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THE DROUGHT-RESPONSIVE ZMFDL1 GENE REGULATES CUTICLE BIOSYNTHESIS AND CUTICLE-DEPENDENT LEAF PERMEABILITY

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In higher plants, the outer surface of the aerial parts is covered by the cuticle, a complex lipid layer that constitutes a barrier against damages caused by environmental factors and provides protection against non-stomatal water loss. We show in this study that cuticle deposition, during the juvenile phase of in maize (*Zea mays*) plant development, and cuticle-dependent leaf permeability are controlled by the MYB transcription factor ZmMYB94/FUSED LEAVES1 (ZmFDL1). Biochemical analysis showed that in fdl1-1 mutant seedlings at the coleoptile stage both cuticle and wax biosynthesis and deposition were altered. Among cutin compounds, ω-hydroxy fatty acids and polyhydroxy-fatty acids were specifically affected, while the reduction of epicuticular waxes, was mainly observed in primary long chain alcohols, and to a minor extent, long-chain wax esters. Transcriptome analysis allowed the identification of novel candidate genes involved in lipid metabolism and the assembly of a proposed pathway for cuticle biosynthesis in maize. Lack of ZmFDL1 affects the expression of genes located in different modules of the pathway and correspondence between gene transcriptional variations and biochemical defects have been highlighted. A decrease in cuticle-dependent leaf permeability was observed in maize seedlings exposed to drought as well as ABA treatment, which implies coordinated changes in the transcript levels of ZmFDL1 and associated genes. Overall, our results suggest that the response to water stress implies the activation of wax biosynthesis and the involvement of by both ZmFDL1 and ABA regulatory pathways.