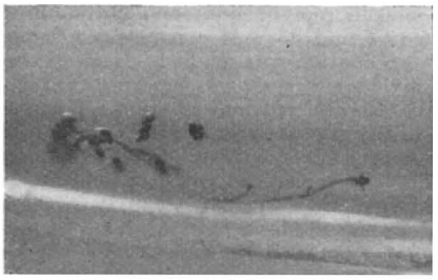

Fig. 1. An axenic *Drosera intermedia* seedling at 1 month (× 4). Black ovals are ungerminated seeds.

Some of this work was done at Brandeis University, Waltham, Massachusetts.

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[1] Darwin, C., *Insectivorous Plants* (D. Appleton and Co., New York, 1897).
[2] Schmucker, T., and Linnemann, G., in Rhuland, W., *Handbuch der Pflanzenphysiologie*, **11**, 198 (Springer-Verlag, Berlin, 1959).
[3] Büsgen, M., *Bot. Zeitung*, **41**, 569, 585 (1883).
[4] Hutner, S. H., Baker, H., Aaronson, S., Nathan, H. A., Rodriguez, E., Lockwood, S., Sanders, M., and Petersen, R. A., *J. Protozool.*, **4**, 269 (1957).
[5] Crocker, W., and Barton, L. V., *Physiology of Seeds* (Chronica Botanica, Waltham, Massachusetts, 1957).

Spore Liberation and Dispersal of Coffee Rust *Hemileia vastatrix* B. et Br.

Nutman, Roberts and Bock[1] have produced evidence recently that *Hemileia vastatrix* uredospores are not liberated into the air from fructifications by wind alone at speeds up to 12·5 miles/hr. and only in small quantities if the supporting leaf flutters violently. They infer that contact of water with the pustules is the principal method of liberation.

However, investigations in the field made during rainstorms at the Coffee Research Station, Ruiru, Kenya, by me in 1956 had shown that wetting of the lower leaf surfaces was usually not very marked and was principally by upward splash from lower leaves. Rust lesions are confined to the lower surfaces and would be too infrequently hit for this to be the predominant method of spore liberation. Microscopic observations of lesions brought in from the field showed that spores were not dislodged by air currents alone to any marked degree. However, with plants grown in the still air of a greenhouse, a light tap on a rusted leaf produced a visible spore cloud. Recently, rust lesions resulting from the inoculation of a coffee plant kindly supplied by the Royal Botanic Gardens, Kew, and kept in a laboratory were found not to liberate spores under calm conditions, but abundant liberation occurred when they were tapped lightly. A lesion tapped at 2–3 week intervals liberated 366,100 spores during three months, and only some further 50,000 could be washed off at the end of this period.

Water droplets allowed to fall on leaves at points situated above fructifications, previously kept in calm conditions, produced abundant spore liberation; for example, ten 5-mm. diameter droplets dropped from a height of 4 ft. liberated 396,600 spores. Further, from such fructifications, currents of air at speeds estimated as less than 1 mile/hr. produced marked liberation. A current not greater than 2 miles/hr. deposited 23,440 spores on 2·5 cm.^{2} of sticky surface held 1 cm. behind a fructification. These observations contrast strongly with those of Nutman[1].

Thus, under field conditions, liberation of spores into the air is probably considerable, though in accord with their rate of fall[1], and as liberation is probably most marked during rainfall, the majority may well be deposited near their point of origin as indicated by Burdekin's[2] observations. The epidemic spread may thus approximate to that expected for a fungus disseminated by rain-splash.

In fructifications kept under calm conditions, stocks of spores are built up by the fascicles of hyphæ which erupt through each stoma forming short, irregular filaments several spores wide. Small mechanical impulses cause these to break off and fall away. Under field conditions, few spores will be ready for liberation at any one time and this may explain Nutman's[1] observations, since his experimental material was brought in from the field.

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[1] Nutman, F. J., Roberts, F. M., and Bock, K. R., *Trans. Brit. Mycol. Soc.*, **43**, 509 (1960).
[2] Burdekin, D. A., *Kenya Coffee*, **25**, 212 (1960).

Production of Symptoms of Barley Leaf-Spot Disease by Culture Filtrate of *Helminthosporium sativum*

IT has been reported by several investigators[1–4] that symptoms of some diseases could be reproduced by the action of the culture filtrate on the host plant, instead of using the infecting spores.

During 1957–58 a series of experiments were carried out at the Phytopathological Laboratory, Willie Commelin Scholten, Baarn, Holland, on the susceptibility of the different Dutch barley varieties, namely, Agio, Balder, Piroline and Wisa, to the leaf-spot disease caused by *Helminthosporium sativum* P. K. and B. Pathogenicity tests were carried out under glasshouse conditions where seedlings of the four barley varieties were sprayed with a standardized suspension of *Helminthosporium* spores. The typical brownish necrotic spots appeared on all seedlings. The most resistant variety, as indicated by the size of the necrotic spots, was Balder, followed by Agio, then Wisa, while Piroline was the most susceptible. The same experiments were repeated, but under field conditions, where identical results on mature barley plants were obtained.

It was thought interesting to study the response of these different barley varieties to the probable toxic action of *Helminthosporium* filtrate. Accordingly, the fungus was grown on modified Fries No. 3 medium[4] for 4 weeks at 25° C. The filtrate was passed through a glass filter to get rid of spores and tiny mycelial fragments. The filtrate was distributed into sample tubes. For each of the four barley varieties, four tubes were prepared in each of which three cut shoots were dipped. The cut shoots dipped in the filtrate were left afterwards for 48 hr. at room temperature ranging from 15° to 20° C. Brownish necrotic spots, similar to those induced by spore infection, were clear on the four varieties. In addition to the necrotic symptoms, cut shoots showed wilting and twisting, and they became