**Contribution of INDEL polymorphism in *FLOWERING LOCUS T* genes**

**to vernalization and photoperiod responsiveness**

**of yellow lupin (*Lupinus luteus* L.)**

Surma A1, Dogra I1, Paul A1, Plewiński P1, Rychel-Bielska S2, Bielski W1,3, ­­ Belter J1, Nowak S1, Kozak B2, Książkiewicz M1

*mksi@igr.poznan.pl, asur@igr.poznan.pl*

1 Institute of Plant Genetics, Polish Academy of Sciences, Poznań, Poland

2 Wrocław University of Environmental and Life Sciences, Wrocław, Poland

3 Poznań University of Life Sciences, Poznań, Poland

Plants have evolved a complex molecular signaling network that regulates flowering in response to environmental factors. Wild yellow lupin accessions require prolonged cold period during juvenile phase to fulfill vernalization requirements and induce flowering. Moreover, they considerably delay flowering under non-inductive, short-day photoperiod. The convergence point of vernalization and photoperiod pathways in plants is the transcriptomic regulation of the floral integratory gene, *FLOWERING LOCUS T* (*FT*). While *Arabidopsis* has only two *FT*-like genes, partially sub-functionalized into temperature and photoperiod responsiveness, legume genomes encode a higher number of FT-like genes, divided into three subclades: *FTa*, *FTb* and *FTc*. Lupins during evolution lost the whole *FTb* clade, but accumulated duplicated *FTa* and *FTc* genes.

The presence of multiple *FT* copies in the genome reduced the selection pressure, facilitating environmental adaptation. It resulted in the loss of vernalization and/or photoperiod requirements, naturally as a drought escape strategy or artificially during domestication process. The causal mutations underlying day-neutral and thermoneutral phenotypes were identified in our study [1] as INDEL polymorphisms in the promoter regions of *FTa1* and *FTc1* genes, carrying the sole candidate binding sites in the whole promoters for the major repressive transcription factors, TARGET OF EAT 2 (TOE2) and AGAMOUS-like 15 (AGL15), respectively. Moreover, a very late flowering phenotype was associated with a *Copia*-like retrotransposon insertion in the third intron of the *FTc2* gene. PCR markers designed for these loci and positively validated in the yellow lupin diversity panel await implementation in marker-assisted selection.

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***References:***

[1] Plewiński P. et al, 'FLOWERING LOCUS T indel variants confer vernalization-independent and photoperiod-insensitive flowering of yellow lupin (Lupinus luteus L.)’ Horticulture Research, vol. 9, 2022, uhac180.