

(05-1-78)

LONGIFOLIA1* and *LONGIFOLIA2*, two homologous proteins, regulate cell expansion in length direction independent of *ROTUNDIFOLIA3

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Objectives

To understand the genetic relationship with *ROT3*, we first determined if the expression of these genes are regulated by each other. Moreover, the functional relationship among these genes was further determined by analyzing an *lng1-3 lng2-1 rot3-1* triple mutant and *lng1-1D rot3-1*

Materials and Methods

1. Material: Plant *Arabidopsis thaliana* Col (WT), *lng1-1D*, *lng1-2*, *lng1-3*, *lng2-1*, *lng2-2*, *lng2-3*, *lng1-3 lng2-1*, *lng1-3 lng2-1 rot3-1*, *lng1-1D rot3-1*
2. Methods: *Arabidopsis* transformation, GUS assay, RT-PCR, Section, Paradermal image analysis

Results and Discussion

Plants have diversified their leaf morphology to adapt to diverse ecological niches they encounter. Molecular components that regulate the leaf morphology, however, have not been fully understood. By screening *Arabidopsis* activation tagging lines, we identified a dominant mutant *longifolia1-1D* (*lng1-1D*). The *lng1-1D* was characterized by long petioles, narrow but extremely long leaf blades with serrated margins, elongated floral organs, and elongated siliques. The elongated leaves of the mutant were due to the increased the polar cell elongation in leaf length direction rather than the increased cell proliferation. The mutation was caused by the overexpression of *LNG1* which homologous genes including *LNG2* were found in both *Arabidopsis* and rice. The *lng1 lng2* double mutant showed further decreased leaf length due to the decreased the polar cell elongation in leaf length direction. Unlike the short leaf length, the width of the *lng1 lng2* mutant was the same as those of the wild type, implying that the role of *LNG1* and *LNG2* on polar cell elongation is similar to *ROT3*. The genetic analysis of a *lng1 lng2 rot3* triple mutant, however, suggested that *LNG1* and *LNG2* promote the polar cell elongation independent of *ROT3*. Taken together, our data indicate that *LNG1* and *LNG2* are new components that regulate the leaf morphology by positively promoting the polar cell elongation in length direction independent of *ROT3* in *Arabidopsis*.