

3. COVERED SMUT OF BARLEY.

(Plate 4, Fig. b.)

Appearance of the field.—Covered smut of barley is most readily recognised after the grain is cut. In the field the untrained observer is likely to mistake it for the loose smut, which it resembles at times rather closely. On carefully examining the ears, those affected with covered smut will be found considerably smaller in size than the sound ones. They are nearly of the same appearance as the sound ear; on looking closely at them, however, it will be found that there are no grains contained in the ear but in place of them spore masses still covered with a fine, whitish membrane or skin, which is easily broken on slight pressure. There is no resemblance of this smut to stinking smut of wheat inasmuch as the grains are not free and enclosed in the glumes, but rather the whole flowering portion seems involved.

Spores disperse with threshing.—As in the case of stinking smut of wheat, the spores of covered smut of barley are generally liberated at the time of threshing. They will then contaminate the barley grains with which they are eventually introduced into the soil.

Germination of spores.—In appearance (plate 8, fig. 8), but particularly in germination, these spores differ from loose smuts and from stinking smut, which latter belongs to a very different group. We have briefly referred to the mode of germination of stinking and loose smut spores of wheat. In the former (*Tilletia*) we observed the 'wreath' of secondary pairs of conidia, in the latter there occurred no conidia but infection tubes were formed. In the covered smut of barley we may observe another mode of germination. The spores are slightly larger than those of loose smut of wheat, perfectly smooth and olive-brown. On being placed in nutrient solutions, they germinate freely, producing a short, stout germinal tube divided by septa into four cells. At these septa are produced or segmented a number of secondary conidia which multiply, even if detached, similarly to the mode of growth of brewers' yeast. Such cultures may be kept alive for a considerable time, during which the conidia increase in large numbers, but, on becoming exhausted, the secondary spores will produce the infection threads by means of which the fungus enters the living plant tissue. When sown with the barley, the spores causing covered smut eventually attack the germinating barley in the same manner as in stinking smut of wheat. We meet here with another case of seedling infection, hence the methods of control would have to be along the lines suggested for the smuts producing seedling infection.

Treatment.—Formalin treatment as recommended for stinking smut is of the greatest value for the form of smut described here. We do not advise treating barley with bluestone, which has been found injurious to the germination of barley to a far greater extent than in the case of wheat.

4. LOOSE SMUT OF BARLEY.

(Plate 4, Fig. a.)

The loose smut of barley is very closely related to loose smut of wheat. Taking into consideration its general symptoms and the life history of the fungus, one might be led to believe it to be the identical species found in wheat. Yet the fungi are biologically different, for the fact that the form from wheat cannot infect barley, and that found on barley cannot be induced to infect wheat, is significant enough in showing that the fungi are different species.