

LETTERS TO THE EDITORS

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IN THE PRESENT CIRCUMSTANCES, PROOFS OF "LETTERS" WILL NOT BE SUBMITTED TO CORRESPONDENTS OUTSIDE GREAT BRITAIN.

NOTES ON POINTS IN SOME OF THIS WEEK'S LETTERS APPEAR ON P. 466. CORRESPONDENTS ARE INVITED TO ATTACH SIMILAR SUMMARIES TO THEIR COMMUNICATIONS.

Production of Synthetic Mycorrhiza in the Cultivated Cranberry

UNDER this title, Bain¹ describes experimental investigations on mycorrhizal relationships in *Vaccinium macrocarpon*, Ait., *V. canadense*, Kalm., and two ericaceous species, reviewing and criticizing the conclusions of earlier observers in the light of his own results. In so far as the latter relate to *Vaccinium macrocarpon*, they may be summarized as follows. A fungus, specifically distinct from those associated with the other species studied, was isolated from roots of the cranberry, *Vaccinium macrocarpon*. Identity of this fungus with that forming mycorrhizal complexes in the root cells of the host was established by inoculation of the mycelium into pure cultures of cranberry seedlings growing in nutrient agar and in 'artificial soil' composed of cork and sand.

Bain describes the colonies and mycelium of this fungus as 'specifically distinct' from those isolated by him from the other species investigated, and also from those of *Phoma radialis callunæ* obtained from the Centralbureau voor Schimmel Cultures in Baarn. Its affinities and systematic position have not been determined.

Designation and acceptance of *Phoma radialis* as the mycorrhizal associate of *Vaccinium* spp. and members of *Ericaceæ* rest on the following evidence. In 1907, Ternetz² reported the isolation of distinct strains of what was regarded as a single fungus species from roots of a number of native ericaceous species and from *Vaccinium Oxycoccus* and *V. Myrtilus*, all growing in Switzerland. Sporing cultures of all these fungi were submitted to Lindau and Hennings in Berlin for identification and were referred by them to the genus *Phoma* as a new species under the name *P. radialis*. The form associated with the European cranberry, *Vaccinium Oxycoccus*, like the others, was distinguished in culture by definite characters relating especially to the numbers of pycnidia produced, manner of fruiting, and size and shape of pycnidia and spores.

In 1915, one of us³ reported the isolation from seeds of *Calluna vulgaris* of a fungus identical in all respects with the form of *P. radialis* described by Ternetz as the mycorrhizal associate of this plant. Subsequent observations on *Vaccinium Oxycoccus* and *V. macrocarpon* were concerned only with systemic infection of the vegetative parts and seeds; isolation of the root fungus was not attempted in either species of *Vaccinium*. It was tacitly assumed in this paper on *Vaccinium* that the mycorrhizal fungus present in roots of the native cranberry, *V. Oxycoccus*, was *Phoma radialis Oxycocci* as described by Ternetz for this species in Switzerland, and this assumption was extended to the closely similar N. American species, *V. macrocarpon*, simultaneously under observation.

Although Bain's results do not necessarily constitute a direct challenge, they introduce uncertainty, as to the correctness of Ternetz's conclusions in respect to the identity of the mycorrhizal associate of *V. Oxycoccus*, and to the validity of the subsequent tacit acceptance of this view and its extension to *V. macrocarpon*; it was evident from study of Bain's paper that a re-investigation of this matter on British material of *V. Oxycoccus* was desirable. The results of such investigation are hereby placed on record.

Freshly lifted roots of *V. Oxycoccus* were washed in running water, sterilized by immersion in 1 per cent hydrochloric acid or 0.01 per cent mercuric chloride for 15-20 seconds, and rinsed repeatedly in sterilized water. Small pieces of roots so treated were then transferred to tubes of various media, including that used by Ternetz. A majority of these platings developed pure culture colonies of greyish white mycelium, becoming pinkish brown to dark brown with age. After two to three weeks growth at room temperature, these colonies fruited, forming pycnidia of various sizes in and upon the substrate. In all respects—character of colonies and mycelium, numbers and mode of formation of pycnidia, and size and characteristics of pycnidia and pycnidiospores—this fungus resembles *Phoma radialis Oxycocci* as described by Ternetz.

We are greatly indebted to Dr. J. Ramsbottom, keeper of botany, British Museum (Natural History), for examining our cultures and confirming the identity of the root fungus isolated by us with that extracted by Ternetz from Swiss material of *V. Oxycoccus*. A similar investigation is in progress on garden material of *V. macrocarpon*.

It may be added that root material treated as described by Bain, by repeated washings in distilled water without surface sterilization, gave rise in all cases observed by us to colonies of unidentified fungi, usually yellow or orange in colour.

Full discussion of Bain's conclusions in respect to this matter and to his views respecting the nature of the mycorrhizal associations in *Ericaceæ* must await a convenient occasion. In justice to the pioneer observations of Ternetz, it is desired to place on record these relating to the cranberry fungus as soon as possible.

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¹ Bain, Henry F., "Production of Synthetic Mycorrhiza in the Cultivated Cranberry", *J. Agric. Res.*, **55**, 811-836 (1937).

² Ternetz, Charlotte, "Über die Assimilation des atmosphärischen Stickstoffes durch Pilze", *Jahrb. wiss. Bot.*, **44**, 353-408 (1907).

³ Rayner, M. C., "The Biology of Fungus Infection in the Genus *Vaccinium*", *Ann. Bot.*, **43**, 55-70 (1929).