Postharvest/Transportation “Training the Trainers” Seminar

Lisa Kitnoja, August 2002.

Demonstration Protocols:

Module 1: (5 demonstrations)

Topics:
Harvesting tools
Maturity Indices
Grading/Sizing
Curing
Packaging Materials

1) Harvesting Tools

Objective: to display and demonstrate the use of cutting tools, sharp knives, hand clippers, field containers.

Materials: Selected cutting tools, sharp knives, hand clippers, field containers.

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(equivalent degrees Brix for sugar solutions) in a small sample of fruit juice. Temperature will affect the reading (increasing about 0.5% SSC for every 5 ºC or 10 ºF), so you should adjust the measurement for the ambient temperature.

A garlic press works well to squeeze the juice from fruit samples. For small fruits, use the whole fruit, while for large fruits, take a wedge for the stem end to the blossom end and to the center of the fruit. Remove any pulp by filtering the juice through a small piece of cheesecloth. You must clean and standardize the refractometer between each reading with distilled water (should read 0% SSC at 20 ºC or 68 ºF).

Here are some examples of minimum %SSC for selected commodities. If your reading indicates a higher % SSC, then your produce is better than the minimum standard. Strawberries which are of excellent flavor, for instance, would measure above 8% SSC.

	Minimum %SSC
Apricot	10%
Blueberry	10
Cherry	14-16
Grape	14-17.5
Kiwifruit	6.5
Mango	10-12
Muskmelon	10

Firmness

The degree of softness or crispiness can be estimated by squeezing produce, or by taking a bite. Objective measurements can be made with inexpensive penetrometers. The most common way to measure firmness is resistance to compression or pounds force (lbf). The Effegi fruit penetrometer is a hand-held probe with a gauge for pounds-force.

To measure firmness, use fruit that are uniform in temperature, since warm fruit are usually softer than cold fruit. Use fruits that are uniform in size, since large fruit are usually softer than smaller fruit. Make two puncture tests per fruit on larger fruits, once per opposite cheeks, midway between stem and blossom ends. Remove a disc of skin (larger than the tip to be used) and choose the appropriate plunger tip (see below). Hold the fruit against a stationary, hard surface, and force the tip into to fruit at a slow, uniform speed (take 2 seconds) to the scribed line on the tip. Take the reading to the nearest 0.5 lbf.

Appropriate Effegi plunger tip sizes to use when measuring firmness in selected fruits:

1.5mm (1/16 inch) Olive

Plug your numbers into the formula below to calculate the % TA of the commodity.

$$\%\ TA = \frac{\text{ml NaOH} \times \text{N(NaOH)} \times \text{acid meq. factor} \times 100}{\text{ml juice titrated}}$$

For berries, citrus fruits and pineapple, use citric acid (acid meq. factor = 0.064)
For apples, pears, peaches and nectarines, use malic acid (acid meq. factor = 0.067)
For grapes, use tartaric acid (acid meq. factor = 0.075)

Example: 10 ml of 'Perlette' grape juice in 20 ml water is titrated with 8 ml 0.1N NaOH.

$$\%\ TA = \frac{8 \text{ ml NaOH} \times 0.1\text{N(NaOH)} \times 0.075 \times 100}{10 \text{ ml juice titrated}} = 0.6\ \%$$

Knowing the sugar content alone is not enough to measure maturity and quality of citrus fruits and grapes. In these cases, the ratio of sugar to acid content is a much better predictor of high quality produce. You need to measure both %SSC and % TA, then divide SSC by TA to calculate the ratio of the two.

Examples of minimum SSC/TA ratio:	
grapefruit	6.0
mandarin	8.0
orange	8.0
grape	20.0

Sources of quality/maturity measurement instruments

McCormick Fruit Tech (sizers, sizing rings, refractometers, penetrometers, pH meters)
615-B S. 48th Ave.
Yakima, WA 98908
Phone (509) 966-8999
FAX (509) 966 7635

DeltaTrak (pH meters)
P O Box 398
Pleasanton, CA 94566
Phone (800) 962-8776
FAX (510) 856 1147

Fruit and Vegetable Quality Control, CA Department of Agriculture
(color charts, sizers, Granny Smith Apple Starch Scale)
1220 N Street, Room A-265
Sacramento, CA 95814
Phone (916) 654-0919
FAX (916) 654 0666

International Ripening Corporation (refractometers, temperature probes, calipers, sizer rings, pressure testers, pH meters, chlorine meters) www.qasuppiles.com
1185 Pineridge Road

3) Grading/Sizing

Objective: to demonstrate various methods used for grading fresh produce.

Materials: color charts, grading charts or description of grades, sizing rings, calipers.

Set-up: Select produce of various types, representing a wide range of sizes, shapes, maturities of each product.

Demo: Show trainees how to measure aspects of product related to grade. See U.S. Grades and Standards and EU Grades and Standards for documentation on grades.

4) Curing

Materials: straw and canvas sheet, illustrations (see Chapter 2 of the Small Scale Postharvest Handling Practices Manual.)

Set-up: 3 or 4 days prior to demonstration, select freshly harvested sweetpotatoes, randomly assign into two groups. Place one group under curing conditions (warm temperature, hi

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Module 2: (3 demonstrations)

Topics:
Temperature effects on ripening/maturity, quality, decay rates and shelf life
Relative Humidity effects on water loss (weight loss), decay and appearance
Cooling practices (small scale)

1) Temperature

Objectives: to demonstrate how temperature effects the rate of ripening, senescence and visual quality (decay, color changes) in fresh produce.

Materials: Select fruits and vegetables (papaya, avocado, chilies, eggplant, okra, green beans) of uniform maturity and quality. Randomly divide each product into four groups.

Set-up: 3 to 5 days prior to demonstration, place selected products under controlled temperatures (0 C, 10 C and 20 C) and at ambient temperature (27 to 32C). For tropical products, take samples from 0 and 10C and leave at ambient conditions for 2 days.

Demo: Show trainees the differneces in appearance, SSC, weight, decay incidence in the products held at different temperatures.

2) Relative Humidity

Objectives: to demonstrate how relative humidity effects the rate of water loss, senescence and visual quality (decay, shrivel, wilting) in fresh produce.

Materials: Select fruits and vegetables (papaya, avocado, chilies, eggplant, okra, green beans) of uniform maturity and quality. Randomly divide each product into four groups.

Set-up: 3 to 5 days prior to demonstration, place selected products under controlled temperatures (0 C, 10 C and 20 C) and at ambient temperature (27 to 32C) under either no RH control (open air storage with low RH) or in vented plastic bags(high RH). For tropical products, take samples from 0 and 10C and leave at ambient conditions for 2 days.

Demo: Show trainees the differneces in appearance, weight, decay incidence in the products held at different temperatures and relative humidities.

3) Cooling Practices

Objectives: to demonstrate some simple cooling practices for fresh produce.

Materials: shade cloth, wet burlap, demo parts and illustrations for showing how to construct small-scale coolers (evaporative cooler, portable forced-air cooler, hydro-cooler, USDA pot-cooler), gel packs, pallet covers.

Set-up: Display cooling materials and illustrations. Freeze one of the gel packs a few days before the training program.

Demo: Show trainees how to use the displayed materials, discuss proper uses, and pros and cons for the various cooling methods for different types of produce. See Chapter 6 of the Small-Scale Postharvest Handling Practices Manual.

Module 3 (2 demonstrations)

Stacking and palletization
Loading patterns and bracing loads

1) Stacking and palletization

Objective: to demonst