

A NOVEL CALCIMETER FOR SOIL CARBONATE ASSESSMENT WITH IMPLICATIONS FOR ACCURATE SOIL TEST METHODS

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ABSTRACT

Calcium carbonate equivalent content is an important soil characteristic, with ramifications for decisions made in agricultural production and soil testing labs alike. However, soil carbonate measurements are rarely included with soil fertility analyses in Kansas due to their tedious nature and the cost of analysis. The objectives of this study were to develop a reliable calcimeter using open-source electronics and readily available labware, and to evaluate its performance against procedures currently in use at the KSRE Soil Testing Lab. Measurements collected by the novel calcimeter were strongly correlated to the mass of reagent-grade calcium carbonate ($R^2=0.9998$). Likewise, regression analysis indicates strong relationships between calcium carbonate equivalent content determined using the novel calcimeter and median values reported by the NAPT program (slope = 0.998; $R^2 = 0.984$). Sample throughput was improved by approximately 10-fold using the new calcimeter when compared to the manometer apparatus currently employed by the KSRE Soil Testing Lab. Other quality-of-life factors were also improved, such as elimination of eye-strain from reading burettes and transcription errors, were an added benefit but are difficult to quantify.