

ABSTRACT

Micromolar concentrations of Al^{3+} inhibit root growth of many agriculturally important plant species. The plasma membrane is a primary target of aluminum (Al) ions. Glucosylceramides and related sphingolipid metabolites are known to influence membrane properties. This study aimed to investigate whether Al affects the sphingoid base (SB) composition in roots of maize (*Zea mays*, L.) lines differing in Al sensitivity. In agreement with the SB pattern found in other *Gramineae*, high levels of Δ^8 -(Z)-unsaturated SBs were present in the roots of the untransformed maize lines. In an Al-sensitive line, Al treatment significantly increased the proportion of (4E,8Z)-sphinga-4,8-dienine and of (8Z)-4-hydroxysphing-8-enine as well as the total SB content. In contrast, in an Al-resistant line, Al treatment decreased the Δ^8 -(Z)-unsaturated SBs and the total SB content. Heterologous expression of a Δ^8 -(E/Z)-sphingolipid desaturase from *Arabidopsis thaliana*, which preferentially introduces a Δ^8 -(E)-double bond into 4-hydroxysphinganine, led to an 8-fold increase in (8E)-4-hydroxysphing-8-enine. In Al-treated root tips of transgenic plants, a slight decrease in Δ^8 -(Z)-unsaturated SBs was observed, whereas the proportion Δ^8 -(E)-unsaturated SBs as well as the total SB content were not significantly altered. Based on Al-induced callose production, the transgenic plants were more Al-sensitive than the wild-type plants, suggesting that an increase in Δ^8 -(E)-unsaturated SBs and the loss of the ability to down-regulate the proportion of Δ^8 -(Z)-unsaturated SBs increased Al sensitivity.