

INTRODUCTION

HISTORICAL

As recently as 1916 doubt was expressed as to whether fungi grew and lived in the soil. The soil bacteriologist Conn (1916) was rather sceptical of their importance, but despite an unfortunate impression gained from the later literature that he refuted their presence altogether, his actual conclusion was that "Although Waksman (1916) was presumably correct in his statement that fungus mycelium is present in the soil, it is doubtful whether it exists there to a significant extent." Following on from the pioneer work of Waksman, however, there has been increased interest in the fungi of the soil and Chesters (1949), in his presidential address to the British Mycological Society, shows clearly that fungi are significant and widespread in soil and indicates many profitable future lines of research into their activities.

Adametz (1886) was responsible for the first isolation of fungi from soil, followed by Oudemans and Koning (1902), Oudemans identifying forty species so obtained. Fungal taxonomy has had to keep pace with this increased knowledge of soil fungi and Gilman (1945) in his Manual of Soil Fungi has provided a useful tool in the hands of the investigator into soil fungi.

Numerous methods of isolating fungi from the soil have been tried. All these methods must be to some extent selective in that they favour the isolation of certain fungi, or groups of fungi, at the expense of others. Waksman placed lumps of soil directly on to an agar plate and isolated them as they grew out into the medium. By comparing the rate of growth of such fungi with the rate of growth of various selected fungi from mycelial and spore inocula he was also able to show that in many cases the first growth from such lumps of soil must have developed from active mycelium in the soil, and not just from spores simply resting in the soil. This provided good evidence that fungal mycelium did, in fact, grow actively in the soil. Soil mycologists also became interested in the actual numbers of fungi per unit of soil and used essentially bacteriological methods for their determinations in that successive dilutions of soil in sterile

media were plated out and the number of colonies developing counted. The validity of such counts, however, is rather doubtful since any given colony may have arisen from a fragment of mycelium or a spore. The heavy sporulation of such fungi as *Penicillium* will obviously weight the counts considerably and, furthermore, there is the fact that conditions favouring mycelial growth may be different from those favouring sporulation. However, fungi can be isolated by this method quite satisfactorily, but too much importance should not be attached to the numerical aspect.

Warcup (1950) describes a soil-plate method in which a small quantity of soil is spread over the bottom of a Petre-dish and cooled agar poured over it.

Rossi (1928) pressed clean microscope slides against a freshly cut surface of soil and after fixation examined these to give a picture of the positional relationships of fungi, bacteria, and soil particles. Cholodny (1930), Conn (1936) and Jensen (1935) have used various modifications of this method.

The disadvantage of the Rossi-Cholodny slides is that sporulation is only rarely seen and the fungi cannot be identified. This is related to an observation made by Chesters (1948) who suggests that "vigorous sporulation in the soil causes early cessation of vegetative growth". If the substrate encourages sporulation, then sterile hyphae are those likely to extend the furthest from their substrates and thus occur more frequently on Rossi-Cholodny slides. Garrett (1956) sums these difficulties up well by saying "that with the plate count method one identifies what one cannot see (i.e. in situ), whereas with the direct method one sees what one cannot identify."

Kubiena (1932, 1935), using vertical illumination, has, however, been able to some extent to study the fungal population in situ and has shown the active growth of certain species not usually appearing in dilution plates.