

content and fineness of grinding by the service section and for rate of solution in dilute acid by the research section. The rate at which a limestone dissolves in a dilute acid does not necessarily reflect its behaviour in the field, and selected limestones are being studied further by pot experimental methods. Field trials are under consideration. In the field a further factor comes into prominence—that of hardness. The treading action of stock is likely to pulverize a soft limestone but have little effect on a hard stone, and the hard stones may require a finer grinding. All stones are being tested for their resistance to crushing, and selected extremes will be compared in mowing trials.

At the present early stage, indications in the pot experiments are that fineness of grinding has a very big influence, overshadowing that of reactivity and also that of size of application. In these experiments the limestone was incorporated in the soil, not applied to the surface. An effect on germination was noted. Some work on the solubility of limestone in a saturated solution of carbon dioxide has been carried out.

Plant Analysis

Investigations of the tissue-test techniques as a means of determining mineral deficiencies in pasture plants and fodder and cereal crops have been continued. The first step in this work has involved the checking and improvement of existing chemical methods, most of which have now been developed to a satisfactory degree. The second stage has involved securing extensive reference data from the more important plant species. The work has now entered the important stage of correlation of results with findings or indications from other techniques of mineral-deficiency investigations.

Visual symptoms have received attention, but have been of limited assistance, especially in the pasture investigations. Efforts, therefore, have been directed more particularly toward relating the tissue-test findings to the results of soil analyses carried out by the soil research sections and the conclusions from field observational top-dressing trials or mowing experiments and conclusions from the peat investigations. It is hoped shortly to add to the over-all picture results of plant-ash analyses.

Using the travelling laboratory, visits have been made to various North Island observational top-dressing trials, in most instances satisfactory agreement being obtained between results of tests and observed responses. However, in detailed plot experiments conducted at the Soil Fertility Research Station, correlation of fertilizer treatment with sap levels or correlation of growth responses to treatments with sap levels has been disappointing. It would appear, therefore, that the tissue-test techniques are of more particular value in revealing acute deficiencies rather than in showing up or evaluating small differences in nutrient availability.

Even between methods of examination of the plant sap considerable variations have been noted. For example, potash and phosphate results by the Purdue and Carolus methods frequently conflict. In general, the Purdue phosphate results are in better agreement with observed responses than the Carolus results, whereas for potash the Carolus technique appears to be preferable.

Despite these shortcomings, however, the method appears to be of value in the following ways: as a confirmatory test to visual methods, especially for crop plants; as a supplementary test to soil or plant-ash analysis; as a quick test for available nitrogen; and as a quick test adaptable for use by field officers.

Weed Control

While the experimental programme of this section has been extended considerably during the year, to a large extent the work has been restricted to investigations into the use of weedicides in the control of perennial weeds of pastures. Much of the work to date has been exploratory, as it has been essential for the Department to check the