

Buoyancy determination in pecan samples

L. J. Grauke, Dec. 1998

Dodge, F. N. 1944. A method of measuring the degree of kernel development of samples of pecan. J. Amer. Soc. Hort. Sci. 45:151-157.

Buoyancy is "the power to float or rise in a fluid". The density of water changes with temperature. At 20C(68F) (temperature recommended by Dodge), water has a density of 0.99823 g/cc, which is rounded to 1 for our purposes. At 25C (77F) water has a density of 0.99707 g/cc, which is also close enough. The temperature should be constant across all samples measured. As noted by Dodge, "buoyancy is taken to be the difference between the total water displacement of the sample and the displacement by the immersed parts of the nuts as they float. This latter is equivalent to the weight of the nuts. Hence the formula used in determining the buoyancy of the sample is: Total displacement in ml (=gm.) minus Weight of Sample in grams equals Buoyancy of Sample in grams. The total displacement of the sample can be calculated from the following formula: Weight of Sample in grams plus Buoyancy in grams equals the Total Displacement (volume)in ml (=gm.)."

We measure buoyancy using the apparatus shown below. A Mettler PM600 digital scale is mounted on a stand. A hole in the upper surface of the stand allows a chain to be attached to the bottom of the scale. A wire rack (or a perforated plastic container, for 10 nut samples) is hung from the chain and into a basin of water. The weight of the apparatus is registered on the scale. Use the tare to zero the scale. Place a single nut in the water under the rack, so that it floats up under the rack. The lift or buoyancy of the nut is registered as a negative number on the scale. Record the buoyancy as a positive number. To determine the nut volume, add the buoyancy to the nut weight.