and 'Queen of Hearts' had the highest amount of marketable melons after storage while 'Fummy' and 'Nova' had the least.

In general, we can conclude that all cultivars evaluated responded similarly to the storage conditions used in this study. All cultivars tested were susceptible to chilling injury as reported for seeded cultivars (9, 10). We would also expect seedless cultivars to react to the prestorage conditioning similar to seeded cultivars (9, 10). In this test, storage at 10°C was better than storage at 1°C for 2 weeks plus one week at 20°C. These data agree with earlier findings (4, 5, 10) for seeded watermelons. In this study decay, particularly after harvest 3, was high but preharvest application of fungicides to control field diseases and post harvest decay should reduce the incidence of decay (4). Seedless cultivars of watermelon should also be able to withstand the rigors and shipping time involved during export. With increased production of seedless watermelons in U.S., perhaps the export potential to Europe and Japan, where high quality is demanded, should be explored. The export market in Europe and Japan prefer the smaller sized fruit as compared to the larger sized fruit. Since seedless watermelons tend to be smaller than the larger sized seeded watermelons, they should be acceptable for the export market in Europe and Japan.

Literature Cited

1. Allred, J. and C. Lucier. 1990. The U.S. watermelon industry. U.S. Dept. of Agr. Staff Report 9015.
2. Anonymous. 1990. Seedless watermelons defy spitting image. Packer June 30, 1990.
3. Chisholm, D. N. and D. H. Picha. 1986. Effect of storage on sugar and organic acid contents of watermelons. HortScience 21:1031-1033.
4. Dow, A. T., R. H. Segall, D. L. Hopkins and G. W. Elmstrom. 1979. Effects of storage temperature and field fungicide treatments on decay of Florida watermelons. Proc. Fla. State Hort. Soc. 91:149-150.
5. Hardenburg, R. E., A. E. Watada and C. Y. Wang. 1986. The commercial storage of fruits, vegetables, and florist and nursery stocks. U.S. Dept. of Agr. Agr. Handbk 66.
6. Kihara, H. 1951. Triploid watermelons. Proc. Amer. Soc. Hort. Sci. 58:217-230.
7. Leupschen, N. S. 1961. The development of *Mycosphaeralla* black rot and *Pellicularia rolfsii* rot of watermelons at various temperatures. Plant Dis. Rptr. 45:557-559.
8. Maynard, D. N. and G. W. Elmstrom. 1989. Evaluation of triploid watermelon cultivars in central and southwest Florida. Proc. Fla. State Hort. Soc. 102:313-319.
9. Picha, D. H. 1986. Postharvest fruit conditioning reduces chilling injury in watermelons. HortScience 21(6):1407-1409.
10. Risse, L. A., J. K. Brecht, S. A. Sargent, S. J. Locascio, J. M. Crall, G. W. Elmstrom and D. N. Maynard. 1990. Storage characteristics of small watermelon cultivars. J. Amer. Soc. Hort. Sci. 115(3):440-443.
11. Showalter, R. K. 1960. Watermelon color as affected by maturity and storage. Proc. Fla. State Hort. Soc. 73:289-293.
12. U.S. Dept. Agr. 1978. U.S. standards for grades of watermelons.

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OPTICAL METHODS FOR MEASURING INTERNAL FRUIT AND VEGETABLE QUALITY

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The definition of fruit and vegetable quality was discussed, including the specific physical and chemical parameters frequently used in assessing product quality. The use of external color as a quality index also was discussed. Major emphasis was placed on obtaining information about the internal quality of a sample and the accomplishment of this task by the use of high optical density spectrophotometry in which the radiation is transmitted through part or all of the intact fruit. To be of practical value the method must be rapid and nondestructive. The radiation of choice in this work is near infrared (NIR). The approaches for acquiring spectral data as well as for treating and analyzing the data were discussed. Specific examples of the approach were presented for determining dry matter in intact onions and white potatoes and soluble solids in intact cantaloupe and honeydew melons.

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NONDESTRUCTIVE MEASUREMENT OF QUALITY OF FRUITS AND VEGETABLES

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The psychological impact of color of various fruits and vegetables, as well as food products derived from them, has a profound effect on consumer's perception of the product's quality. The bright orange of oranges, redness of tomatoes or yellow color of a 'Golden Delicious' apple are always perceived as indicators of better quality than lighter colors of the same produce. In most instances, the perception and the reality of higher quality coincide, since the development of the coloring materials in the peels of fruits, coupled with the disappearance of chlorophyll, indicates stages of maturity, which in turn coincides with accumulation of desirable components. Changes of internal color can be used similarly. Color is commonly used to emphasize certain product characteristics, therefore specific product standards are normally developed to indicate the desired attributes. Color can be evaluated in comparison with these standards, or in terms of standardized

color values. Visual evaluation techniques, used originally to describe color characteristics, and their pitfalls were described. The visual approach has been largely superseded by instrumental measurements. The available instrumentation and some of the color scales currently employed were discussed. Types of instruments in use range from simple narrow-band filter color comparators, through broad-band tristimulus instruments to full spectrum spectrophotometers. For practical use with fruits and vegetables, most are employed in reflectance mode. Examples of the instruments were shown. Most frequently used instrumental color scales are based on tristimulus values. Specific scales have been developed for various fruit and vegetable products to indicate color characteristics deemed desirable.

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ON-LINE QUALITY MEASUREMENTS OF FRUITS AND VEGETABLES

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On-line sensing of fresh produce has been an important area of research and development since the early 1950's. The goal of such processes has been to identify fruits and vegetables that meet certain grade criteria and to then segregate the product based on such criteria. An overall grading system can be subdivided into three parts: sensing, classification and actuator components. Coupled with this grading system must be a handling system for product presentation to the sensor, indexing of the product and a mechanism for category diversion into the desired product streams. The rationale for such automation has been the high cost and unreliability of a labor force for seasonal work which is monotonous and somewhat arduous. Also, the consistency and accuracy of machine-based grading may be higher than that of manual grading. Such systems may also have more flexibility in adjusting acceptable standards. For example, packing a premium grade for export or upscale domestic markets would be desirable.

An ideal sensor system should be reliable, durable, environmentally immune, small in size and non-intrusive. Also, high resolution and accuracy are desirable but are usually considered trade-off factors with overall costs. The microprocessor decision making portion of such units must work in real-time. For most packinghouse operations, the speed requirements are 20 to 100 decisions per second. The amount of data can vary extensively from single inputs, e.g., mass, to digital image processing, typically 256 x 256 arrays or greater. New computer modeling tools are now becoming available for data analysis that more closely emulate the human decision making process. The next generation of automatic grading equipment will no doubt have "trainable classifiers" based on neural networks or pattern recognition concepts. It is envisioned that automatic grading will eventually offer packers the ability to analyze for features, especially internal quality attributes, that the current manual grading cannot discern.