Abstract

Storability of shelled corn was defined as the fraction of remaining allowable storage time, an assessment of spoilage potential. Corn from three years (1986, 1991, and 1992) was harvested, dried, and subsequently stored in small bins. Samples taken at harvest and samples taken after various periods of bin storage (up to 77 months) were subjected to three primary tests: (1) accelerated storage and carbon dioxide evolution, (2) electrolyte leakage, and (3) near-infrared spectroscopy. The initial ($t < 72$ h) slopes (SLOPE72) of carbon dioxide evolution rate curves were related to storability ($r = 0.82$), as measured by cumulative carbon dioxide evolution at 200 hours. The correlation between SLOPE72 and storability was corroborated by mold assays before and after carbon dioxide tests. SLOPE72 was subsequently used to evaluate the effects of the following factors on storability: (1) hybrid, (2) drying method, (3) postharvest fungicide, and (4) previous storage history. Differences in storability, attributable to hybrid, were measurable and significant both at harvest and after periods of bin storage (up to 56 months). Corn dried by high-temperature ($T = 95°C$) batch crossflow drying had significantly lower storability (i.e., greater SLOPE72), than did the same hybrid dried by low-temperature (ambient air) drying. Corn treated with Iprodione, a postharvest fungicide, had greater storability than did untreated controls, both after drying and after 9 months of bin storage. Previous storage history (moisture and time) affected subsequent storability (i.e., SLOPE72). Storage for longer periods, given the same moisture, resulted in lower subsequent storability, and storage at higher moisture, given the same time period, also resulted in lower subsequent storability. In electrolyte leakage tests, 100 g of seeds were soaked in deionized water. The correlation between the conductivity after 10 minutes (COND10) and SLOPE72 was $r = 0.79$. Stepwise multiple linear regression was used to compare near-infrared transmittance (whole grain) and reflectance (ground grain), over a range of wavelengths, to SLOPE72. The best model ($R^2 = 0.78$) expressed SLOPE72 as a function of three independent variables: COND10 and the second derivatives of log(1/R) at 1668 and 2288 nm. Differences in storability may, therefore, be detectable by these two rapid test procedures.