

## CHANGES IN STARCH AND AMMONIA METABOLISM DURING LOW TEMPERATURE STRESS-INDUCED FLOWERING IN 'HASS' AVOCADO

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'Hass' avocado on clonal 'Duke 7' rootstock, two years from budding, were induced to flower by subjecting the trees to 4 and 8 weeks of low temperature, 8-h day (500  $\mu\text{E}/\text{m}^2\cdot\text{sec}$ ) at 15 to 18°C/16-h night at 10 to 13°C, and then transferring the trees to 12-h day (500  $\mu\text{E}/\text{m}^2\cdot\text{sec}$ ) at 24°C/12-h night at 19°C. Floral intensity was the same for trees treated for four or eight weeks, approximately 1200 flowers per tree. Control trees maintained at the warm temperature did not flower. Leaf  $\text{NH}_3\text{-NH}_4^+$  content increased to a maximum concentration during the second week of low temperature treatment and remained high through the third week of stress. For trees subjected to either four or eight weeks of low temperature treatment, leaf  $\text{NH}_3\text{-NH}_4^+$  content increased more than two-fold by week nine and remained significantly higher through the four-week period which culminated in full bloom. Leaf starch content decreased during this period to a minimum value coincident to peak bloom. Neither tree  $\text{NH}_3\text{-NH}_4^+$  status nor flowering could be increased by foliar application of low biuret urea. Uptake of [ $^{14}\text{C}$ ] urea and urease activity of 'Hass' avocado leaves were insignificant.

Whether the leaf content of  $\text{NH}_3\text{-NH}_4^+$ , or a metabolite thereof, is important to the induction of flowering in the 'Hass' avocado cannot be determined from our results thus far. Four and eight weeks of low temperature stress caused equal concentrations of  $\text{NH}_3\text{-NH}_4^+$  to accumulate in 'Hass' avocado leaves and resulted in equal floral intensity. Consistent with our demonstration that urea uptake and urease activity are probably too low in the leaves of the 'Hass' avocado to be of physiological significance, we were unable to raise the  $\text{NH}_3\text{-NH}_4^+$  content of the tree through foliar application of low biuret urea at the same concentration that is effective with citrus. Thus, it was impossible to determine if floral intensity was influenced by the  $\text{NH}_3\text{-NH}_4^+$  status of the tree as it is in citrus.

Future research will determine if tree  $\text{NH}_3\text{-NH}_4^+$  status directly influences flowering in 'Hass' avocado by artificially raising the  $\text{NH}_3\text{-NH}_4^+$  status of the tree through soil application of urea or  $\text{NH}_4\text{NO}_3$  or foliar application of  $\text{NH}_4\text{NO}_3$ .