**Title** Tomato taste modelling: sugar and acid physiology meets biopsy sampling

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**Abstract**

Taste of tomatoes as perceived during eating is primarily based on sugar and acids levels. An approach is presented that allows repeated measurements of the same tomato using a biopsy needle in combination with HPLC protocols to assess the sugar and acid levels dynamically over time.

Biopsy samples from tomatoes differing in ripeness, from mature green to ripe red, were taken from round and cherry type tomato cultivars. Tomatoes were stored at three temperatures (12, 19 and 24.5 °c) and biopsy samples were taken every few days during three weeks. A model regarding the most important processes that convert sugars and acids is proposed. Results of the model calibration show that the hexoses are in a steady state with more break down of hexoses in red tomatoes and more conversion of malate into hexoses in green tomatoes. This process, glucogenesis, is more important in the cherry type cultivar due to fast hexose and malate break down while in the round type cultivar malate levels are high due to fast citrate breakdown and slow malate breakdown. This surprisingly important role for glucogenesis might be related to the futile cycle it forms with glycolysis. This cycle might sustain the synthesis of flavour compounds from the citric acid cycle intermediates during postharvest ripening which might explain the generally better taste perception of cherry type tomatoes compared to round tomatoes.

The benefit of using biopsy sampling is not only that experiments can now be done with fewer amounts of tomatoes. The main benefit is that processes related to internal quality attributes like taste can now be monitored without having to worry about the effects of maturity differences between tomatoes.