



## Flowering Time in Hemp

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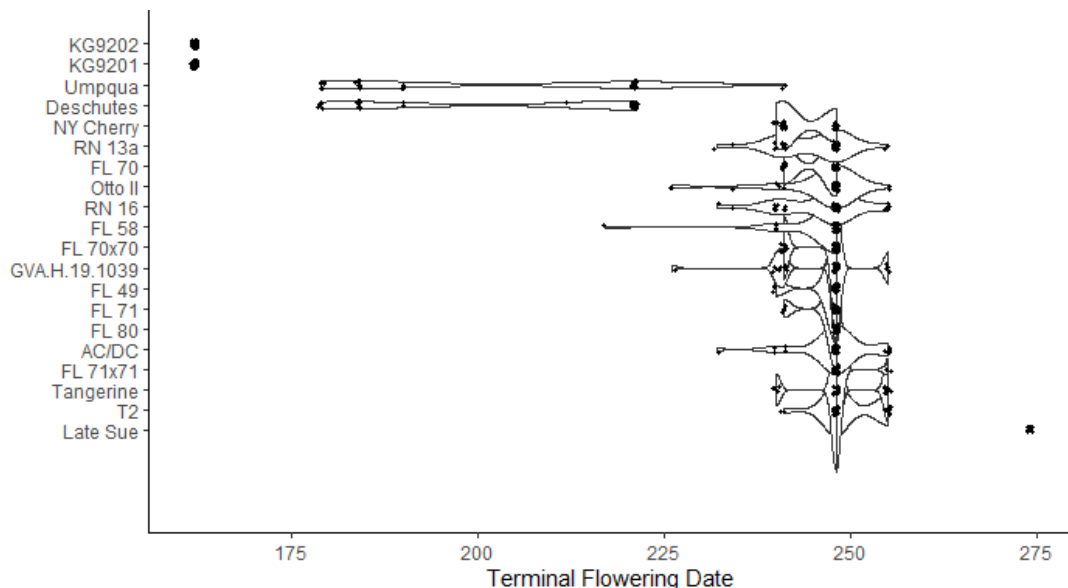
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**Hemp is usually photoperiod-sensitive, but exceptions exist.**

Most cultivars grown for CBD or CBG will only terminally flower when the night is long enough. However, “Autoflowering” cultivars will flower regardless of day/night length. Induction of flowering for grain and fiber cultivars is more complex.

**There is genetic variability in critical photoperiod of photoperiod-sensitive hemp (Figure 1).**

We have identified three distinct genetic loci that contribute to differential flowering time, and are developing molecular markers and investigating interactions between these loci.



**Figure 1.** Flowering date in cultivars grown for CBD in 2019. Adapted from Stack et al. 2021 *GCB Bioenergy*.

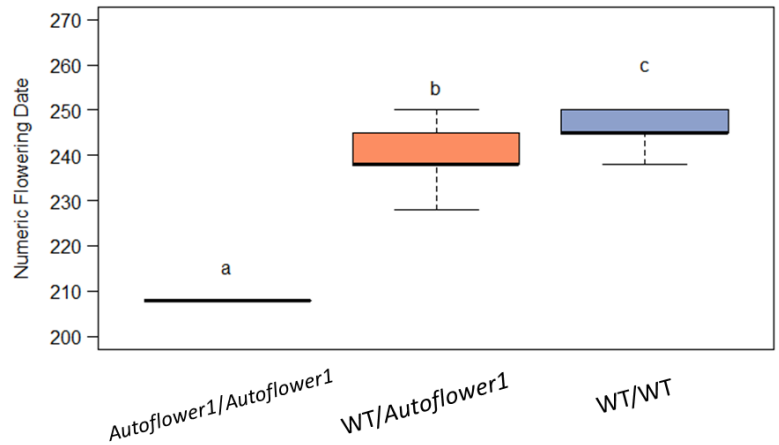
# Mapping and Analysis of Flowering Time Loci

**Autoflower1 locus:** Several high cannabinoid hemp cultivars are “Autoflowering” (photoperiod-insensitive), and others are heterozygous for the trait. Homozygous *Autoflower1* hemp is photoperiod-insensitive and very early, and plants heterozygous for this locus terminally flower earlier than wildtype hemp (Figure 2). The *Autoflower1* locus is on chromosome 1.

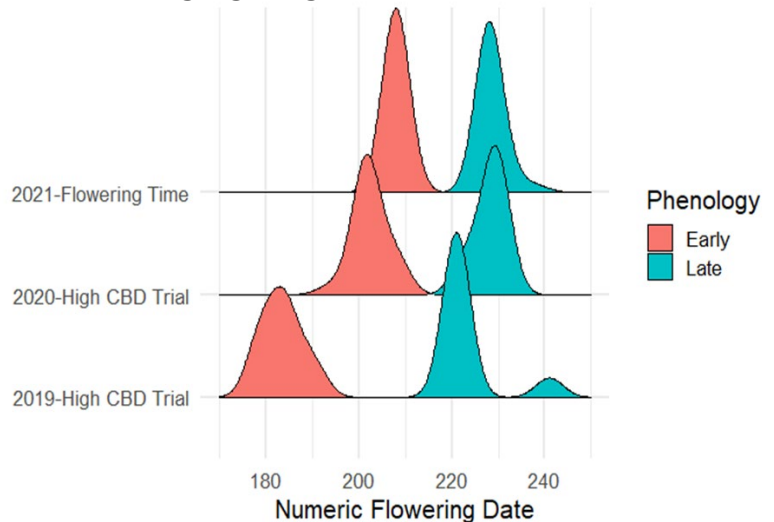
**Early1 locus:** The cultivar ‘Umpqua’ segregates 1:1 for a major effect locus, *Early1* (Figure 3). The early group is heterozygous for this locus while the late group is homozygous wildtype for this locus. *Early1* is on chromosome 1, but is distinct from *Autoflower1*.

**‘FINOLA’-type earliness locus:** The grain cultivar ‘FINOLA’ is very early and will flower under long days. The causative locus is on chromosome 8 and heterozygotes have a range of flowering times (Figure 4).

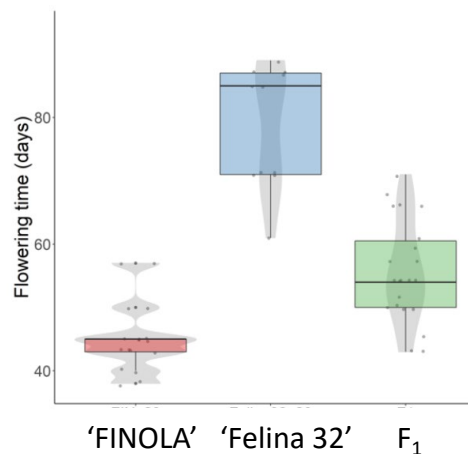
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**Figure 2.** Effect of *Autoflower1* locus on flowering time in a segregating population.



**Figure 3.** Flowering date in ‘Umpqua’.



**Figure 4.** A) Days to flower for ‘FINOLA’ (early), ‘Felina 32’ (late), and their  $F_1$ .