Ammonium Bicarbonate Toxicity
root injury occurred from within few hours to several weeks

in solution culture tests with citrus, avocado, and soybeans

The ammonium source of nitrogen
is often considered less desirable than
other nitrogen sources for some plants.
Nitrate is believed-by many people-to be superior to ammonium nitrogen for citrus, especially under acid soil con-ditions.
Workers in Florida showed recently that poor growth in citrus with am-monium nitrogen could largely be over-come by raising the pH-relative acidity-alkalinity-of the nutrient medium to about 6.
It was reasoned that if ammonium ni-

trogen were less toxic at pH 6 than at pH 4 it might be even less toxic if bicar-bonate were present and if the pH were above 7. The hypothesis involved the fixation of the bicarbonate into organic acids which in turn would be combined with the ammonia to form amino acids and thus provide a means of rendering ammonia nontoxic. The treatment, how-ever, proved to be almost lethal to- the plants.

Root Injury

Avocado roots were severely injured in solution culturc by ainmoniurri bicar-honale within 72 hours and by urea with bicarbonate in about seben days. They were visibly injured by ammonium sul-fate in the presence of calcium carbonate, also in solution culture. in atwut two weeks. Actually avocado roots were in-jured somewhat by bicarbonate in the

presence of nitrate. Such injury occurred in about three weeks.

Roots of citrus and soybean seedlings were injured much in the same manner as were avocado roots, but the injury did not occur quite so rapidly, nor was there injury with a combination of bicar-bonato and nitrate.
Bicarbonate concentrations of 5 m.e. -milliequivalents-per liter or less pro-duced relatively little toxicity while those 10 and above produced considerable toxicity. Likewise the lower ammonium concentration, the less the toxicity.

Dry Weights of Roots of Soybeans

Treatment Wt. in sramr ~ ~~ ~ ~~~~~
ammonium-N pH 4 . . . . 1.5
ammonium-N pH 6 . . . . 1.7
ammonium-N pH 7 .... ,._. 3.5
ammonium-N-bicarbonate pH 8.5. . 1.1
nitrate N-pH 4 . . . . . . , ... 4.0
nitrate N-pH 6 . . . . , ... 3.9
nitrate N-pH 7 . . . . , . . 3.5
nitrate N-bicarbonate pH 8.5. . . . 4.0