

INTRODUCTION

A. Previous Work.

The use of rapid chemical tissue tests in determining the mineral status of plants was originated in the United States of America by Hoffer in 1926 (1) working with maize and was later used by Pettinger also on the maize crop (2) in which visual methods had proved not entirely satisfactory.

The effect of soil types and the application of fertilisers on the sap of plants was studied by McCool and Weldon in 1928 (3). Techniques suitable for use on both plants and soils were described by Thornton, Conner and Fraser (4) and, for certain micro-nutrients, by Morgan (5).

From 1943 onwards considerable work on these methods was carried out in England, chiefly by Nicholas, Plant and Jones at Long Ashton (6 - 16) and also, in conjunction with visual methods, by Wallace (21 - 23). Pioneer American workers include Emmert, Carolus and Hester (17 - 20).

The methods had been applied mainly to temperate crops, e.g. potato, cauliflower, tomato, sugar beet, etc. and, with the exception of the apple, had not been used for tree crops. The tests had shown their value in determining deficiencies in the nutrition of these crops, however, and good correlation between visual data, chemical analysis and the tissue tests was obtained.

Actual quantitative values were not set to the results obtained, the quantities present being recorded as high (H+, H,H-), medium (M+,M,M-) or low (L+,L,L-). Methods were evolved for testing for nitrate-nitrogen, potassium, calcium, magnesium, manganese, ferric iron, zinc, phosphorus and Chlorine.

Tissue tests, in spite of certain limitations, have some advantages over the usual methods of complete chemical

analysis particularly with respect to economy in time and material, relative simplicity of operation, less apparatus required and the fact that, for some elements, it is possible to carry out the tests in the field. They serve as useful adjuncts to other diagnostic methods such as visual diagnosis and leaf injection tests.

Recently much, as yet unpublished, work has been undertaken by H. Evans at the Imperial College of Tropical Agriculture, Trinidad in adapting these methods for use on cacao and in extending the tests to include certain additional micro-nutrients - notably copper, zinc, boron and molybdenum. This work is still in progress.

The method used by Nicholas (24,25) was to soak chopped samples of plant tissue (leaf lamina or petioles) for a certain time in Morgans reagent, or, for the determination of certain micro-elements, in hydrochloric acid and to carry out on the filtered (and if necessary decolourised) extract colorimetric or turbidimetric tests.