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# Urea uptake and nitrogen mobilization by apple leaves in relation to tree nitrogen status in autumn

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## Summary

Bench-grafted Fuji/M.26 trees were fertigated with one of seven nitrogen concentrations (0, 2.5, 5, 7.5, 10, 15 or 20 mM), using a modified Hoagland's solution from 30 June to 1 September. In mid-October, plants in each N treatment were randomly divided into three groups. One group was sampled destructively to determine background tree N status before foliar urea applications. The second was painted with a 3%  $^{15}\text{N}$ -enriched urea solution twice, at weekly intervals, on both sides of all leaves. The third group served as the control. All the fallen leaves from both the  $^{15}\text{N}$ -treated and the control trees were collected during leaf abscission. The trees were harvested at the end of natural leaf fall. Nitrogen fertigation during the growing season resulted in a wide range of tree N status, as indicated by leaf N ( $1.3\text{--}3.5\text{ g m}^{-2}$ ) in the autumn. The percentage of N partitioned into the foliage increased linearly with increasing leaf N content up to  $2.2\text{ g m}^{-2}$ , then reached a plateau of 50–55% with further rise in leaf N.  $^{15}\text{N}$  uptake and mobilization per unit leaf area and the percentage of  $^{15}\text{N}$  mobilized

from the leaves decreased with increasing leaf N content. Of the  $^{15}\text{N}$  mobilized back to the tree, the percentage of  $^{15}\text{N}$  partitioned into the root system decreased with increasing tree N status. For the control trees, N mobilization per unit leaf area increased with increasing leaf N up to  $3 \text{ g m}^{-2}$ , then levelled off with any further increase in N content. The percentage of N mobilization remained at approximately 60% until leaf N reached  $3 \text{ g m}^{-2}$ , then declined with a further increase in leaf N content. Foliar  $^{15}\text{N}$ -urea applications reduced mobilization of endogenous leaf N regardless of tree N status. On a whole-tree basis, foliar  $^{15}\text{N}$ -urea applications increased the total amount of N across N fertigation treatments. We conclude that trees with low N status are more efficient in absorbing and mobilizing N from foliar urea than those with high N status. Likewise, more N derived from foliar urea is partitioned into the root systems of low N trees than of high N trees.



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