Peach tree architecture is influenced by auxin and its associated gene expression.

*Background*. Branch orientation (direction of branch growth) and distribution (position along the trunk) establishes a fruit tree’s canopy architecture, light penetration, and amenability to mechanized technologies. Branching patterns and growth habit are highly consistent within cultivars and are altered to obtain management goals. In standard production, growers may prune branches to increase light distribution and then train branches to a horizontal orientation, to reduce vegetative vigor and improve fruitfulness. Natural branching patterns of trees can be selected for and managed to reduce pruning and training costs. Tree branch patterns can be key to successful mechanization practices; for example, short branches that are closely-spaced along a single shoot axis would facilitate camera-visualization and robotic access to fruit tree canopies. Natural branching patterns and orientations are likely controlled, at least in part, by endogenous hormone concentrations and associated gene expression in peach or apple trees. Improved understanding of the underlying mechanisms that contribute to the differences in branch orientation and spacing would assist growers and breeders obtain trees with desired growth habits. These processes might be genetically modifiable or managed culturally to customize tree architecture.

*Approach*. Endogenous hormone concentrations and associated gene expression will be determined in peach or apple trees with different branch patterns and orientation classes with the goal of identifying genetically modifiable regulatory processes or those that can be managed culturally to customize tree architecture. Peach trees with genetically distinct branch patterns and orientations from the AFRS breeding program will be used to assess linkage to auxin concentration. Apple trees with genetically distinct branch patterns and orientations from the University of Maryland breeding program may also be used to determine hormone differences. Shoots in peach or apple will be studied during each of four periods of growth when bud break and branch spatial orientation is developing. Endogenous auxin concentrations determined by GC/MS and selected gene expression will be relatively quantified with real-time PCR. Expression of candidate genes shown to respond to auxin and which led to altered branching in other dicots is to be determined by developing gene-specific primers and conducting quantitative PCR using total RNA extracts from peach buds and young shoots.

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