Comments and Letters to the Editor

Comments on The DTPA-Extractable Iron, Manganese, Copper and Zinc from Neutral and Calcareous Soils Dried Under Different Conditions.

Leggett and Argyle (1983) berated standard texts for devoting little attention to sample preparation. In fact Jackson (1958) stated that many types of analyses must be carried out on moist samples immediately after collection, such as exchangeable Fe, Mn and K; acid-extractable P; NO₃⁻-N, NH₄⁺-N and pH. To these I would add electrical conductivity, and Bartlett (1979) has added Cr. Uehara and Gillman (1981) reported changes in cation exchange capacity and rheological properties of variable-charge soils: “in the tropics the rule of thumb is not to air-dry or oven-dry samples prior to analysis”. In summary it emerges that drying is unsuitable for all analyses on some soils, and some analyses on all soils. Drying can have the same chemical effects in the field. In Northern Ireland, for example, cereals are regularly Mn-deficient in spring and early summer, symptoms disappearing in July or (in unusually wet years) Aug., some while after the soils begin to dry out in the field. Exchangeable Mn increases during this period, and so does Mn concentration in lysimeters (McAllister and Benians, unpublished). The process culminates in massive leaching of Mn with the fall, and so Mn deficiency in the following spring.

The inevitable conclusion is that soils really do change significantly when they dry, whether in the lab or in the field.

Leggett and Argyle (1983) criticised the diethylenetriaminepentacetic acid (DTPA) test for Fe and Mn on the ground that the results change after drying. In my view any test for Fe and Mn that did not change if the soil was dried would be next to worthless, as it would not reflect the true situation in the soil. Lindsay (1979) explained the mathematics of the DTPA extraction, but its basis is very simple: the concentration of the chelate ligand-metal complex is directly proportional to the activity of the metal in the aqueous phase. In effect it is like a water extraction made more sensitive (at least until the reserves of metal to replenish the aqueous phase is substantially reduced). Changing the solubility of the reserves of metal changes the activity of its ions in the aqueous phase, which in turn changes the concentration of the metal in the chelated phase. This is how a good soil test should work.

Finally, I should like to ask my colleagues at large, as well as Drs. Leggett and Argyle, why they dry soil samples. The procedure is time-consuming, when farmers everywhere are grumbling about slowness in soils labs; it is also expensive. Most important, it gives spurious results — except where field soils air-dry anyway, e.g. Colorado. And why store the samples before testing them?

I value Leggett and Argyle’s paper as a useful addition to our knowledge of the effects of drying and storage, but their quest for correction factors to relate products of different laboratories’ drying rooms (= “Lab Dirt”; Bartlett, 1979) is a wrong response to the situation.

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References


