

# Starch branching enzymes as putative determinants of postharvest quality in horticultural crops

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## Abstract

Starch branching enzymes (SBEs) are key determinants of the structure and amount of the starch in plant organs, and as such, they have the capacity to influence plant growth, developmental, and fitness processes, and in addition, the industrial end-use of starch. However, little is known about the role of SBEs in determining starch structure-function relations in economically important horticultural crops such as fruit and leafy greens, many of which accumulate starch transiently. Further, a full understanding of the biological function of these types of starches is lacking. Because of this gap in knowledge, this minireview aims to provide an overview of SBEs in horticultural crops, to investigate the potential role of starch in determining postharvest quality. A systematic examination of SBE sequences in 43 diverse horticultural species, identified SBE1, 2 and 3 isoforms in all species examined except apple, olive, and *Brassicaceae*, which lacked SBE1, but had a duplicated SBE2. Among our findings after a comprehensive and critical review of published data, was that as apple, banana, and tomato fruits ripens, the ratio of the highly digestible amylopectin component of starch increases relative to the more digestion-resistant amylose fraction, with parallel increases in SBE2 transcription, fruit sugar content, and decreases in starch. It is tempting to speculate that during the ripening of these fruit when starch degradation occurs, there are rearrangements made to the structure of starch possibly via branching enzymes to increase starch digestibility to sugars. We propose that based on the known action of SBEs, and these observations, SBEs may affect produce quality, and shelf-life directly through starch accumulation, and indirectly, by altering sugar availability. Further studies where SBE activity is fine-tuned in these crops, can enrich our understanding of the role of starch across species and may improve horticulture postharvest quality.