

between two different types of hyphae each growing away from its own inoculum.

Whereas a mechanism to account for the type of phenomenon seen in Fig. 1 is comparatively easy to envisage, the second type of divergent 'sector', involving as it does a conversion of hyphae from one type or another, presents some difficulty. Two kinds of system seem possible. First, a physiological reaction involving positive feedback, and secondly, an infective principle. In the former case, a local environmental condition (for example, low pH) might stimulate or initiate the production of a substance (for example, organic acid) that would accentuate or stabilize the environmental change, and if this condition caused a visibly distinct form of growth to be produced by the hyphal tips, a divergent sector could be expected to form independently of the growth rates in the affected area. In this example it is thought that the stimulus (that is, low pH) would diffuse externally to the hyphae through the medium, but there seems to be no reason to assume that it might not occur internally by way of lateral anastomoses. In this case it would be difficult to distinguish from the effect that might be expected of an internal parasite such as a virus, which is the other system considered possible.

A study is under way in this laboratory in the hope of clarifying the cause of the divergent 'sectors' in *A. tenuis* illustrated in Fig. 2.

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¹ Pontecorvo, G., and Gemmel, A. R., *Nature*, **154**, 532 (1944).

² Hawker, L. E., *Physiology of Fungi* (Lond. Univ. Press).

A New Rust Disease on Groundsel

A NEW species of rust, *Puccinia terrieriana*, has recently been described by Mayor¹ on groundsel, *Senecio vulgaris* L. Only aecidial and teleutospore stages were observed, both on the same host.

This rust disease was first noticed in Aberystwyth in November and December 1962. It reappeared in April 1963 and was also found during the summer at Borth, Cardiganshire, and on the Merionethshire coast near Towyn and Barmouth. During August it was observed at three places on the Cornish coast and on five of the Isles of Scilly. Records of rust diseases in the Aberystwyth area have been kept since 1935. It is curious that this new disease should appear so suddenly and be so widespread in its occurrence.

A pycnidial fungus has been found associated with the aecidial stage; but it has not yet been tested experimentally whether this is part of the life-cycle of *Puccinia terrieriana* or not. Probably it is not.

When first observed it was thought that the groundsel rust might be *Puccinia schoeleriana* Plowr. and Magn., which has aecidia on *Senecio jacobaea* and teleutospores on *Carex arenaria*. This is not the case since aecidiospores from groundsel do not infect *Carex arenaria* but do infect other groundsel plants, producing first aecidia and then teleutospores as described by Mayor¹ for *P. terrieriana*.

Herbarium material of *P. terrieriana* Mayor with aecidiospores and teleutospores has been deposited at the Commonwealth Mycological Institute, Kew, at the Herbarium of the Royal Botanic Gardens, Kew, and at the Herbarium of the Royal Botanic Garden, Edinburgh.

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¹ Mayor, E., *Ber. schweiz. Bot. Ges.*, **72**, 262 (1962).

MICROBIOLOGY

Effect of Ethylenediamine Tetraacetic Acid on the Cell Fragility of Brewer's Yeast

THE cell envelope of brewer's yeast (*Saccharomyces cerevisiae* Guinness strain class II) is extremely resistant to rupture by mechanical means. It was found that the addition of EDTA to the buffered medium in which the cells were shaken with glass beads increased the proportion of cells ruptured by a given intensity of shearing forces.

Pressed yeast (3 g) was weighed into each of two glass cells, together with Ballotini beads (1 g size 5A, English Glass Co.) and *tris* buffer, M/20, pH 8.0 (3 ml.). EDTA disodium salt (30 mg) was added to one of the cells. Both were shaken in the same way on a Mickle tissue disintegrator adjusted so that the fork was resonating with a shaking amplitude of 3.5 cm. Small samples (about 0.01 ml. each) were taken at the end of each 5-min interval, during a total shaking period of 30 min; the amount removed in this way did not appreciably change the conditions of the experiment and no estimation of a correction factor was necessary.

The disintegration of the cells was readily observed under the microscope, but the proportion broken was not easily estimated by a differential count, due to the presence of much cell wall material which had undergone extensive fragmentation after the primary bursting of the cell. A control experiment, performed without any glass beads, showed that, under those conditions of pH and temperature, no leakage of intra-cellular substances occurred. The ratio of phosphate in an aliquot of the supernatant after centrifugation at 1,000g for 5 min to the total phosphate in an identical uncentrifuged aliquot could, therefore, be used as an indirect measure of the proportion of cells ruptured.

The results of a typical experiment are shown in Fig. 1. Cell rupture, as indicated by the increase in supernatant phosphate, proceeded rapidly and smoothly on shaking with glass beads. The rate of cell rupture and the proportion of cells broken were both increased in the presence of EDTA. At the end of 30 min the rate of cell rupture had decreased and further shaking was ineffective. Under more vigorous conditions, the proportion of supernatant phosphate approached its limiting value of unity when it was seen by microscopic examination that no intact cells remained. The effect of EDTA could still be observed in these more vigorous conditions though less marked than in Fig. 1.

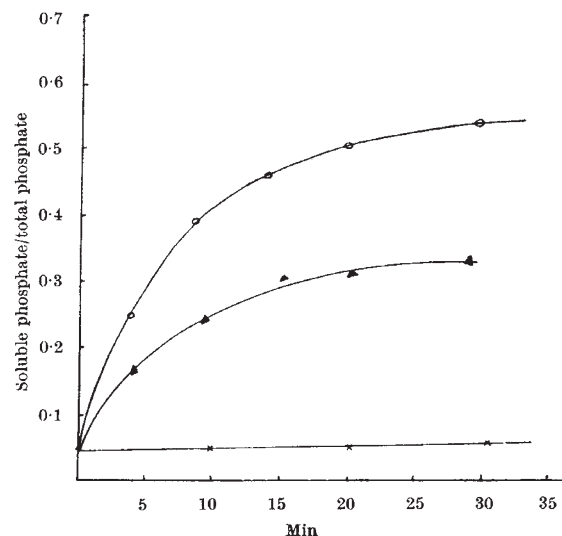


Fig. 1. Release of phosphate on cell rupture, by shaking yeast with glass beads: O, with EDTA present; Δ, with no EDTA; ×, no phosphate was released from the yeast when the glass beads were omitted