1990 Summary of Avocado Research, pages 12-13
Avocado Research Advisory Committee
University of California, Riverside

A DEFINITIVE TEST TO DETERMINE WHETHER PHOSPHITE FERTILIZATION CAN REPLACE PHOSPHATE FERTILIZATION TO SUPPLY P IN THE METABOLISM OF HASS ON DUKE 7

Dr. Carol J. Lovatt
Botany and Plant Sciences, Univ. of Calif., Riverside

It is well established that phosphorus deficiency causes the accumulation of arginine (an amino acid essential to the growth of plants) in a variety of vascular plants (Freiberg and Steward 1960; Geleiter and Parker 1957; Nemec and Meredith 1981; Rabe and Lovatt 1984). Previous research in my lab with two species of citrus, two citrus hybrids, and summer squash demonstrated that the accumulation of arginine during phosphorus deficiency was due to a dramatic (as high as 10-fold) increase in the rate of *de novo* arginine biosynthesis (Rabe and Lovatt 1984) in response to accumulating NH_3-NH_4^+ (Rabe and Lovatt 1986a,b). Resupplying phosphorus as calcium phosphate returned the rate of *de novo* arginine biosynthesis to that of the phosphorus-sufficient control plants receiving optimum calcium phosphate and restored the growth of the plants (Rabe and Lovatt 1984).

Recent preliminary results demonstrated that foliar application of potassium phosphite to phosphorus-deficient citrus seedlings also returned the rate of *de novo* arginine biosynthesis to the rate of the phosphorus-sufficient control plants receiving the optimum rate of calcium phosphate, with a concomitant decrease in arginine content, and restored the growth of the plants. These results clearly demonstrate (1) that phosphite is taken up through citrus leaves and (2) that phosphite can replace phosphate as a source of P for normal metabolism in citrus.

If this is also the case for avocado, there is the potential use of phosphite as a P fertilizer through soil or foliar application or trunk injection to capitalize on the secondary beneficial effects of controlling *Phytophthora* root rot.

Phytophthora root rot causes extensive damage to feeder roots, which results in a progressive decline in tree health and the eventual death of the tree. *Phytophthora* root rot is a major factor limiting avocado production world wide.

Darvas, Toerien and Milne (1984) demonstrated that trunk injections with fosetyl-Al (Aliette®) were effective in the treatment of *Phytophthora* root rot in avocados. Fosetyl-Al is degraded to phosphorous acid (H_3PO_3) in plants. Avocado root rot control is more effective with H_3PO_3 than with fosetyl-Al (Darvas and Bezuidenhout 1987). For avocado growers, potassium phosphite (H_3PO_3 neutralized to pH 6.2 with KOH) used as a trunk injection is an extremely inexpensive and effective product for *Phytophthora* root rot control (Coffey 1987). Thus far, it appears nontoxic at fungicidal dosages to both plants and animals. Phosphite has been used in extensive injection programs with citrus and avocados in South Africa and Australia with no apparent toxicity to date. Phosphorous acid has not been registered for use as a fungicide in California; no commercial sponsors are pursuing registration. Thus, if we can demonstrate that phosphite can replace phosphate fertilizer as a source of P in avocado metabolism, it would open the way for avocado growers to use phosphite as a fertilizer without having to register it as a fungicide.

Literature Cited

Coffey, M.D. 1987. California Avocado Growers Yrbk.

Darvas, J.M. and J.J. Bezuidenhout. 1987. S. Aft. Avocado Growers' Assoc. Yrbk. 10: 91-93.

Darvas, J.M., J.C. Toerien and D.L. Milne. 1984. Plant Disease 68: 691-693.

Frieberg, S.R. and F.C. Steward. 1960. Ann. Bot. 12: 147-157.

Geleiter, M.E. and H.E. Parker. 1957. Arch. Biochem. Biophys. 71: 430-436.

Nemec, S. and F.I. Meredith. 1981. Ann. Bot. 47: 351-358.

Rabe, E. and CJ. Lovatt. 1984. Plant Physiol. 76: 747-752.

Rabe, E. and C.J. Lovatt. 1986a. Plant Physiol. 81: 774-779.

Rabe, E. and C.J. Lovatt. 1986b. J. Amer. Soc. Hort. Sci. Ill: 922-926.