

Calcium Nitrate Pays Off on Citrus

Research indicates increased productivity and profitability, root health, and tree longevity.

During the past 72 years, studies have been conducted in Florida and California to define the value of calcium nitrate fertilizer for citrus growth and production. Its benefits are threefold: 1) increased tree productivity and profitability, 2) a healthy root system, and 3) greater tree longevity. We'll review these benefits in greater detail.

PRODUCTIVITY/PROFITABILITY

Hydro Agri research trials (1993 to 1998), conducted in cooperation with the University of Florida, showed citrus fertilized with calcium nitrate yielded 10 to 12 percent more pound solids on young and producing trees, and 7 percent more on trees 30 years and older, compared to those fertilized with ammonium nitrate. Economically this means production in the range of 3,000 pounds solids per acre (at \$0.85 per pound) increased grower gross profitability \$178 to \$306 per acre with just 150 pounds of nitrogen (N) per acre per

year. Furthermore, 150 lbs/A of N from calcium nitrate is in compliance with best management practices suggested by the University of Florida's Institute of Food and Agricultural Sciences (IFAS). A 21-year N fertilizer source study in California (1928 to 1949) produced similar results. Trees fertilized with calcium nitrate produced 10 and 23 percent more fruit over the study duration than those fertilized with urea and ammonium sulfate. In a University of Florida study, calcium had a greater impact on tree size and production than all other nutrients except potassium (N was supplied to all trees).

So, in terms of tree productivity and grower profitability, studies have shown calcium nitrate fertilizer has a definite positive effect and is superior to ammonium nitrate, ammonium sulfate, and urea.

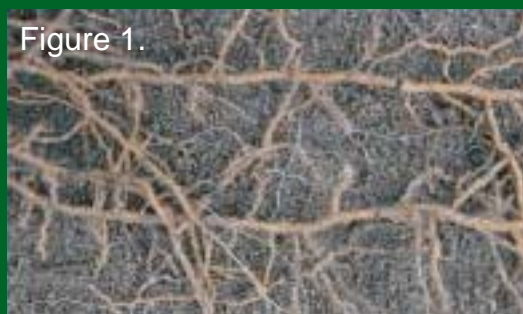
ROOT HEALTH

Healthy fibrous roots are essential for nutrient uptake by citrus trees. Diminished scaffold and fibrous rooting ca-

capacity from soilborne disease reduces tree productivity and profitability. The ammonium form of N (e.g. from ammonium nitrate, ammonium sulfate, or urea) has been implicated in the proliferation of fungal root disease organisms such as *Phytophthora sp.* and *Fusarium solani*. The nitrate form of N as supplied by calcium nitrate, sodium nitrate, and potassium nitrate, appears to reduce citrus root infection by these pathogens.

The fungus *Fusarium solani* also damages citrus scaffold and fibrous roots. The population of *F. solani* increases significantly following ammonium nitrogen application and produces large quantities of naphthazarium phytotoxins that destroy citrus roots. The damaging effects of *F. solani* can be managed with the application of nitrate nitrogen. In fact, *Fusarium* cultures in the presence of nitrate from calcium nitrate did *not* produce their root destroying phytotoxins, but thrived and produced large amounts of toxins in the

Figure 1.



Fibrous root rot symptoms caused by *Fusarium solani* in a citrus grove at Bartow, Florida.

Lane A

Lane B

Lane C

Fusarium naphthazarium toxins extracted from cultures grown with ammonium nitrate (Lanes A and B) and cultures grown with Calcium Nitrate (Lane C) and developed on thin-layer chromatography plates. Note the absence of toxin in the Calcium Nitrate pictured above

presence of ammonium nitrogen from ammonium nitrate (Figure 1). So, in terms of citrus tree root health, calcium nitrate fertilizer clearly has a positive effect and is superior to ammonium nitrate, ammonium sulfate, and urea.

TREELONGEVITY

With the high purchase cost of seedlings and other inputs to bring it into production, sudden tree loss can be economically devastating. Here again, nitrate nitrogen improves tree longevity while ammonium decreases it.

Fertilizer research, after two years of study by Florida scientists, suggests the following. Of 340 citrus trees, 17 trees (5.0%) fertilized with calcium nitrate were considered economically unproductive. When sodium nitrate was used as the treatment, 6.8% or 23 trees were unproductive. With ammonium nitrate, 15.3% or 52 trees were considered unproductive. The positive effects of the calcium nitrate treatments in this comparison are plainly evident. In terms of citrus longevity, calcium nitrate fertilizer has a definite positive effect and is superior to ammonium nitrate, ammonium sulfate, and urea. Research and commercial use have shown that the agronomics and economics of fertilizing citrus with calcium nitrate are fully justified.

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