

## Analysis of ratio-based responses

Righetti, T. L., Sandrock, D. R., Strik, B., Vasconcelos, C., Moreno, Y., Ortega-Farias, S., & Banados, P. (2007). Analysis of ratio-based responses. *Journal of the American Society for Horticultural Science*, 132(1), 3-13. <10.21273/JASHS.132.1.3> Accessed 04 Jun 2024.

### Abstract

It is not appropriate to compare ratio-based expressions for different cultivars or treatments if a plot of the denominator versus the numerator of a ratio-based expression has a nonzero y-intercept and the values for either the denominators or numerators differ with cultivars or treatments. Whenever nonzero y-intercepts are encountered, the value for a ratio-based expression will be dependent on both the denominator and numerator. The “ratio problem” is demonstrated with shoot N concentration in blueberries (*Vaccinium corymbosum* L.) and amino acid accumulation in almonds [*Prunus dulcis* (Mill.) D.A. Webb]. Data were collected from the first and second growth flush of blueberry shoots on plants that were at two in-row spacings and two rates of N fertilizer. Free amino acid:total amino acid ratios were measured in dormant almond trees fertilized at different rates with and without foliar N supplements. Functions describing the relationship between dry weight and total N content in blueberry tissues have positive y-intercepts for both N fertilizer application rates. Functions describing the relationship between total amino acids and free amino acids in almond trees have a negative y-intercept. Differences attributable to fertilization rate in blueberries probably were the result of differences in N uptake and N utilization, but the effects of spacing and growth flush are indirect and can be accounted for by differences in dry weight. Likewise, effects of fertilization rate and foliar N supplement in almonds are indirect and can be accounted for by differences in the total amino acids in dormant trees. With regression one can determine if the relationship between the denominator and numerator differs for the groups or treatments being studied. When an analysis of covariance is used to account for differences in the denominators of ratio-based expressions, results are consistent with the regression analysis. When a conclusion is based on statistical differences of a ratio-based expression, it is the researcher's responsibility to determine whether these effects are direct or indirect.

### Keywords

intercept corrections, ratio-based efficiency, regression models, slope-based efficiency.