Painless and Efficient Maturity Testing

Win Cowgill
Professor Emeritus Rutgers, Win Enterprises International, LLC
Jon Clements
Extension Tree Fruit Educator, University of Massachusetts

Our observation has been that few growers utilize the Starch Index (SI) method of determining harvest maturity. Perhaps SI testing is perceived as time consuming and difficult to properly judge. We contend, however, that SI testing is the best and easiest indicator of apple maturity that a grower can use to plan their harvest and storage regimes.

Why is it important to perform SI testing? First, as mentioned, the SI method is probably the best way to judge fruit maturity without expensive equipment. The Sl technique, wherein the starch content is visualized, is correlated with ethylene evolution. In fact, ethylene synthesis occurs as fruit ripens. Therefore, the SI index is an inexpensive way to assess the degree to which fruit has converted starch to sugar and is indicative of the onset and progress of ethylene production.

Secondly, because SI is a reliable indicator of relative fruit maturity, SI testing can help you determine if harvested fruit should be placed in early CA, late CA, or regular cold storage. Remember that, as a rule, fruit with SI readings of 3-4 are suitable for late CA, apples measuring 4-6 on the SI scale are best for early CA, and any fruit reading 6 or above should be placed in regular cold storage or marketed immediately. Of course, reliability in using the SI method for determining apple maturity is predicated on good sampling techniques, i.e.; looking at fruit that has sufficient size and color. Or, in other words, sample apples that you expect are approaching harvest readiness. [Note: Apples going into late CA (available in April-June, etc.) should not average less than 16 lbs. flesh firmness, except for Honeycrisp.]

The postharvest physiologists at Cornell University have developed a universally accepted chart that is useful for all varieties. Cornell has an excellent publication available to help you use the starch-iodine test and to develop an apple maturity program. The publication also contains a laminated starch iodine chart to aid in interpreting the tests. I strongly suggest that anyone seriously interested in harvesting high quality apples with good storage potential download a copy of this publication, 'Predicting Harvest Date Windows for Apples (1992)' Information Bulletin 221 -- http://ecommons.library.cornell.edu/handle/1813/3299

Full-color plates show how to use and interpret the starch-iodine test for determining maturity and the best harvest dates for quality, especially important for apples going into storage. It covers McIntosh, Cortland, Empire, Delicious, Mutsu/Crispin, and Idared; dates for other varieties can be interpreted from the information presented. The cost of the publication is $5.50 and can be ordered from Cornell University by calling 607-255-2080 and using a credit card to pay for the pub or by ordering online at http://ecommons.library.cornell.edu/handle/1813/3299

Having tested tens of thousands of apples over the years, per numerous experimental protocols, we can now suggest a simple, quick, and efficient method for evaluating orchard by orchard or block by block SI apple samples. Here is our quick and simple testing technique:

- Equipment consists of a one quart hand-operated spray bottle filled with SI solution, a pocketknife, and a Starch Index chart. It's most important to just use the chart and begin sampling and testing the fruit two weeks before anticipated harvest to get a baseline on the maturity.
- The procedure is simple -- pick a sample of apples that appear ready to harvest, based on size, color, days after full bloom, and taste. Spray the SI solution on longitudinally halved fruit, wait one to one and one-half minutes, and make your readings based on the SI chart. The whole process is portable, quick, simple, and saves Sl solution compared to dipping individual apple in a solution filled pan.

- It is important to keep good records on your maturity determinations by cultivar and block. You will start to build a good database of harvest maturity information for your orchard.

Although the SI is a reliable gauge of many cultivars, such as McIntosh, Empire, Jonathan, Delicious, Golden Delicious, and Macoun, some cultivars do not work as well to the SI test. Examples include Gala, Honeycrisp, and Fuji, where SI readings do not correlate well with maturity, and maturity of these cultivars should be gauged using background color, soluble solids content, and flesh firmness.

Background color is a very good maturity indicator on Gala and will provide the grower with an accurate maturity gauge. Red color, flesh firmness and soluble solids are not as reliable an indicator of maturity as is background color on this cultivar. Fruit should be harvested for optimum long-term storage quality when the background color of the fruit is changing from a green to yellow color. After that, the background color changes from yellow to cream. It is at this stage that the fruit is ready for immediate sales or short-term storage. Galas will require multiple pickings for optimum fruit quality. Background color is also one of the best indicators of maturity for Fuji cultivars.

Here are some additional resources on fruit maturity testing and for purchasing/making supplies for doing the SI test, including SI Test solution and charts. Also, contact Win Cowgill or Jon Clements if you have further questions or need more information.

How to prepare Starch Iodine test solution from the Ontario Ministry of Agriculture

The Ontario Ministry of Agriculture, Food, and Rural Affairs, has two publications on using the SI test, including directions for making the solution and charts for McIntosh, Delicious, Empire, Idared, and Spartan. For the complete Ontario Fact Sheet see http://www.omafra.gov.on.ca/english/crops/facts/00-027.htm#prep

From the Ontario publications: Always use a freshly prepared solution at the beginning of every season. This solution is sensitive to light and should be stored in a dark container. A dark-colored bottle or a glass jar wrapped in aluminum foil will serve the purpose. Chemicals needed for this test are potassium iodide and iodine crystals. A pharmacist or a chemist can use the following recipe to make up the iodine solution. Dissolve 8.8 grams of potassium iodide in approximately 30 mL of warm water. Gently stir the solution until potassium iodide is properly dissolved. Add 2.2 grams of iodine crystals. Shake the mixture until the crystals are thoroughly dissolved. Dilute this mixture with water to make 1.0 L of test solution. Mix them well.

Purchasing Starch Iodine Solution

We have not found a source of pre-mixed iodine solution. Potassium iodide and Iodine crystals can be purchased from Fisher Scientific https://www.fishersci.com/us/en/home.html

Updated August 30, 2021

STS
SUMMIT TREE SALES, INC.
REPRESENTING THE COUNTRY'S FINEST NURSERIES

Your One-Stop Source
For Commercial Fruit Trees

- *New varieties*
- *Reliable rootstocks*
- *Top quality nursery trees*
- *Decades of industry knowledge*

Dawn Melvin

Matthew Schuld

**Your time is valuable,
make Summit your first call!**

800.424.2765

www.summittreesales.com • Like us on Facebook