SHORT COMMUNICATIONS

Some Effects of Light on the Vegetative Growth of *Pilaira anomala*

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Pilaira anomala exhibits a number of light-dependent phenomena (Fletcher, 1969*a, b*). There appear to have been no previous studies on its vegetative growth. Growth has been shown to be retarded by light in the related organisms *Pilobolus* (Page, 1952) and *Phycomyces* (Carlile, 1962). This paper describes the effect of light on its growth and the production of a vegetative 'growth ring', a phenomenon of limited occurrence in fungi (Jerebzooff, 1965). Such a ring was described by Stevens & Hall (1909) in *Ascochyta chrysanthemi* but this can now be interpreted as due to an endogenous rhythm and not directly related to environmental influence.

Pilaira anomala (I.M.I. 109387) was isolated from deer dung and maintained on 'Oxoid' Sabouraud Maltose Agar. Experimental cultures were grown on a synthetic basal medium containing glucose (10 g./l.) and salts (Page, 1952). Agar media contained in addition an amino-acid mixture (Fletcher, 1969*b*), yeast extract (Difco) at either 0.05 or 10.0 g./l. and 'Oxoid Ionagar' (12 g./l.). Liquid medium contained, in addition to the basal medium, vitamin-free Difco-Casamino acids (5.0 g./l.) and thiamine (1.0 µg./ml.). Plastic Petri dishes (90 mm.) containing 15 ml. of agar medium were used. Liquid cultures were grown in 100 ml. 'Monax' rimless Erlenmeyer flasks containing 20 ml. of medium. The inoculum for agar was a 3 mm. diam. disc of agar bearing mycelium cut from the margin of a young colony and for liquid cultures was a dense filtered spore suspension. Four replicates were used in each experiment. Cultures were incubated at 25° either in complete darkness or in an illuminated incubator fitted with an 'Atlas' miniature 13 w fluorescent tube. The light was filtered through a 1% CuSO₄ solution to reduce infrared radiation (Trinci & Banbury, 1969), and was at 750 lx at the level of the Petri dishes. Measurements of radial expansion were made on two diameters of each colony at right angles. Cultures maintained in darkness were examined under red photographic safelight (Kodak Wratten no. 1). Liquid cultures were harvested after 6 days into perforated 20 ml. 'Oxoid' aluminium caps lined with filter paper discs, and dried overnight at 105°.

To determine the effects of exposure to continuous light, agar cultures were grown in continuous light (controls in continuous darkness) and radial expansion was measured at intervals for 3 days. The rate of growth with 0.05 g. yeast extract/l. (colourless) was 0.7 mm./hr. in light and 1.1 mm./hr in darkness. With 1.0 g. yeast extract/l. (coloured brown) it was 1.2 mm./hr in light and darkness. With 0.05 g. yeast extract/l., marginal staling became marked in the light and growth ceased before the colony reached the edge of the plate. In static liquid cultures the dry weights obtained from a colourless medium were 163 ± 2.4 mg./100 ml. medium in darkness but only 123 ± 0.6 mg./100 ml. medium in light.

The retardation of *Pilaira* on colourless but not on coloured media is similar to that of *Pilobolus* on synthetic agar but not on dung agar (Page, 1952). However, Page (1965) cited Willoughby as having shown that dung did not exercise a mere shading effect. The medium containing only 0.05 g. yeast extract/l. might be nutritionally suboptimal for *Pilaira*, leading to the depression of growth in the light (Carlile, 1965).

To investigate further the retarding effect of light on 0.05 g. yeast extract/l., cultures incubated in darkness for 36 hr were exposed to light for 1 hr and then returned to darkness, while reciprocal transfers were made from light to darkness for 1 hr, followed by return to light. The most conspicuous effect of the transfer from darkness to light and back to darkness, was the production of a vegetative growth ring, the inner limit of which was the diameter reached by the outer edge of the colony margin at the moment of exposure to light (Pl. 1, fig. 1). Growth rate in darkness declined following 1 hr exposure to light. A growth ring was not formed as a result of light-darkness-light transfer.

Photomicrographs were made of the margin of the same colony before (Pl. 1, fig. 2) and 1 hr after (Pl. 1, fig. 3) exposure to light. The marginal zone in darkness was a region of sparse hyphae where only the minor branches of the main radial hyphae overlap. Behind this zone there was a much denser felt of hyphae. Exposure to light changed the spatial distribution of the hyphae in the marginal zone. The number of lateral branches was reduced and open spaces appeared between the radial hyphae, which grew erratically. These phenomena combined to give the macroscopic appearance of the growth ring. The marginal zone was narrower after light exposure. The shape of the hyphal tips did not alter through exposure to light. This behaviour is morphologically similar to that observed by Stevens & Hall (1909) in *Ascochyta*.

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EXPLANATION OF PLATE

Fig. 1. Whole colony, showing macroscopic appearance of growth ring, $\times 2\frac{1}{2}$.

Fig. 2. Marginal zone of colony grown in complete darkness, $\times 80$.

Fig. 3. Marginal zone of colony after exposure to light for 1 hr, following return to darkness for a further 1 hr, $\times 80$.