C. L. Douglas

Claude H. Pair
ASAE Fellow

J. Hamilton Smith

Sprinkler Fertilization and Plant Damage

APPLYING fertilizer through sprinkler irrigation systems is fast and simple — and the nutrients in solution are quickly available to plants. However there's the possibility of plant damage when high fertilizer concentrations are applied without rinsing the fertilizer from the plants.

To determine the concentrations that can safely be applied through a self-propelled sprinkler system without rinsing the plants, potatoes, sugar beets and wheat were grown in pots in a greenhouse. The same type of silt loam was used throughout the experiments. Fertilizer solutions were applied through a 0.25 in. stainless steel fog nozzle; at 40 psi the equivalent of 0.5 acre-inch could be applied to the plants in 30 min. Plants were fertilized weekly with varying concentrations of ammonium nitrate or a mixture of ammonium nitrate and urea similar to commercial nitrogen solutions. In each test unfertilized plants were grown under these same conditions for control. All plants were watered with distilled water as needed.

Potatoes

Amonium nitrate fertilizer in concentrations from 100 to 1500 ppm (equivalent to 11.4 to 170 lb in 0.5 acre-inch of water) were sprayed on Russet Burbank potato plants once each week for 4 weeks. No visible damage could be detected. Potatoes responded to the fertilizer and grew well.

C. L. Douglas is soil scientist, Claude H. Pair is research engineer (irrigation), and J. Hamilton Smith is research soil scientist at the Snake River Conservation Research Center, SWCRD, USDA at Kimberly, Idaho. This project was undertaken in cooperation with the University of Idaho Agricultural Experiment Station.

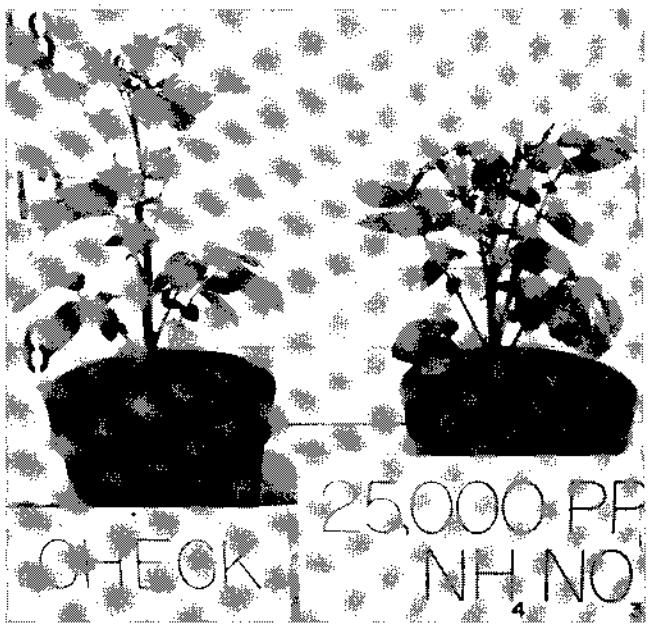

Fig. 1 The russet burbank potato plant on the right was fertilized with ammonium nitrate by sprinkling

Ammonium nitrate and urea solutions then were applied in concentrations of 200 to 2000 ppm (22.7 to 227 lb in 0.5 acre-inch of water) weekly for 3 weeks. Again the potatoes grew well with no signs of damage. To determine at what fertilizer concentration damage could be expected, ammonium nitrate concentrations of 5000, 10,000, 15,000, 20,000 and 25,000 ppm were applied (equivalent to 567 to 2835 lb in 0.5 acre-inch of water). While these treatments did damage leaves slightly (Fig. 1) they didn't seriously injure plants.

Previously nitrogen concentrations about 10 times greater than our 25,000 ppm rate had been established as giving about 50 percent defoliation. The fact that no defoliation occurred in these tests may be due also to the growth stage of the plants plus the absence of moisture stress and low humidity.

Sugar Beets

Fertilization was begun when potted sugar beets were about 4 in. high. Application was weekly for 5 weeks using ammonium nitrate in concentrations of 200 to 2000 ppm. These plants also responded well to the nitrogen applications — with no symptoms of injury.

Wheat

Lemhi wheat was similarly planted; upon emergence it was thinned to 10 plants per pot. When plants averaged 9 in. in height they were sprinkled with ammonium nitrate at the same rates and frequency as the sugar beets. Again no damage was noted with any of the applications. Plant heading and maturity came about 1 week earlier with the highest nitrogen rate.

While these observations were made in the greenhouse, they indicate that there should be no damage to sugar beets, potatoes or wheat from sprinkler fertilizing with ammonium nitrate or ammonium nitrate and urea mixtures at almost any economical rate a farmer may wish to apply. • •

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