THE GLOSSY1 GENE OF MAIZE IS INVOLVED IN DIFFERENT ASPECTS OF EPIDERMIS DEVELOPMENT

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The surfaces of many plants are covered with a cuticle secreted by epidermal cells, which deserves several protective roles and consists of a reticulated cuticle membrane layer covered with amorphous epicuticular waxes.

The maize Glossy1 (Gl1) gene is one of the many loci involved in epicuticular wax biosynthesis on seedling leaves. Mutations at this locus confer a glossy phenotype to the first 5 to 6 leaves in contrast to the dull appearance of their wt counterparts.

To gain insights into Gl1 functions, transcriptional analysis and microscopic inspection of mutant epidermis were performed. From the expression profile it turned out that Gl1 function is not restricted to the juvenile developmental phase of the maize plant. This suggests a broader role of the gene product than previously predicted on the basis of the visual phenotype of gl1 mutants. Moreover, ultrastructural analysis of leaf epidermis indicated a pleiotropic effect of the gl1 mutation on juvenile leaf development. Besides reduction in wax synthesis, SEM analysis revealed alterations of leaf trichomes, namely decreased trichome size and increased trichome frequency, on gl1 seedling leaves. Analysis of the cuticle with TEM highlighted a strong reduction of cuticle membrane thickness in mutant seedlings. Similarly, mutations in the Arabidopsis Wax2 gene, a putative Gl1 homologue, alter cuticle membrane synthesis, epicuticular wax production and trichome morphology. However, in wax2 mutants abnormal cuticle development triggers post-genital organ fusion of adult organs soon after emergence. This trait is not associated with gl1 mutations pointing to a different role of maize and Arabidopsis cuticles in leaf development.