

**STIVAL DA SILVA, A.L., SPERLING, P., HORST, W.J., FRANKE, S., OTT, C., BECKER, D., STAß, A., LÖRZ, H., HEINZ, E. (2005): A POSSIBLE ROLE OF SPHINGOLIPIDS IN THE ALUMINIUM RESISTANCE OF YEAST AND MAIZE. J. PLANT PHYSIOL. (IN PRESS)**

**Abstract**

The plasma membrane is probably the major target for sensing aluminium (Al) leading to inhibition of plant root-growth. As a result of high external Al, alterations in plasma membrane composition may be expected in order to maintain its properties. As sphingolipids are characteristic components of this membrane, their involvement in membrane adjustment to increased Al concentrations was investigated. Heterologous expression of a stereounselective long-chain base (LCB) (8E/Z)-desaturase from *Arabidopsis thaliana*, *Brassica napus* and *Helianthus annuus* in *Saccharomyces cerevisiae* improved the Al resistance of the transgenic yeast cells. This encouraged us to investigate whether Al affects the LCB composition and whether genetic engineering of the LCB profile modifies the Al resistance of the Al-sensitive plant species maize (*Zea mays*, L.). Constitutive expression of the LCB (8E/Z)-desaturase from *Arabidopsis thaliana* in maize roots led to a 8- to 10-fold increase in (8E)-4-hydroxysphing-8-enine in total roots. Less marked but similar changes were observed in 3 mm root apices.

Al treatment of the Al-sensitive maize cv Lixis resulted in a significant increase in the proportion of (8Z)-LCB and in the content of total LCBs in root tips which was not observed in the Al-resistant cv ATP-Y. When root tips of transgenic plants were exposed to Al, only minor changes of both (8Z)- and (8E)-unsaturated LCBs as well as of the total LCB were observed. Al treatment of the wild type parental line H99 decreased the (8Z)-unsaturated LCBs and the total LCB content. Based on Al-induced callose production, a marker for Al sensitivity, the parental line H99 was as Al-resistant as cv ATP-Y, whereas the transgenic line became as sensitive as cv Lixis. Taken together these data suggest that particularly the loss of the ability to down-regulate the proportion of (8Z)-unsaturated LCBs may be related to increased Al sensitivity.