

# Heat shock induced flowering of PtFT apple plants

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Apple plants have a long vegetative phase of 7 to 10 years involving a time consuming, non-economical process of breeding apple resistant to fire blight, scab and powdery mildew. An early onset of flowers would be a great advantage to release disease resistant pre-breeding material. Over-expression of the flower promoting genes *LEAFY* and *FLOWERING LOCUS T* from *Arabidopsis thaliana* in poplar (*Populus trichocarpa*) and *BpMADS4* from *Betula pendula* in apple (*Malus × domestica*) led to an accelerated development of flowers. Over-expression of the *BpMADS4* gene in apple resulted in constitutive flowering from in vitro culture to greenhouse. A continuous development of fruits was achieved based on

the constitutive expression of the 35S promoter in these plants. This extensive fruit production resulted in an abnormal vegetative plant development, in small-sized fruits and in high fruit drop due to a lack in nutrient supply. As an improved approach a heat-induced flowering was established based on the heat-shock promoter *Gmhsp 17.5-E* (HSP) from soybean (*Glycine max*). In poplar a heat-regulated expression of the poplar *FLOWERING LOCUS T* (*PtFT*) gene resulted in flowering after certain heat-treatments. We introduced the *PtFT1* and *PtFT2* gene from poplar under the HSP-promoter into apple. The conditions for heat-induced regulation of these genes in apple were studied.