Sugar starvation signalling maintains axillary bud dormancy to inhibit shoot branching.

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Abstract

The control of axillary bud dormancy release is one of the main drivers of shoot branching in plants. This process is due to a complex regulatory network involving hormones, nutrients and metabolites. Sugar allocation to axillary buds is an important factor that determines the transition from dormancy to bud outgrowth. However, the molecular components involved in this regulation remain largely unknown. Our work shows that the transcription factor basic leucine zipper 11 (bZIP11), known to be induced by sugar starvation, inhibits axillary bud outgrowth and shoot branching. In addition, our results indicate that the protein levels of bZIP11 in axillary buds are inhibited by removal of the shoot tip, a treatment that releases axillary buds from dormancy. The protein levels of bZIP11 also appears to be inhibited by the sugar signal trehalose 6-Phosphate (Tre6P), known to trigger bud outgrowth. Further experiments demonstrated that SnRK1, a master regulator of energy management in the cell, alleviates the effect of Tre6P on bZIP11 protein levels and inhibits shoot branching. Altogether, the results from our work demonstrate that axillary bud dormancy is not simply maintain by a lack of energy and carbon supply, and that specific sugar signalling pathways are involved in this process.