Maximizing the agronomic potential and adaptation of white lupin (*Lupinus albus* L.) to short growing seasons through genetic improvement

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***Lupinus albus* is a promising alternative to soybean due to the high concentrations of essential amino acids and proteins in its seeds.**However, the existing varieties need genetic improvement to maximize their agronomic potential. One of the major breeding limitations is the long period from sowing to flowering and maturity. **Our previous studies revealed the complex regulation of flowering in white lupin, which is dispersed among numerous QTLs localized on several chromosomes.**

Previously, we observed that the early flowering trait in the reference *L. angustifolius* is determined by a 1.4-kb deletion in the promoter region of *FT* homologue. **Interestingly, despite their close relationship, the regulatory mechanisms controlling early flowering in *L. albus* are different. This discovery adds an intriguing aspect to comparative studies and may have implications for future research in this area.**

We analyzed the genetic diversity and population structure of white lupin and **confirmed a significant correlation between the phenotype and the distribution of the lines in the formed subpopulations**. However, we also observed that the intrapopulation phenotypic variability did not follow the allelic phases of key genes from the previously identified flowering regulatory pathways. It suggests the presence of additional flowering-inducing mechanisms. **Despite the identification of novel genetic sources of early flowering, additional regulation within the subpopulations was observed.** Our GWAS analysis revealed several markers, correlated with flowering time, located in the promoter regions of *LalbFT* genes and intergenic regions, such as **the hypothetical miRNA clusters, which indicates that the additional regulatory mechanisms may rely on miRNA.**

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***References:***

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[2] Rychel-Bielska, S., et al., A GWAS study highlights significant associations between a series of indels in a FLOWERING LOCUS T gene promoter and flowering time in white lupin (Lupinus albus L.). UNPUBLISHED, 2024