which are distinguishable by their sensitivity to aminopurine on one hand, and to bromodeoxyuridine and bromouracil on the other, in inducing back-mutations. One type can be reverted more readily by the pyrimidine analogues than by aminopurine. The other type responds poorly, if at all, to the pyrimidine analogues but responds well to aminopurine; the effectiveness of aminopurine on most of these mutants is enhanced by thymine. We have not found this second class among spontaneous or aminopurine-induced mutants; it appears to be one of the two main classes among bromodeoxyuridine-induced mutants. As it is induced by a base analogue it is likely to be a base-pair change—a change that cannot be readily reverted by the base analogue that induced it.

It seems from this and other work that the pattern of induction and reversion of mutations in *Salmonella typhimurium* is more complex than the patterns described in bacteriophage.

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SOIL SCIENCE

Resistance of Tea Plants to Blister Blight in Soils augmented with Nickel

In 1961, protective spraying of tea plants with nickel chloride hexahydrate gave dramatic control of the blister blight disease[1], and later certain salts of nickel were shown to possess eradicative control properties when applied in a dilute aqueous solution to tea foliage 3–5 days after inoculation with *Exobasidium vexans* Massee, the causal pathogen[2]. Very recently it has been observed that, in soils augmented with nickel ammonium sulphate and nickel nitrate, tea plants developed disease resistance.

Potted tea plants of susceptible monoclonal selection, 12 months from cutting, were pruned back to 6 in., incubated in a plastic house and used for the experiment when they had produced 3–4 shoots. The 5 lb. of soil in each pot was treated with 1, 2 or 3 g of nickel ammonium sulphate, applied on the surface and watered down, untreated controls being maintained. The young leaves in four plants in each treatment, and the control, were artificially inoculated with spores of *E. vexans* by the usual method[2], 5, 8, 15 or 20 days after the nickel was applied to the soil. After inoculation the plants were incubated at room temperature (20°–30° C), protected against natural infection from air-borne spores. Observations were made on the number of lesions that developed, and the number of sporulating blisters, up to 14 and 21 days, respectively, after inoculation.

Results (Table 1) showed that the number of lesions developing on plants in soil treated with nickel ammonium sulphate 5 days before inoculation was markedly lower when compared with the control. In the lots inoculated 8, 15 and 20 days after treatment, no lesions formed on plants treated with nickel ammonium sulphate at 3 g/pot; at the lower dosage of 2 and 1 g the plants developed only a few lesions, whereas control plants were heavily infected. Similar results were obtained when nickel nitrate was used. No specific influence of nickel application on sporulation was noticed; lesions which formed on treated plants sporulated in the same proportion as those in the untreated ones. Symptoms of iron chlorosis developed in the second week in the treated plants and growth was slightly retarded.

Table 1

Nickel ammonium sulphate treatment	Number of lesions on 4 plants maintained for 5, 8, 15 and 20 days in treated soil							
	5		8		15		20	
1 g/pot	87 (10)	**52***	14 (12)	**14**	5 (14)	**4**	23 (13)	**19**
2 g/pot	126 (19)	**91**	33 (10)	**22**	2 (12)	**2**	8 (11)	**6**
3 g/pot	44 (18)	**30**	0 (13)		0 (18)		0 (14)	
Control	261 (13)	**225**	201 (14)	**180**	141 (14)	**114**	256 (14)	**219**

* Figures in parentheses give the number of leaves examined, those in bold type the number of lesions which sporulated.

In preliminary experiments in the field, when 4-year-old clonal plants were each given 4, 8 and 12 g nickel ammonium sulphate, dibbered into the soil around the collar and watered down, they seemed to develop resistance to blister blight for 4 weeks following treatment, but mature bushes which received 15 g showed no such resistance. No increase in nickel level was observed in the leaf from these mature bushes when analysed by dry ashing polarographic technique 2, 3 and 4 weeks after soil treatment. Symptoms of iron chlorosis were not seen in either the 4-year-old clonal plants, or the mature bushes, at these rates of nickel application. Leaves from different clones growing in the same locality were analysed, when it was seen that one which is immune to blister blight contained 14–25 p.p.m. nickel, as opposed to 6–10 p.p.m. in two susceptible clones, indicating that in tea plants nickel may have an important role in host resistance to blister blight.

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Simple Estimation of Soluble Salts in Glasshouse Soils

For a number of years the National Agricultural Advisory Service has been carrying out routine determinations of electrical conductivity on aqueous extracts of glass-house soils as an advisory service to horticulturists. Extracts are usually prepared at a water : soil ratio of 2·5 : 1 by shaking 16 g of soil with distilled water for 15 min. After settling, conductivity determinations on the clear extract are carried out at a temperature of 20° C and the results are usually expressed as *p*C or C*f* values, *p*C being the negative logarithm of the specific conductivity and C*f* being the specific conductivity multiplied by 10^4. These values have been classified on the basis of soluble salt content of soils and effect on plant growth[2], and are often used to predict harmful effects to plants due to accumulation of fertilizer residues.

It has been recognized for some time that the interpretation of *p*C values has certain difficulties caused by the properties of calcium sulphate which tends to accumulate in glasshouse soils where sulphate fertilizers are used or where the water is hard. Calcium sulphate cannot reach a high concentration in the soil solution owing to its low solubility, and it has been shown by experimental work (ref. 3, confirmed in this laboratory) that calcium sulphate is harmless to lettuce and tomato plants even when present in large excess. It can, however, greatly affect laboratory measurements of conductivity when carried out at a high solvent : soil ratio[4,5] for convenience in routine analysis. This is because at a high solvent : soil ratio much more calcium sulphate can dissolve, if a considerable amount is present in the soil, than would be in solution when plants were growing in the soil.

Winsor *et al.*[3] found that the difficulties due to calcium sulphate could be eliminated simply by determining the conductivity in a soil extract obtained by using saturated calcium sulphate solution instead of water[5], thereby eliminating calcium sulphate as a variable in the extract.