external in the seed-borne phase, and can be controlled readily and almost completely by dry mercurial dressings. Some small advantage might accrue from control by a non-poisonous treatment; but, though radio-heating would provide this, the degree of control is not adequate for practical application. Work with loose smut of barley is now in hand, for if high-frequency heating is to have any advantage, it should be demonstrable with this internal seed-borne parasite.

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Effect of Quinhydrone on Soil Nitrification

Lees and Quastel[1] showed that if soils of temperate regions were submitted to an initial treatment with 4×10^{-3} *M* quinhydrone and afterwards rinsed with water to remove excess quinhydrone, they failed thereafter to nitrify percolated ammonium salts at the normal rate. It has since been found (Lees, unpublished results) that nitrification in these soils was inhibited by millimolar concentrations of quinhydrone allowed to percolate at the same time as ammonium salts. This latter result has now been confirmed by experiments with two soils from Trinidad: soil *A*, a fertile loam, and soil *B*, a poor heavy clay. Each soil had a *p*H of 7·0–7·4 and a soil organic matter content of 11–14 per cent.

Ten-gram samples of the 4·0–1·0 mm. fractions of the crumb layers of these soils were stimulated to nitrification in the standard way[2] and repercolated with 100-ml. lots of $2{\cdot}5 \times 10^{-3}$ *M* ammonium sulphate solution containing various concentrations of quinhydrone. The resultant nitrifications are shown in Fig. 1. It will be seen that nitrification was markedly inhibited by quinhydrone in concentrations as low as $1{\cdot}0 \times 10^{-4}$ *M*; in fact, quinhydrone had a toxicity towards nitrification of the same order as the toxicity of sodium azide (Fig. 2).

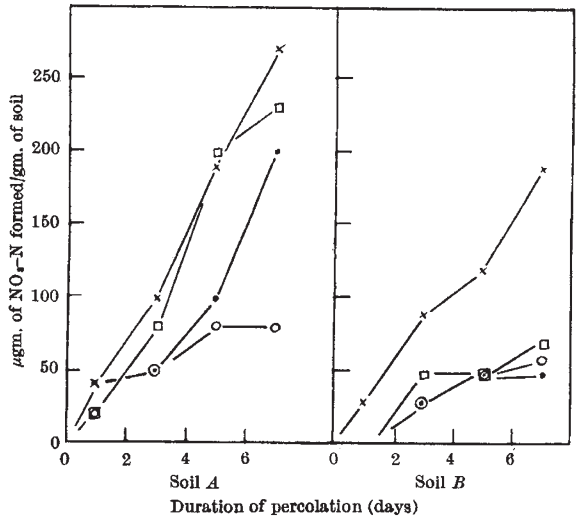

Fig. 1. Inhibition of nitrification by quinhydrone. Quinhydrone concentration of percolate: — × —, nil (control); — O —, $2{\cdot}5 \times 10^{-4}$ *M*; — ● —, $1{\cdot}0 \times 10^{-4}$ *M*; — □ —, $5{\cdot}0 \times 10^{-5}$ *M*

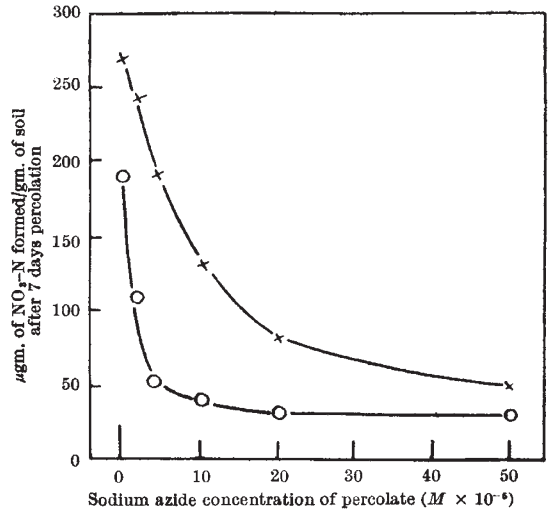

Fig. 2. Inhibition of nitrification by sodium azide: — × —, soil *A*; — O —, soil *B*

It is probable that in none of the experiments cited was quinhydrone itself the toxic agent, since a rapid darkening of the percolate during the first few hours of percolation, indicative of quinhydrone oxidation, was always observed. A search for the actual toxic agent among the quinones and polyphenols, possible oxidation products of quinhydrone, is now being conducted.

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[1] Lees, H., and Quastel, J. H., *Biochem. J.*, **40**, 803 (1946).
[2] Lees, H., *Plant and Soil*, **1**, 221 (1949).

Use of Lime and Sodium Molybdate for the Control of 'Whiptail' in Broccoli

IN the report in *Nature*[1] on the occurrence of 'whiptail' in cauliflower in Great Britain, it was stated that this deficiency disease, attributable to molybdenum[2,3], is endemic in south-eastern England. From observations and experiments carried out at this Station since 1947, 'whiptail' in cauliflower and broccoli is prevalent in most of the market-garden districts of the south of England and Wales, and particularly in the broccoli-growing areas of Cornwall. The problem occurs on acid soils, and a wide range of different parent materials is involved, including granite, Devonian shales and sandstones, Carboniferous Limestone and Lower Greensand.

As regards 'whiptail' in broccoli, the symptoms are characterized by a reduction and malformation of the lamina, excessive extension of the petioles and atrophy of the growing point.

Field experiments carried out during the past two years at centres in Cornwall and Wales have shown that while the incidence and severity of 'whiptail' is affected by the seasonal conditions, the application of lime or sodium molybdate to acid soils will prevent this trouble.