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

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Onions (*Allium cepa* L.) were always considered a salt sensitive crop. However, to date there is very little evidence to that claim and information about the physiological and metabolomic effects of salinity on onion plants is lacking. We therefore assess physiological and metabolic changes in leaves and bulbs of three different onion genotypes after soil and foliar applications with chloride-free Na₂SO₄. Furthermore, the antioxidative defense mechanism in onion and the transport of sodium within the plant was analyzed. Our findings demonstrated that sodium is mainly transported via xylem and therefore foliar application does not lead to sodium accumulation in the bulbs. On the other hand, soil application with Na₂SO₄ resulted in accumulation of sodium in leaves and bulbs but - except one onion variety - this did not alter the metabolite profile of onions significantly. Even potassium, magnesium, calcium, and organic solutes levels were unchanged after exposure to sodium. Only the antioxidative defense system in onion bulbs was slightly affected by sodium. This study demonstrated that onion plants have the ability to exclude Na⁺ at moderate Na₂SO₄ treatment, and the potential for quality onion production at increasing saline conditions could in fact be much higher than previously assumed.