

PROBLEMS WITH UREA-N FOLIAR FERTILIZATION OF AVOCADO

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There have been conflicting reports in the literature regarding the ability of avocado leaves to take up foliar applied urea.

Young, fully expanded leaves of 'Hass' avocado on clonal 'Duke 7' rootstock, 2 years from budding, were used to assess changes in leaf $\text{NH}_3\text{-NH}_4^+$ content. Foliar application of 1.5 g low biuret urea per tree failed to increase the leaf $\text{NH}_3\text{-NH}_4^+$ content: compare 23.6 ± 5.8 versus $20.1 \pm 5.7 \mu\text{g NH}_3\text{-NH}_4^+$ per g fr. wt. leaf tissue ($x \pm \text{STD. DEV.}$, $N = 3$ trees per treatment) from trees treated with and without urea, respectively (Nevin and Lovatt, 1989). Foliar application of 1.5 g of low biuret urea per tree to 5-year-old rooted cuttings of the 'Washington' navel orange of comparable size increased the leaf $\text{NH}_3\text{-NH}_4^+$ content of the trees subjected to 4, 6, or 8 weeks of low temperature 1.7-, 2.2-, and 1.2-fold, respectively.

To further test the capacity of 'Hass' avocado leaves to take up foliarly applied urea, areas of a leaf (1 cm x 1 cm) were painted with a single application of ^{14}C -urea (12×10^3 dpm/nmol, 0.2 μM final concentration). These areas were collected with a cork borer after 1 h, 2 h, 4 h, 6 h, 12 h, 24 h, 48 h, and 5 days. Sample areas were swabbed with distilled water until no radioactivity remained on the leaf surface. The leaf sample was placed in 80% methanol and bleached. The content of radioactivity was determined using a Beckman LS100 liquid scintillation counter.

Movement of ^{14}C -urea applied to the upper surface of 'Hass' avocado leaves into the leaf was minimal. Maximum uptake occurred after 2 days and was not improved by an additional 3 day of exposure to the ^{14}C -urea. Maximum uptake represented only 2.1% of the urea applied to the leaf surface, which is physiologically insignificant. At such levels of urea, urease activity of intact cells of 'Hass' avocado leaves was also insignificant.

To determine if there were cultivar differences, the ^{14}C -urea uptake experiments were repeated with 'Gwen' on seedling 'G6' rootstock, 7 months from budding, and with 'Fuerte' on seedling 'Duke 7' rootstock, 1-1/2 years from budding. Five-year-old rooted cuttings of 'Washington' navel orange served as the experimental control.

Uptake of ^{14}C -urea applied to the upper surface of 'Gwen' and 'Fuerte' avocado leaves was more rapid and greater than uptake by 'Hass' avocado leaves. However, the uptake

of foliar-applied urea by all three avocado cultivars was significantly lower than that of 5-year-old rooted cuttings of the 'Washington' navel orange and physiologically insignificant.

Since urea is ineffective as a foliar fertilizer in avocado, it may be possible to utilize urea as a thinning agent. Avocado flowers are damaged by low concentrations (0.5 - 1.0%) of urea (Zilkah, Klein and David, 1988, J. Hort. Sci. 63: 209). The sensitivity of avocado flowers, as opposed to the potential insensitivity of the avocado leaf, has prompted us to undertake a study to evaluate urea as a thinning agent for avocados.