Biology Seminar

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Plant architecture and the perennial problem: the roles of *SINGLE FLOWER TRUSS* and *SELF-PRUNING* in regulating complex growth habits

Plant architecture and the timing and distribution of reproductive structures are fundamental agronomic traits shaped by patterns of determinate (i.e. reproductive) and indeterminate (i.e. vegetative) growth. Florigen, encoded by *SINGLE FLOWER TRUSS* (*SFT*) in tomato and *FLOWERING LOCUS T* in Arabidopsis, advances determinate growth while its closely-related antagonist, *SELF-PRUNING* (*SP*) in tomato and *TERMINAL FLOWER 1* in Arabidopsis, maintains indeterminate growth. The ratio of *SFT* to *SP*, and their functional homologs in other flowering plants, is proposed to control the patterns of determinate and indeterminate growth and thus plant architecture. Domestication of upland cotton (*Gossypium hirsutum*) converted it from a lanky photoperiodic perennial to a compact day-neutral plant that is managed as an annual row-crop. Residual perennial traits, however, complicate crop management and more determinate architectures are desired. We questioned if and how the *SFT*-like and *SP*-like genes control the balance of monopodial and sympodial growth in a woody perennial with complex architecture. Virus-based manipulation of *GhSP* and *GhSFT* expression enabled unprecedented functional analysis of cotton development. GhSP maintains indeterminate growth in all apices; in its absence, both monopodial and sympodial branch systems precociously terminate as flowers, resulting in a remarkably determinate plant. GhSP is also essential to establish and maintain cambial activity. *GhSFT* encodes a florigenic signal stimulating rapid onset of sympodial branching and flowering in side shoots of wild photoperiodic and modern day-neutral accessions. Silencing *GhSFT* in day-neutral accessions delayed the onset of flowering, implying that deregulated florigen was a selection target during domestication. These results suggest that the *GhSFT* and *GhSP* gene family, and genes acting in these signaling networks, hold promise for improving cotton cultivation and management.

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