



Sodium accumulation and its effect on the metabolome profile of onion bulbs

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Onion (*Allium cepa* L.) is one of the most cultivated vegetables worldwide. For more than 50 years onion producers have been following a small subset of rules to ensure that their harvest is successful – choosing the correct variety, cultivation management techniques and soil properties. With soil properties in particular, onions were always considered to be a salt sensitive crop – one that should not be cultivated in conditions where salinity is high. However, to date there was very little evidence to that claim and information about the physiological and metabolomic effect of salinity on onion plants in particular was lacking.

The aim of this study was to assess physiological and metabolic changes in leaves and bulbs of three different onion genotypes after soil and foliar applications with Na₂SO₄. Furthermore, the antioxidative defense mechanism in onion bulbs and the transport of sodium within the plant were also analyzed. A pot experiment was conducted in a greenhouse, where the onion plants were harvested at the end of the first growing season. After that, leaves, bulbs and soil samples were collected and analyzed through targeted and untargeted metabolic methods.

Results demonstrated that sodium is mainly transported via xylem and foliar application does not lead to sodium accumulating in the bulbs. On the other hand, soil application with Na₂SO₄ resulted in accumulation of sodium in both leaves and bulbs but did not alter the metabolome profile of onion plants significantly. Only the antioxidative defense system in onion bulbs was slightly affected. This study demonstrates that there are varieties of onions with greater salt tolerance than reported so far in the available literature and the potential for onion production under increased saline conditions could in fact be much higher than previously assumed.