrivelled but not mealy apples. Multiple regression indicated that twist strength change was not only affected by mealiness development, but also by different treatments and apple age, so it was not a suitable mealiness indicator.

Elastic modulus changes did not respond well to the development of apple mealiness. When apples shrivelled, elastic modulus declined greatly. Multiple regression results indicated that both apple mealiness development, and apple age affected the change of elastic modulus. Low R^2 values indicated that elastic modulus were weakly related to the treatments, apple age and mealiness development. It could not be used as an apple mealiness indicator.

Both compressive energy and fracture strength declined with storage time. Multiple regression results indicated that both changes of compressive energy and fracture strength were not only affected by mealiness development, but were also equally affected by different treatments and apple age, so they were not suitable mealiness indicators.

Based on literature studies, shear strength is mainly determined by the strength of the cell wall. Shear gradient declined with storage time and the development of apple mealiness. Multiple regression results indicated that changes of shear gradient were only

affected by mealiness development, and so it may be a suitable mealiness indicator. However, the regression coefficient was relatively low (0.43), and further research work would need to be done to attempt to improve its reliability.

Keywords: Fruit texture, texture analyser, fruit mealiness, density, twist strength, elastic modulus, fracture strength, compressive energy, shear gradient.

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