DEXON AND TRUVAN VS. AMMONIUM NITROGEN PHYTOTOXICITY

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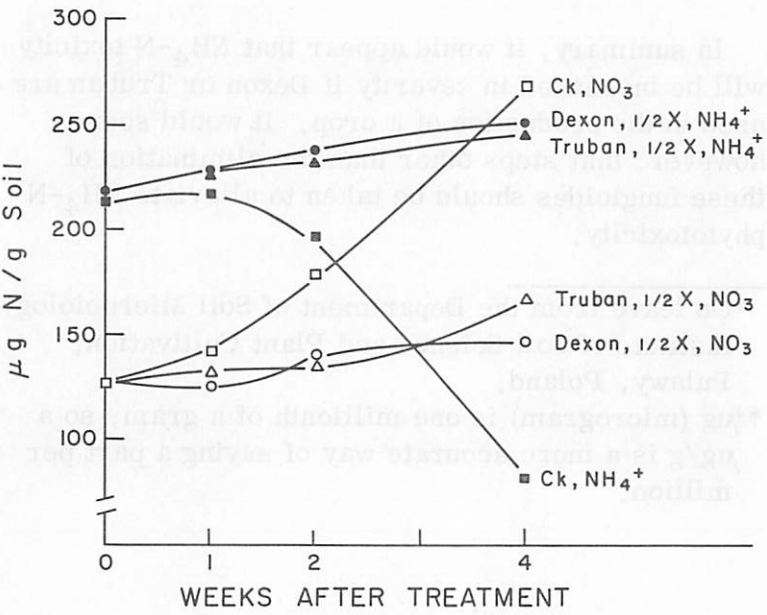
Dexon and Truban are fungicides widely used in intensively cultivated soils. They are very efficient in controlling certain soilborne plant pathogens such as Pythium and Phytophthora sp.

In these same intensively cultivated soils, ammonium nitrogen (NH_4-N) is frequently found to be phytotoxic. NH_4-N toxicity is alleviated when the nitrifying soil bacteria oxidize the NH_4-N to nitrate nitrogen (NO_3-N). This NH_4-N oxidation may be inhibited by many factors such as low temperature, low soil pH, poor aeration, excessive metallic ions or salts and, possibly, by the use of pesticides such as Dexon and Truban.

These fungicides were, therefore, introduced into soil at 1/2, 1, 2 and 4 times the normal rate of treatment for potted plants grown in the greenhouse. Analyses were made at 0, 1, 2 and 4 weeks.

These samples were incubated according to the Bremner nitrogen mineralization procedure. Ten grams of air dry soil were mixed with 30 grams of quartz sand (for aeration) and treated with 0.5% $CaCO_3$ and 150 μg** ammonium nitrogen (from NH_4Cl) per gram of soil. The nitrogen and fungicides were introduced in 6 ml water to provide 60% water by weight. They were incubated at 30°C. The pH was determined from a 2.5:1 H_2O:soil ratio. Extraction was with 1.5 N KCl

At 4 weeks (figure 1) the NH_4-N (215 µg/g soil)** in this soil had dropped to 80 µg/g soil, indicating that nitrification had occurred where no fungicide had been added. But at all rates of fungicide incorporation, even at half the recommended rates, nitrogen oxidation was inhibited.



It is fortunate that NH_4-N toxicity is not omnipresent. A system of checks and balances (microbial activity, mineral fixation, leaching, etc.) seems to operate in the soil with remarkable efficiency. Otherwise, using these fungicides even at suboptimal rates might instigate NH_4-N phytotoxicity. The innumerable intricacies of soil chemistry employ safeguards that overcome predicted toxicities. Plants will grow where failure is anticipated.

When NH_4-N is oxidized to NO_3-N, the soil becomes more acid. Greenhouse soils are generally well supplied with limestone. The incubation mixture used in this experiment was amended with 0.5% limestone. This increased the pH from 4.9 (typical for soils of this area) to 6.6 ± 0.4, depending upon treatment of the mix.

In summary, it would appear that NH_4-N toxicity will be increased in severity if Dexon or Truban are used in the production of a crop. It would seem, however, that steps other than the elimination of these fungicides should be taken to alleviate NH_4-N phytotoxicity.

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**µg (microgram) is one millionth of a gram, so a µg/g is a more accurate way of saying a part per million.