Target of Rapamycin Signaling Regulates Metabolism, Growth, and Life Span in Arabidopsis

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Résumé en anglais	Target of Rapamycin (TOR) is a major nutrition and energy sensor that regulates growth and life span in yeast and animals. In plants, growth and life span are intertwined not only with nutrient acquisition from the soil and nutrition generation via photosynthesis but also with their unique modes of development and differentiation. How TOR functions in these processes has not yet been determined. To gain further insights, rapamycin-sensitive transgenic Arabidopsis thaliana lines (BP12) expressing yeast FK506 Binding Protein12 were developed. Inhibition of TOR in BP12 plants by rapamycin resulted in slower overall root, leaf, and shoot growth and development leading to poor nutrient uptake and light energy utilization. Experimental limitation of nutrient availability and light energy supply in wild-type Arabidopsis produced phenotypes observed with TOR knockdown plants, indicating a link between TOR signaling and nutrition/light energy status. Genetic and physiological studies together with RNA sequencing and metabolite analysis of TOR-suppressed lines revealed that TOR regulates development and life span in Arabidopsis by restructuring cell growth, carbon and nitrogen metabolism, gene expression, and rRNA and protein synthesis. Gain- and loss-of-function Ribosomal Protein S6 (RPS6) mutants additionally show that TOR function involves RPS6-mediated nutrition and light-dependent growth and life span in Arabidopsis.
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