

Reviewing the procedure for specific gravity measurement of potato tubers

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Specific gravity of potatoes is an important determinant of harvest quality. In practice this attribute of a tuber is an indicator of maturation that the industry uses as a reference to judge fry quality, baking characteristics and storability. More importantly the specific gravity measurements reflect environmental factors and cultural management procedures that were made during the production season.

Improper sampling and methods of determinations could mislead specific gravity measurements. In addition the distribution of starch or dry matter, sugar content, types of sugars and distribution, internal cell structures, tuber size and shape, tuber defects such as growth cracks and hollow heart can also influence specific gravity measurements. Given these variations one can use some prudence in the selection and preparations for specific gravity measurements. The procedure outlined here should minimize some of the variations in specific gravity determinations of potato tubers.

Selection of samples: A 10 to 15 lb. sample unit is an adequate sample size. If they are to be collected at harvest select tubers from hills that are close together. However, several such locations within the field should be selected representing topographic differences within the field. Similarly, if collecting from a storage or from a delivery truck samples units should be collected at random from several locations or points.

- Tuber size: Tuber size can influence specific gravity measurements. For this reason, sample units should contain tubers of all sizes and ones that are smooth skinned.
- Dirt and debris: All extraneous matter adhering to the tuber should be removed. Better yet the sample unit should be washed before preparing for specific gravity measurement.
- Tuber dryness: Wet tubers have about 0.001 units higher specific gravity than dry matter. Therefore some consistency in this condition should be maintained.
- Water and tuber temperature: Water and tuber pulp temperature should be standard for all samples measured. Ideal water and pulp temperature for specific gravity measurements is 50 F.
- Calibrate scales: There may be slight variations between scales and materials used for weighing from time to time. These measures need to be re-calibrated and standardized periodically.
- Sample agitation: Air bubbles adhering to the sample potatoes submerged in the water will add to errors in specific gravity measurements. Lightly agitate tubers in the container as it is lowered into the water.

Determining specific gravity of potato tubers:

The weight in air/ weight in water method is one of the common methods of specific gravity

determinations. Selected sample units are first weighed in air and then the same unit is re-weighed suspended in water. Specific gravity can then be calculated using the following formula:

$$\text{Specific gravity} = \text{Weight in air} / (\text{Weight in air} - \text{Weight in water})$$

The total solids of the potatoes can be estimated from the calculated specific gravity measurements using the following table:

Specific gravity	Percent total solids
1.072	19.0
1.074	19.4
1.076	19.8
1.078	20.3
1.080	20.7
1.082	21.1
1.084	21.6
1.086	22.0
1.088	22.4
1.090	22.8
1.092	23.2
1.094	23.7

[Link to an Excel spreadsheet for specific gravity and percent solids](#)

United States standards for grades of potatoes for processing The two other methods of specific gravity determination procedures are the hydrometer methods and the brine solution methods. Excerpts of this article were taken from The Specific Gravity of Potatoes written by Bill B. Dean and Robert E. Thornton. Washington State University Cooperative Extension publication # EB1541.