by the parasite. These enlarged cells which lose their starch content seem to be identical with normal gall cells. There is no indication of any formation of wound periderm-like tissues. Occasionally the fungus fructifies sparsely on the tumours, a condition never found in normal reacting tissues of hypersensitive genotypes; this is an indication that the tumours so found favour the development of the parasite.

The tubers of the same genotype differ in their capacity to react in the manner described. This variation is connected with physiological differences between the individual tubers of the same plant.

I suggest the following explanation of these phenomena. Besides the gene *R* which controls the degree of sensitivity of the affected tissues to the invading parasite, there is another gene (or genes?) which enables the cells to grow and divide in response to the influence of substances released by the dying tissues. If, as appears, the 'tumourized' tissues are less sensitive than unchanged tissues, then the parasite has a greater chance of survival and fructification in the former than in the latter tissues.

The most striking feature of these experiments is that a parasite, known only as such because of its tissue-destroying properties, can stimulate certain host genotypes to develop tumours. Moreover, these observations indicate that this capacity of the host to react in such a manner is a stage beyond that of hypersensitivity in the phylogenetical development of the plant types concerned.

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¹ Müller, K. O., and Behr, L., *Nature*, **163**, 498 (1949).

² Müller, K. O., *Nature* (in the press).

Sharp Eyespot as a Severe Disease of Oats

SHARP eyespot of wheat¹, caused by *Corticium* (*Rhizoctonia*) *Solani*, is a common disease; but the lesions on leaf sheaths and straws are usually superficial, and there is no evidence that it is of economic importance. Hitherto, it does not appear to have been described on other cereals in Great Britain, though Oört² shows a photograph of it on rye in Holland, and Sprague records it on barley³ and on oats⁴ in America. This year a crop of oats has been found in Bedfordshire with many plants severely attacked by a *Rhizoctonia* resembling that obtained from sharp eyespot in wheat. The lesions in oats resemble those in wheat; but the fungus penetrates deeply into the tissues of leaf sheaths and straws, rotting the shoots. The disease is evidently serious; but the loss cannot be estimated because another parasite, the eelworm *Heterodora major*, is attacking the roots and reducing growth of the crop. Many barley and a few wheat plants are scattered among the oats and some show typical superficial sharp eyespot lesions; the vigorous growth of the wheat and barley does not seem to be affected, and contrasts vividly with that of the oats.

The suggestion that sharp eyespot is a more severe disease of oats than it is of wheat or barley is supported by sand culture experiments in which wheat, barley, oats and rye were inoculated with two isolates of *Corticium* (*Rhizoctonia*) *Solani* obtained from sharp eyespot in wheat. Lesions developed on the leaf sheaths of all four cereals, but oats and rye were

much more severely affected than wheat and barley; the fungus penetrated more deeply into the shoots of oats and rye and killed about half the inoculated seedlings.

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¹ Glynne and Ritchie, *Nature*, **152**, 161 (1943).

² Oört, A. J. P., *Tidsch. over Plantenziekten*, **42**, 179 (1936).

³ Sprague, R., *Pop. Bull.* 192 Wash. Agri. Exp. Sta. (1948).

⁴ Sprague, R. *Phytopath.*, **27**, 798 (1937).

Humidity and Temperature in Grass Microclimates with Reference to Insolation

IN view of a recent communication in *Nature*¹ by Miss Champness, it may be of interest to report certain investigations of grassland microclimates resulting from an inquiry into the behaviour of insect larvae (mostly Tenthredinidae) during 1947-49.

Shielded wet and dry thermocouples aspirated at a low rate in order to disturb as little as possible any thermal stratification were used in making air temperature and humidity observations in the face of direct insolation. Insect temperatures were taken per rectum, and leaf temperatures by threading thermocouples through leaves. The plots of grasses contained a mixture of species growing wild or semi-wild under conditions of varying density and height.

Curves of air temperature variation within the atmosphere enclosed by the grass have been obtained under suitable conditions of sunshine for vegetation from 25 to 60 cm. in height, thus bridging the gap as regards height between Geiger's² cornfields and Miss Champness's grass seedlings. The findings agree in general with their results. Clearly the quality and density of herbage affects temperature and humidity distribution (see also Roussakov³) and may compensate for height changes; for whereas in young corn the hottest layer of air is at ground-level and does not become remote from it until growth has proceeded for some time, in growing grass only a few centimetres in height the hottest air layer is already above ground-level. The extent of the cooler, wetter, lower microclimate depends upon the depth of penetration of the sun's rays, which is determined by the angle of these rays (varying diurnally and seasonally) as well as the physical conditions of the vegetation.

This was illustrated at Dundee by records of larval, leaf and air temperatures taken at different levels in vegetation 35-55 cm. in height at different times of the year. Temperatures of freely exposed larvae and leaves during periods of insolation were 1-3° C. above air temperature. When shielded from radiant heat, leaves were at air temperature while larvae were at temperatures slightly lower. In July, temperatures above that of air were recorded for larvae and leaves in the upper half of grass cover, denoting considerable radiant heat penetration. Here a low hot-air zone was recorded. In September and October, plant temperatures fell almost to that of the air and animal temperatures lower, in situations only 5-6 cm. below the grass tips, denoting reduced radiant heat penetration. As expected, a high hot-air zone was noted. Similar results for radiant heat penetration were obtained by exposing differentially connected black-and-white thermocouples *in vacuo* at different levels.

In grass partially flattened due to previous exposure to very strong winds and thereby presenting