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Biuret, Toxic Form of Nitrogen

Soluble nitrogen compounds are not of equal value as fertilizers as shown by tests with citrus and avocado

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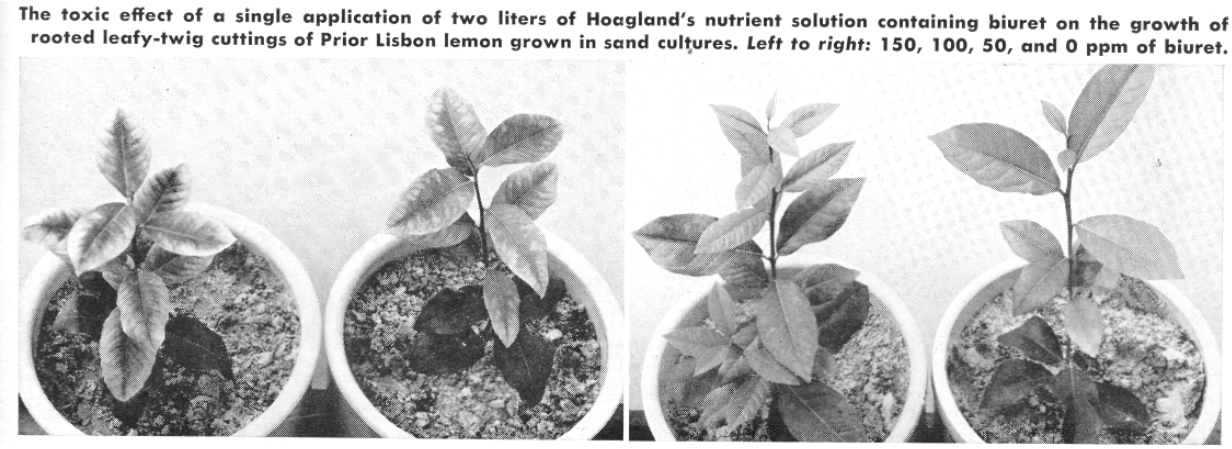
Biuret—a compound form of nitrogen obtainable from urea—was recently tested for its toxic effect on the growth of citrus and avocado.

The claim has often been made that similar concentrations of soluble nitrogen are of equal value for the healthy growth of citrus and avocado trees regardless of the nature of the nitrogen containing fertilizer. One of the forms of nitrogen frequently used in the fertilization of such trees is urea, so tests were designed to determine what effect the use of biuret—derivable from urea— would have on citrus and avocado tree growth.

Prior Lisbon lemon leafy-twig cuttings were obtained from parent trees S1A, R7, T1 in the Citrus Experiment Station orchard at Riverside on February 4, 1954. The cuttings were rooted in propagation chambers. The use of continuous mist—periodically containing a nutrient solution—resulted in 100% of the cuttings taking root. When hardened, a single cutting was planted in each of several three-gallon capacity earthenware jars containing pure silica sand. The cuttings remained in these jars, with only distilled water added to each of the silica sand cultures, until a new cycle of growth was well under way.

On March 4, 1954, each culture received two liters of Hoagland's nutrient solution made with distilled water and containing the trace elements: boron, manganese, zinc, iron, aluminum, copper, and molybdenum. This solution has given excellent healthy growth in other experiments.



The toxic effect of a single application of two liters of Hoagland's nutrient solution containing biuret on the growth of rooted leafy-twig cuttings of Prior Lisbon lemon grown in sand cultures. *Left to right:* 150, 100, 50, and 0 ppm of biuret.

Biuret, at concentrations of 0, 50, 100, or 150 ppm—parts per million—was added to the nutrient in this study. Within a few days the injurious effect of the biuret was observed, even though the Hoagland's nutrient solution contained 718 ppm of nitrate. When the pronounced symptoms produced by the 150 ppm biuret concentration were first be coming evident, the leaf margins of half-grown leaves appeared wilted and ready to show leaf burn. Instead of burning, the margins became increasingly chlorotic—yellow. The original mature leaves of the cuttings—grown before the biuret was added to the solution—showed no effect of the biuret' by April 9, 1954, when the photographs on this page were taken. At the 50 ppm biuret concentration, slight chlorosis—yellow spotting—occurred in the new leaves, and at higher concentrations the chlorosis increased.

Effect on the leaves of rooted leafy-twig Zutano (Mex.) avocado cuttings grown in soil cultures of a single application of two liters of nutrient solution containing—*Left to right:* 100, 50, and 0 ppm of biuret.

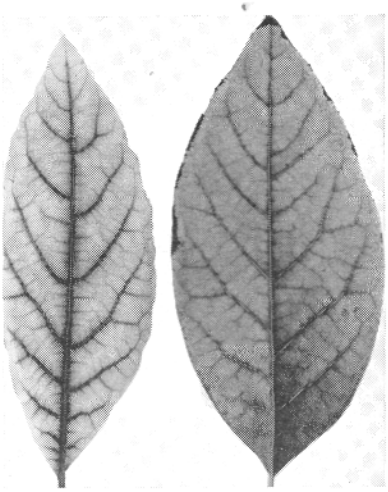
The toxicity of biuret was also tested on the growth of rooted leafy-twig Zutano — Mexican — avocado cuttings grown in two-gallon-capacity soil cultures. These cultures received Hoagland's complete nutrient solution from time to time and on March 9, 1954, each culture received two liters of the nutrient containing: 0, 50, 100, 150, or 200 ppm of biuret. Within a few days, wherever immature leaves occurred, the symptoms of biuret toxicity were present, mature leaves requiring a somewhat longer period in which to show the symptoms.

On April 9, 1954, the effects were severe, and a few of the cultures were photographed. Many of the immature affected leaves, even at the 50 ppm concentration, were shed. The initial effects were practically all confined to the immature leaves of the culture with biuret.

The toxic effect of biuret on the leaves of avocado seedlings was also very pronounced. Hass—Guatemalan—avocado seedlings were grown in soil cultures with Hoagland's

complete nutrient solution until they were several feet high and possessed cycles of immature leaf growth.

A few days after a single application of the nutrient solution containing 50 ppm of biuret, the partially mature leaves became markedly chlorotic.



Chlorosis of immature leaves of large and previously healthy avocado seedlings brought about within a few days by the addition of 50 ppm of biuret in a single application of two liters of nutrient to the soil cultures.

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