Interaction between two timing microRNAs controls trichome distribution in arabidopsis

Prof. Chen Xiaoya's lab at Shanghai Institute of Plant Physiology and Ecology, Chinese Academy of Sciences, elucidated the interaction between two timing miRNAs of plant, which was published in *PLOS Genetics* (**2014**, 10(4): e1004266).

The miR156-targeted SQUAMOSA PROMOTER BINDING PROTEIN LIKE (SPL) transcription factors function as an endogenous age cue in regulating plant phase transition and phase-dependent morphogenesis, but the control of SPL output remains poorly understood. In *Arabidopsis*, the spatial pattern of trichome is a hallmark of phase transition and governed by SPLs. By dissecting the regulatory network controlling trichome formation on stem, Xue Xueyi et al. at Chen's lab found that the miR171-targeted *LOST MERISTEMS* 1 (*LOM*1), *LOM*2 and *LOM*3, encoding GRAS family factors, are involved in regulating the SPL activity. Reduced LOM abundance by overexpression of miR171 led to decreased trichome density on stems and floral organs, and conversely, constitutive expression of the miR171-resistant LOM (rLOM) genes promoted trichome production, thus LOMs enhance trichome initiation at the reproductive stage. Genetic analysis demonstrated LOMs shaping trichome distribution is dependent on SPLs, which positively regulate trichome repressor genes *TRICHOMELESS* 1 (*TCL*1) and *TRIPTYCHON* (*TRY*). Physical interaction between the N-terminus of LOMs and SPLs underpins the repression of SPL activity. Importantly, other growth and developmental events, such as flowering, are also modulated by LOM-SPL interaction, indicating a broad effect. Furthermore, *MIR*171gene expression is regulated by its targeted LOMs, forming a homeostatic feedback loop. These data uncover an antagonistic interplay between the two timing miRNAs in controlling plant growth, phase transition and morphogenesis through direct interaction of their targets..

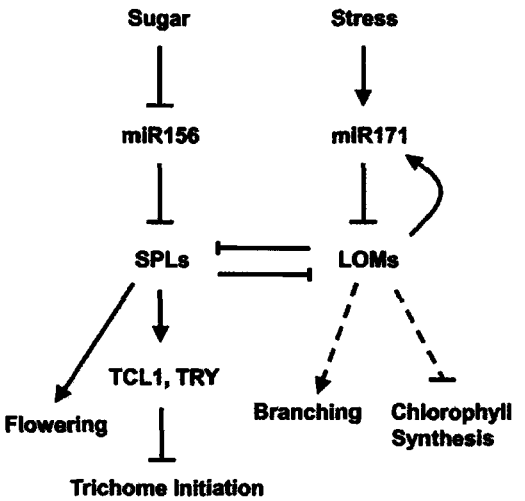

Figure A model for miR171-LOM and miR156-SPL interaction in regulating trichome formation and other biological events. The miR156-targeted SPLs up-regulate trichome negative factors *TRY* and *TCL*1 to repress trichome production on stem and inflorescence, whereas miR171-targeted LOMs counteract the SPLs through protein-protein interaction. LOMs positively regulate MIR171, forming a feedback loop to maintain their homeostasis. Arrows indicate positive regulation, blunt ends indicate negative regulation, and the dashed line indicates the unidentified pathway.

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