*Medicago truncatula* FLOWERING LOCUS T genes *FTb1* and *FTb2* function redundantly to control the induction of flowering in response to long-day photoperiods.

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Flowering time significantly impacts plant yield and adaptability to diverse climates and day lengths. The FLOWERING LOCUS T (FT) genes play pivotal roles in the transition from vegetative to reproductive stages in plants. In the legume *Medicago truncatula*, an important forage crop, six FT orthologs - *Mt FTa1, FTa2, FTa3, Ftb1, Ftb2,* and *FTc* - are present. Currently, only the role of *MtFTa1* has been described[1], with a strong involvement in promoting flowering after prolonged exposure to cold, known as vernalisation, but the functions of the other five are not fully understood. In this study, we demonstrate that the genes *MtFTb1* and *b2* together are essential for the induction of flowering only under long-day (LD) photoperiod conditions. Using CRISPR/Cas9, we generated single and double mutants for *MtFTb1* and *MtFTb1/MtFTb2* genes. We found that they function redundantly and are required for the upregulation of the *MtFTa1* gene under LD conditions. While the *Mtftb1* mutants displayed normal flowering behaviour under both short day (SD) and long day (LD) conditions, the *Mtftb1*/2 double mutant exhibited delayed flowering exclusively under LD conditions and retained its response to vernalisation (V). To identify genes that act downstream of *MtFTb1* and *MtFTb2*, we performed a transcriptomic analysis comparing wild-type and *Mtftb1/2* plants. This analysis revealed differentially expressed genes (DEGs), including both known and novel transcription factors that act to promote the floral transition. This study sheds light on the genetic control of flowering time in legumes and could have practical implications for increasing forage productivity.

***References:***

[1] Laurie, Rebecca E., et al. "The Medicago FLOWERING LOCUS T homolog, MtFTa1, is a key regulator of flowering time." Plant physiology 156.4 (2011): 2207-2224.