

Some Considerations on Speed of Weighing Watermelon Fruit in Yield Trials

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Watermelon breeders interested in measuring yield of new inbreds and hybrids need an efficient method to get fruit weight. The method should provide data on many cultivars without using excessive time or resources. Often fruit weight in trials is measured by rounding the value either to the nearest integer or to the nearest tenth of the measurement unit (lb or kg). Data from each plot are then changed into standard measures (cwt/A or Mg/ha), and average fruit weight is calculated to characterize the cultivars by size: icebox (<12 lb), small (12-18 lb), medium (18-24 lb), large (24-32 lb), and giant (>32 lb) (1).

Neppl recently surveyed the trialing methods used by watermelon breeders (2) and found that trials are usually conducted using small plots of 1 to 3 rows each, in multiple locations when possible. The vines are not trained to avoid reducing the amount fruit set and the fruit are traced to the proper plot at harvest. Breeders in private companies usually use single harvest trials, public researchers usually use multiple harvest trials. The development of an efficient method for measuring fruit weight would be useful in reducing the cost of yield trials. Methods used by researchers include weighing each fruit for each plot, weighing all the fruit in one load per plot, or weighing one typical fruit per plot and multiplying by the number of fruit in the plot. The first method appears to be most common, while the last method requires that the average fruit be carefully chosen.

Factors affecting efficiency: In our study, yield data were taken by a four person crew, with one person loading the scale, one unloading, one reading the measurement on the scale display, and one person recording the measurement on a portable computer.

The crew moved together across the field measuring fruit weights for a series of eight plots using different techniques.

The speed of yield data collection was not affected by whether the data was recorded in tenths or rounded off to the nearest lb or kg. In our case, the limiting factor was the delay from the time the fruit was placed on the scale to the time the weight was displayed. A spring scale may be faster than a digital scale in this case. However, digital scales but not spring scales are available with an extension cord for the display to permit reading while standing away from the scale. That reduces interference with the scale loading crew, permitting the crew to work faster.

There was a large effect on speed due to the coordination and order of the single operations leading to the weighing of each plot. However, this will depend on the number and quality of people available to help do the field work, so was not measured as part of this study.

Precision required on single fruit weights: We were interested in the effect of reduced precision in yield data on the estimate of average fruit weight for cultivars being tested. For this, yield data were obtained from the watermelon trials conducted at the Cunningham Research Station at Kinston, NC (68 accessions) and at the Central Crops Research Station at Clayton, NC (64 accessions) in 2000. Each trial was harvested three times. The plot data were collected as single fruit weights with data taken to the nearest pound or in tenths of a pound. The average fruit weight was the mean of all fruit harvested for each cultivar. Yield was the mean over replications summed over harvests for each cultivar.

Average fruit weight and yield were calculated both from the non-rounded and rounded weights. Correlation analysis was run for the two traits calculated from rounded data vs. the same traits calculated from non-rounded data. The data were analyzed for five fruit-size categories: icebox (<12 lb), small (12-18 lb), medium (18-24 lb), large (24-32 lb), and giant (>32 lb) (1).

Yield estimates measured from values rounded to the nearest pound and not rounded (one decimal position of precision) were completely correlated. Thus, the two measurement methods (rounding vs. non-rounding) have the same accuracy. Furthermore, average fruit weights (rounded vs. non-rounded) were highly correlated, confirming the same conclusions for

accuracy. We found the same correlation levels presented above also within the five fruit-size categories. Therefore, there was no effect of measuring weights to the nearest pound or tenths of a pound, regardless of whether working on small-fruited or large-fruited cultivars (Table 1).

Literature Cited

1. Maynard, D. N., ed. Watermelons. Characteristics, production, and marketing. I ed. 2001, ASHS Press. 227.
2. Nepl, G. P., and T. C. Wehner. 2001. Survey of watermelon trialing methods used by breeders in the United States. Cucurbit Genetics Cooperative Report 24:67-69.

Table 1. Correlation of watermelon weight with and without tenths of the measurement unit (lb).^z

Trait	Fruit-size ¹	correlation (r)
Yield	Overall	1.00
	Icebox	1.00
	Small	1.00
	Medium	1.00
	Large	1.00
	Giant	1.00
Average fruit-weight	Overall	1.00
	Icebox	0.99 **
	Small	0.99 **
	Medium	0.99 **
	Large	0.99 **
	Giant	0.99 **

** r-value significant at p-value≤0.01

¹ Icebox (<12 lb), small (12-18 lb), medium (18-24 lb), large (24-32 lb), and giant (>32 lb)

^z Data are single fruit-weights of 2 trials and 4 replications each.