



Photo 1.

Left: Seedlings are normal when growing in a soil of low pH.

Middle: Seedlings are normal when copper oxychloride is added to a soil of pH 5.6.

Right: Root development cannot take place when copper oxychloride is added to a soil of low pH.

All seedlings are *Pinus radiata*.



Photo 2: *Pinus radiata* seedlings grown in Kaikohe soil treated with copper oxychloride. The majority of root tips are withered.

PHYTOTOXICITY OF COPPER OXYCHLORIDE ON ACID SOILS

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The literature on the application of fungicidal drenches to the soil includes a paper by Gibson (1958) in which he shows that copper oxychloride and cuprous oxide are toxic to *Pinus radiata* and *P. patula* seedlings on acid soils in Kenya. The main symptom was early death of the root tip, resulting in the root failing to grow and, ultimately, in the death of the seedling.

As copper fungicides are sometimes used in this way in New Zealand nurseries some small trials have been made to find whether the phytotoxic effect is demonstrable here.

Several pot experiments were made in which Whakarewarewa soil was acidified to various degrees, seed of *Pinus radiata* were sown in each pot, and half the pots at each pH were treated with copper oxychloride.

Below pH 5.0 the fungicide caused an increasing amount of seedling injury as acidity increased, with losses of about 75% at pH 4.3. Low pH's had no ill effects on seedlings in the series which had no fungicide added to the soil (photo 1).

A test on soil from the Kaikohe nursery, which normally has a pH of 4.4, gave confirmatory results (photo 2).

Gibson found that old stocks of fungicide caused much greater losses than did fresh material; the reason for this is not known. Nor is it definitely known why the damage is done, but Gibson produces some evidence to suggest that copper is liberated in the soil under acid conditions.

The amount of fungicide used was 0.3% suspension at the rate of $\frac{1}{2}$ gal. per sq. yd. once during emergence and once a week thereafter for six weeks. This was the amount used by Gibson in his trials, and was adhered to through lack of any known standard practice in New Zealand. It is likely that fewer applications would have the same effect, as most of the damage was evident after the first two applications.

The results suggest that nurseries with a pH of 5.0 and below should avoid using this fungicide; and it may be a wise precaution for other intending users to buy fresh stocks each year.

REFERENCE

Gibson, I. A. S., 1958. Phytotoxic effects of copper fungicides on acid soils. *East African Agric. J.* 24:2.

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