

Briefly, then, while in any case of twin seedlings, one haploid and the other diploid, it is quite possible and even likely that the former has arisen from an unfertilized synergid and the latter from a zygote, the condition needs careful scrutiny before any judgment can be given. Adventive embryos, however, whether originating from the nucellus or the integument, are diploid.

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¹ Johansen, D. A., *Bot. Rev.*, **2**, 87 (1945).

² Cooper, D. C., *Amer. J. Bot.*, **30**, 408 (1943).

³ Yamamoto, Y., *Bot. Mag. Tokyo*, **50**, 573 (1936).

⁴ Engelbert, V., *Canadian J. Res.*, C, **19**, 135 (1941).

Origin of Toxicity to Fungi in Wareham Heath Soil

DR. BRIAN'S discovery of marked antibiotic activity by species of *Penicillium* present in Wareham soil is a welcome addition to our knowledge of the factors directly responsible for the observed inhibition of microbiological activity in this soil, with the resulting pronounced biological inertia and infertility for plant growth¹.

The presence of a factor or factors of biological origin actively toxic or antagonistic to fungus growth and normal root development was suggested by me in a paper published in 1934². The correctness of this hypothesis was later fully established³. It would have been indeed a fortunate coincidence if the discovery of penicillin and realization of the important part played in Nature by the production of bacteriostatic and fungistatic substances had come in time to direct attention at that stage of the work to the species of *Penicillium* observed in samples of Wareham soil, more especially in those selected as likely to exhibit the highest degree of toxicity.

Incidentally, our observations suggested that the distribution and abundance of the soil *Penicillium* spp. present is sporadic throughout the experimental area and possibly influenced by seasonal conditions. Until further data are available, it must remain an open question whether gliotoxin as such is the immediate cause of all the observed phenomena in Wareham soil, including especially limitation of growth of those mycorrhizal fungi known to be present involving either complete failure of mycorrhizal activity, or the development of mycorrhizas structurally and functionally abnormal; or whether this substance is one—perhaps the chief initiating cause—of a number of disturbances of microbiological origin leading ultimately to soil infertility. The differential susceptibility of air-borne micro-organisms present on plates tested by the agar-film method had been noted and the resistance of *Penicillium* spp. as compared with *Mucor* spp. and other air-borne infections is possibly of some significance.

Dr. Brian's observations on the mycorrhizal and other fungi sent to him are of particular interest. Of these fungi, *Boletus bovinus*, *B. elegans*, *Mycelium radialis nigrostrigosum* and *Phoma radialis callunæ* are mycorrhiza-formers. *B. bovinus* was the only known mycorrhiza-former of pine and spruce initially present throughout the area. *B. elegans* does not occur on the area but appears in adjoining woods of larch, of which it is a proved mycorrhiza-former; nor has

Mycelium radialis nigrostrigosum ever been observed unless introduced in soil inocula, although this fungus is extremely abundant as a mycorrhiza-former in woods of Scots pine adjoining the area. *Phoma radialis callunæ* is the mycorrhiza-former of *Calluna vulgaris*, a natural dominant on Wareham heath.

The differential susceptibility of these mycorrhizal fungi to gliotoxin, as recorded by Dr. Brian, is in agreement with all observations and facts relating to growth activity in the case of those present on the experimental area, and, in the case of those not present, for example, *B. elegans* and *M. radialis nigrostrigosum*, accords with expectation.

The case of *Phoma* is of special interest. This endophyte shows relatively slight susceptibility, as might be expected from its wide distribution throughout the area in mycorrhizas of *Calluna*. That some susceptibility exists is in agreement with observations made by me at an early stage of the Wareham researches in respect of relatively slight and varying degrees of abnormality in mycorrhizal development and structure observed in mycorrhizas of *Calluna vulgaris* on the heath-land before ploughing.

The reaction of the pseudomycorrhiza-formers *Mycelium radialis atrovirens* and *Rhizoctonia* sp. is also of interest. *M. radialis atrovirens* is present throughout the area, but is relatively rare and has not been observed to attack either pines or spruces in the field. *Rhizoctonia silvestris*, the form sent to Dr. Brian, does not occur in Wareham soil. In respect of *M. radialis atrovirens*, it would be of particular interest to have a comparative test of a form imported in a Swedish soil that proved to be highly pathogenic to Norway spruce under Wareham conditions⁴.

The title given to Dr. Brian's communication is unfortunate. The use of 'mycorrhiza' in the singular to describe the general phenomenon is now recognized as incorrect and has been given up by those familiar with the facts. The toxicity recorded by Dr. Brian is to 'mycorrhizal fungi' and not to 'mycorrhiza'.

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¹ Brian, P. W., Hemming, H. G., and McGowan, J. C., *Nature*, **155**, 637 (1945).

² Rayner, M. C., *Forestry*, **8**, 96 (1934).

³ Neilson-Jones, W., *J. Agric. Sci.*, **31**, 379 (1941).

⁴ Rayner, M. C., *Forestry*, **15**, 1 (1941).

Nutritive Value of Coco-nut

THE communications on the nutritive value of coco-nut by Dr. Lucius Nicholls and Sir Jack Drummond¹ were read by us with interest.

In 1941, while working with the microbiological assay of vitamins, stories of seamen and aviators stranded on 'coco-nut isles' became common, and it occurred to us to measure the vitamin content of the 'coco-nut milk' popularly supposed to be the dietary mainstay under such conditions. The values listed are those obtained for the centre fluid of an apparently normal specimen obtained at a local grocery store.

Nicotinic acid	..	..	0.64 micrograms/c.c.
Pantothenic acid	..	..	0.52 "
Biotin	..	..	0.02 "
Riboflavin	..	..	< 0.01 "
Folic acid	..	..	0.003 "