Berry shrivel causes – summarizing current hypotheses

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Abstract

Diverse ripening disorders affect grapevine resulting in high economic losses worldwide. The common obvious symptom is shriveling berries, however the shriveling pattern and the consequences for berry quality traits are distinct in each disorder. Among them, the disorder berry shrivel is characterized by a reduced sugar accumulation short after the onset of berry ripening leaving the clusters unsuitable for wine processing. Although our knowledge on BS increased recently, potential internal or external triggers contributing to the induction of BS are yet to be explored. Based on previously obtained results, we speculate on three main hypotheses for future research: i) BS starts with a failure in phloem unloading of sugar and its metabolism in berry cytosol, ii) the brush area of berries is subjected to a premature cell death starting BS and further promotes programmed cell death in other berry areas and pedicels, and iii) the onset of berry ripening is disturbed either by phytohormone or other signals with consequences on sink strength. Sampling strategies need to be adapted to account for ripening asynchrony and include pre-symptomatic clusters. Additionally, innovative ideas and new methodological approaches are necessary to decipher the spatial and temporal factors in BS induction on the biochemical, transcriptional and morphological level. BS is a challenge for viticulture, as prevention strategies are currently not reliable. Identifying the causal events could facilitate to adapt vineyard management to reduce BS risks.

Keywords: sugar metabolism, mesocarp cell death, ripening onset regulation