

Title Color indices for the assessment of chlorophyll development and greening of fresh market potatoes  
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### Abstract

When displayed under supplemental lighting, potato (*Solanum tuberosum* L.) tubers develop chlorophyll, which leads to undesirable greening. Produce managers routinely cull potatoes that have greened; however, the process is subjective and variable, due to the absence of specific grading criteria and a lack of information on the time course and extent of greening under retail/fresh market conditions. The objectives of this study were to characterize the time course of greening/chlorophyll development for selected fresh market cultivars and to develop objectively-based scales of greening to subjectively sort tubers based on changes in visible color in retail markets. A survey of retail outlets showed that most potatoes are displayed at relatively low light intensities, ranging from 2 to 10  $\mu\text{mol quanta m}^{-2} \text{s}^{-1}$  (400–700 nm). At 6.8  $\mu\text{mol quanta m}^{-2} \text{s}^{-1}$ , chlorophyll concentrations in cells underlying the periderm of cultivars White Rose (WR), Yukon Gold (YG), Dark Red Norland (DRN), Russet Norkotah (RN), and Reba (R) increased linearly over a 5–7 day greening interval. The increased chlorophyll content affected changes in the *L*-value (darkness) and hue angle (color) of the periderm, characterizing the off color development unique to each cultivar. A greening scale was developed for each cultivar by subjectively selecting tubers from a population that had greened for 0–7 days to achieve a visually perceivable sequence of greening that spanned 8–10 levels, depending on the cultivar. Chlorophyll content increased linearly over the greening scales for WR, YG, and DRN ( $R^2 = 0.95\text{--}0.98$ ,  $P \leq 0.001$ ), whereas the relationships were quadratic ( $R^2 = 0.96\text{--}0.97$ ,  $P \leq 0.001$ ) for R and RN. These data calibrated the scales for chlorophyll concentration and indicated that the visible color changes were directly linked to chlorophyll development. The discoloration resulting from greening and characterized by changes in hue angle was dictated by chlorophyll in conjunction with the periderm color unique to each cultivar.