

Whether caoutchouc, resins, and tannins have any value, nutrient or otherwise, in the plant still remains to be determined. If they prove to be simply waste products, we shall be confronted with a peculiar method of dealing with waste matter which does not show much analogy to methods known at present.

R. H. BIFFEN.

FRANK SMART STUDENT,
GONVILLE AND CAIUS COLLEGE, CAMBRIDGE.

ON PEZIZA AURANTIA.—In March, 1896, the large pond in the Botanic Gardens, Cambridge, was emptied and cleaned, and large quantities of mud, chiefly the peculiar blue clay—gault—so common here, were removed from the bottom, together with plant-remains, such as the rhizomes and stems of water-lilies, *Epilobium*, *Scirpus*, *Polygonum*, &c. This mud was put into heaps in the garden under the shade of trees. At the same time a heap of similar blue clay, obtained during the digging for sewerage operations in the streets outside the gardens, was made near these heaps of pond-mud.

In September we noticed the apparently sudden outburst of enormous numbers of brilliant orange-scarlet *Peziza* cups on the heaps from the pond, and these increased during October and November, forming one of the most magnificent crops of these Fungi I have ever seen.

Examination showed the *Peziza* to be *P. aurantia* (Oed.), the cups, asci, and spores exhibiting the characters given in Phillips' British Discomycetes, p. 56, as those of the typical species, and reference to Massee (Brit. Fungus-Flora, iv, p. 448), Lindau (Engler, Pflanzenfam., 1 Th. 1 Abth. Lfg. 130, p. 187), and Winter (Rabenh., Die Pilze, B. III, p. 970) confirmed this, though these authors differ in the authorities cited for the name and synonyms.

Brefeld has not succeeded in germinating the spores of this species, and so I made attempts to cultivate it, and hoped to get out its life-history, but in vain.

It was quite easy to obtain the spores, though the majority of them appeared hardly ripe; nevertheless, numerous attempts to germinate them failed. In hanging-drops of water, gelatine culture-media, agar, &c., they did not stir under any of the given conditions, nor could I get them to grow in test-tubes on what experience suggested were probably suitable media.

At the same time, and especially when I found my attempts failing, I examined the *Pezizas* themselves to see if anything of the nature of a sclerotium or similar resting body had given rise to the crop; the results were negative. I also examined the plants round the pond for signs of such sclerotia, as well as the remains in the heaps, for it seemed possible that the sudden outburst of the crop on the particular heaps of mud from the pond might be due to large numbers of resting sclerotia having been dug up from the pond, although no such bodies are known in this group of *Pezizas*. All was in vain: no trace of any such body could be found either on the débris in the heaps or on the plants at the margins of the pond.

The observation that a few smaller patches of the *Peziza* occurred later in November on the clay heap not brought from the pond, made one ask whether, after all, it might not be merely a case of suitable pabulum, and to suggest that the blue gault clay was the favouring factor for the germination of wind-borne (or otherwise carried) spores.

Here again all experiments gave negative results, and I could not get the spores to germinate in either clay-washings or on the clay itself.

Moreover, I found that although the Fungus seemed to be spreading on to the sewer-clay, which was separated only by a narrow space—a couple of feet or so—from the heap of mud and débris of *Epilobium*, *Scirpus*, *Polygonum*, &c., where the large crop of Fungus grew, there was very little or none to be found on adjacent heaps of blue clay mud, also from the pond. On the other hand, a heap of the pond-mud and débris which had been fired to kill the *Polygonum*, &c., and covered with the same from the heap last mentioned, bore an abundant crop.

All these facts suggested that the hypothesis of wind-borne spores and a suitable pabulum was less probable than the hypothesis that the spores or other resting form of the Fungus had been brought from the pond with the mud.

Several times during repeated examinations of the heaps and their crop of *Peziza* cups, and of the latter when brought into the laboratory, I had noticed that the hymenium was marked with pale sunken patches, whence the asci and paraphyses had evidently been removed by some gnawing animal, and it required little search to find the culprit, in the shape of a small slug ensconced during the day on the lower side of the cup or on the ground near. The proof that the slug *was* the culprit was readily obtained by shutting it up in a glass dish

in which was a piece of moist filter-paper with a *Peziza* cup, for it rapidly attacked the hymenium in the dark, and gnawed just such holes in it as I had noticed.

In a few hours also the animal had left little ellipsoidal pellets of dung on the glass, paper, &c., and the bright scarlet colour of these told plainly the nature of his food. Microscopic examination of the dung-pellets showed abundance of spores, apparently uninjured, and now it seemed as if the problem was at length to be solved: of course it had suggested itself that the spores required passage through the body of the slug as a condition for germination.

Here again, however, nothing but failure attended all my efforts. It was very easy to obtain the spores, in the dung, in hanging-drops; yet in no case would they germinate, but behaved as if dead, until Bacteria obscured the view and the culture had to be abandoned.

Failure to germinate the spores has also attended every attempt made since the winter, in the hope that exposure to frost and a winter-rest might be necessary for germination, as is known to be the case with other spores.

H. MARSHALL WARD.

ON THE GINGER-BEER PLANT.—In my work on the Ginger-Beer Plant (Phil. Trans., B. 1892, p. 187) I pointed out the resemblances between Kephir and this symbiotic compound organism. On p. 186 I also gave reasons for believing that the *Bacterium* was introduced with the sugar.

I have now good reasons for believing that the early accounts of Kephir are not correct, or that there are several distinct varieties of this and other Ginger-beer plants, and that in all cases the Schizomycete I named *Bacterium vermiforme* is concerned, but associated with different yeasts; in any case, it appears certain that it can be artificially made to form a symbiotic union with other yeasts than the one I used in 1892; the aerobic yeast protecting the anaerobic *Bacterium*.

The following note is of interest in this connexion.

My wife recently received from a lady in Paris a number of grains of a body looking like boiled sago, and obviously of some such nature as Kephir or the Ginger-beer plant. It was said to have been given to our hostess by a missionary from Madagascar, who described it as 'an excrescence on the sugar-cane.'



Ward, H. Marshall. 1897. "On *Peziza aurantia*." *Annals of botany* 11, 339–341.
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