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Accuracy of the generic equation to convert CCI to chlorophyll concentration in the Apogee model MC-100 Chlorophyll Concentration meter

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Chlorophyll strongly absorbs photons below 700 nm and transmits above 700 nm. Because of this property, chlorophyll concentration can be estimated by measuring the ratio of transmitted photons through a leaf at specific wavelengths. Chlorophyll concentration is then calculated using empirical relationships.

The fundamental relationship between transmitted photons and chlorophyll is highly non-linear. The Apogee model MC-100 linearizes the relationship using species-specific relationships that correct for differences in position and orientation of chloroplasts among species. This meter also includes a generic equation based on the average of 22 species (Parry et al., 2014), but accuracy of this generic empirical relationship has not been tested for species not in the original study.

Materials and Methods

Measurements from seven plants (cucumber, radish, spinach, and four cultivars of lettuce) were used to evaluate the accuracy of the generic equation for chlorophyll concentration. Chlorophyll was extracted and measured using the procedures described by Parry et al. (2014). Values for chlorophyll concentration ranged from 50 to 700 $\mu\text{mol per m}^2$.

Results

The generic equation linearized the optical /absolute relationship for all species and values were close to the 1:1 line (Figure 1).

Discussion

When a species-specific relationship is not available, the generic relationship linearized the optical/absolute relationship across species, and significantly improved the estimation of absolute chlorophyll compared to the use of an uncorrected index of transmitted photons.

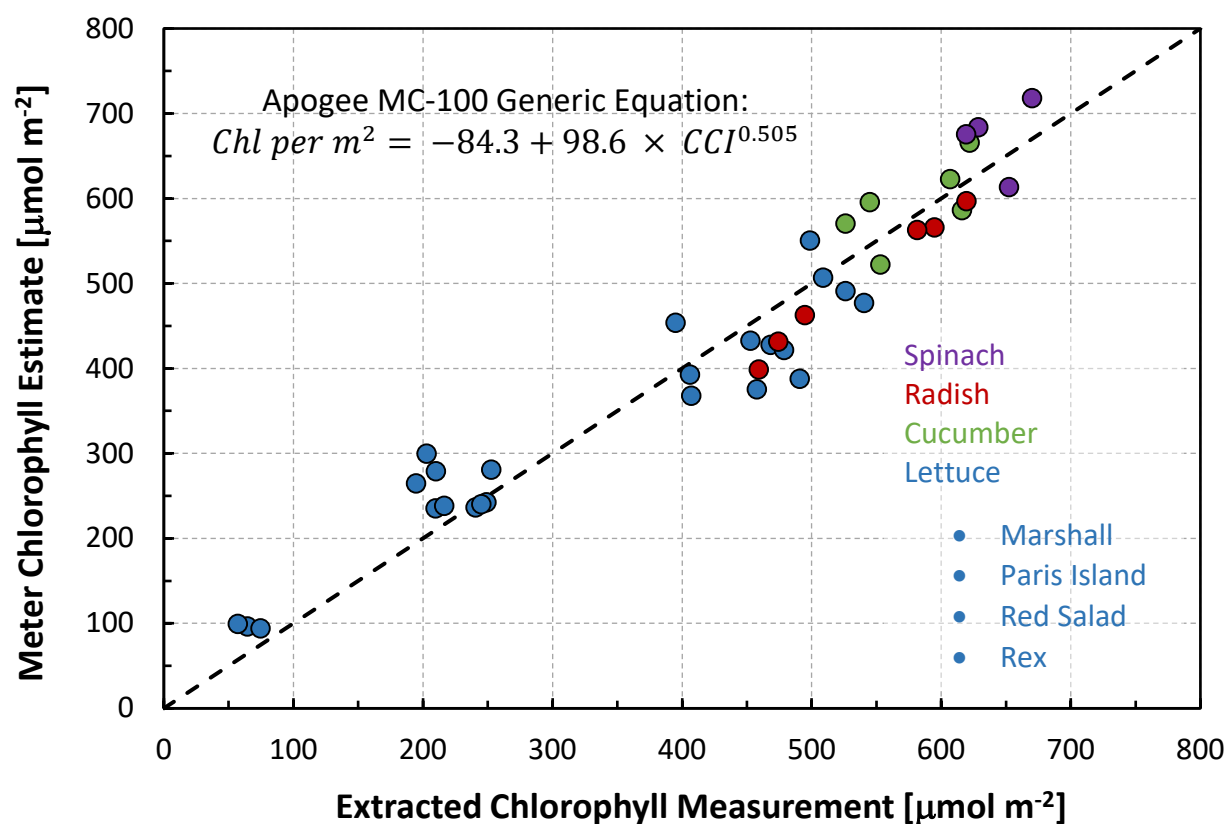


Figure 1. Relationship between the measured and extracted chlorophyll concentration for cucumber (green), radish (red), spinach (purple), and four varieties of lettuce (blue).

Literature Cited

Parry, C., Blonquist, J. M., & Bugbee, B. (2014). *In Situ* Measurement of Leaf Chlorophyll Concentration: Analysis of the Optical/Absolute Relationship. *Plant, Cell, and Environment*, 37, 2508 - 2520.