A kinetic model of sugar metabolism allows the simulation of sugar concentrations and its genetic variability during peach fruit growth

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Abstract:
Fruit taste is largely affected by the concentration of soluble sugars. Moreover sugar metabolism is central because it feeds respiration and acid metabolism via glycolysis and provides carbon for synthesis of structural compounds (cell wall). Concentrations of sugars in fruit vary according to fruit development, environment and genotype. In general, weak correlations were found between the variations of sugar concentrations and the capacities of enzymes directly related to the synthesis or degradation of sugars. This suggests that the relations between enzyme capacities and metabolites are not direct and difficult to assess with conventional statistics. Thus a kinetic model of sugar metabolism has been developed to simulate the concentrations of sugars (sucrose, glucose, fructose and sorbitol) during fruit development in peach, taking advantage of recent profiling data. Cellular compartmentation (cytosol and vacuole) is explicitly described and data-driven enzyme capacities are used to parameterize the equations. The model correctly accounts for genotypic variability observed in five genotypes derived from an interspecific cross, providing important information on sugar metabolism functioning and on mechanisms underlying the specification of phenotypic differences.

Key words : *P. persica*, sugar metabolism, kinetic model