

Phenotypic characterization and inheritance of enzymatic browning on cut surfaces of stems and leaf ribs of romaine lettuce

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Abstract

Enzymatic browning is a major postharvest quality defect of romaine lettuce (*Lactuca sativa* L.). This study provides the first analysis of the relationship between the browning of leaf ribs and stems across twelve lettuce genotypes (ten cultivars, a breeding line, and a plant introduction). While all samples showed a progressive increase in browning index (BI) and decline in lightness (L^*) and hue (h°) during 5 °C storage, differences in the rate of browning development were observed among genotypes. The most intensive browning was observed mainly around the vascular bundles dispersed along the rim area of the stems. Browning on the cut surfaces of the stems was correlated with browning on the cut leaf ribs, with Pearson correlation coefficients of 0.886 for BI, 0.891 for L^* and 0.866 for h° . These results showed that the degree of browning in leaf ribs can be predicted by the browning degree of the stems. High genetic similarity was found among four cultivars with limited browning (Darkland, Parris Island Cos, Green Towers, and Hearts Delight) and also between cultivars with severe browning (King Henry and Tall Guzmaine). The highest broad-sense heritability (H^2) in both trials (July and November 2018) was 0.88 and 0.92 for stem and rib browning, respectively. The method based on stem browning can be used to simplify postharvest phenotypic evaluation of lettuce and to decipher the genetics of browning to accelerate the breeding of browning-resistant cultivars.