

## SMUT IN WHEAT.

BY T. STEPHENS, M.A., F.G.S.

The letter of Mr. Joseph Barwick, read at the last meeting of the Royal Society, is specially interesting as showing a spirit of intelligent enquiry, and a desire to work out the solution of one of the numerous problems connected with natural phenomena, which are to some extent a matter of uncertainty even to those who have devoted their lives to scientific research. Mr. Barwick's long experience as a practical farmer, and the results of his special experiments, have shown him that the origin and spread of the parasitic disease to which he refers is involved in much obscurity. He has, however, perhaps not sufficiently realised that a thorough knowledge of the general history of these low forms of vegetable life must be acquired before one can be sure of a satisfactory basis for experiments. The absence here of facilities of access to standard works and recent reports increases the difficulty of investigation, but the main facts of the propagation of the disease in question are sufficiently well-known for all practical purposes. Smut and bunt may be regarded as convertible terms. Though they are spoken of as distinct species by some authorities, I can say from personal knowledge that what is called smut in Tasmania bears the same name in some parts of England, while elsewhere it is known as bunt. It is a minute fungus belonging to the family *Coniomycetes*, sub-order *Ustilaginei*, and has been described at different times under various names, as *Uredo caries*, *Uredo fetida*, *Tilletia caries*, and *Ustilago segetum*; but it is pretty well-known now that the form in which the disease is always recognised is simply one of the conditions or stages in the life of a fungoid plant, which in other stages is known by a different name. In the case of animal parasites, such as the sheep fluke (*Fasciola hepatica*), the stage in which it appears to the ordinary observer is only the final development in the sheep of a cycle of changes, one of which, at least, cannot take place except in the body of an animal belonging to a totally different class. Again, the disease in sheep called "sturdy" or "staggers"—the common term in Tasmania is a "cranky" sheep—is derived from the ova of the tape worm (*Taenia*) in a dog which, voided on the grass, are taken up by the sheep with its natural food, and find their way through the circulation into the brain, and are there developed into a new form called *Cœnurus cerebratis*, which, lodged near the inner surface of the skull and pressing on the brain, produces the symptoms which are well-known to most sheep farmers. So the blight known as "corn mildew" (*Puccinia graminis*) has been definitely corrected

with a fungus (*Æcidium berberidis*) found on the wild barberry, and is said to have disappeared from some localities when this hedgerow tree had been extirpated. As regards smut, it is sufficient to know that the disease generally springs from seed infected by the minute spores of the fungus known by that name, which explains the use of sulphate of copper or some other fungus destroyer, as a preventive, and it is probable that the intermediate changes take place in different parts of the wheat plant, reaching their final development in the ear. It is well known that self-sown wheat, such as grows on headlands, is very rarely affected by the disease, and the probable explanation of this fact is that it is not so much exposed to infection as that which has passed through the steam-threshing machine. The myriads of spores beaten out from even one smutted ear form a cloud of impalpable slightly glutinous dust, which adheres to the grain with which it comes in contact, and this applies also to hand-threshed wheat, though in a much less degree. When the machines first came into use, English farmers still preferred to use the flail for wheat intended for seed, because in machine-dressed wheat some of the grain is often so much broken by the beaters as to be unfit to produce healthy plants. They do not omit in either case to use some preventive against smut, the experience of generations have proved that if properly applied, it very rarely fails to check its ravages. Of course wheat selected from sound ears and rubbed out by hand, as described by Mr. Barwick, would be in a condition analogous to that of self-sown wheat, having been free from exposure to the ordinary causes of infection. I doubt very much whether any trials of seed at the Botanical Gardens could be of much practical value in a matter of this kind; but further experiments by Mr. Barwick and other intelligent farmers might prove interesting. As the mode of dressing wheat against smut varies considerably, and some kinds of treatment may do as much harm as good, I will conclude these remarks with a brief description of the process adopted by the best farmers in the North of England, where it was always regarded as an almost infallible preventive. A solution is prepared by dissolving powdered sulphate of copper in water, at the rate of 2ozs. to a pint for each bushel of wheat. The grain is emptied on a floor, a little of it is shovelled to one side by one person, while another sprinkles the solution over it, and this process is continued until the whole quantity is gone over. The heap is then turned repeatedly, the men working with shovels opposite to each other. After lying for a few minutes the grain is ready for sowing either by hand or machine. The seed ought not to be steeped in the solution, but merely wetted. A too strong solution may kill the seed as well as the fungus, and damaged grains are probably often

destroyed by the ordinary process of pickling ; while too long soaking in even a weak solution may cause premature germination, resulting in a badly-rooted and unhealthy plant.

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#### DISCUSSION.

MR. R. M. JOHNSTON said he had studied this matter 17 or 18 years ago, and had found that the same form of fungoid growths prevailed in all these cases. At that time he took occasion to make enquiries among the western farmers as to the surroundings which usually proved most favourable to the development of the pest, and the prevailing opinion was that it was most prevalent in newly cleared lands, adjoining forest lands, and that the further removed the land was from the timber growth, the pest sensibly decreased. Perhaps, in view of all this, it might be wise on the part of farmers, when selecting seed wheat, to obtain it from districts which were free, or almost free, from the pest.

MR. MAULT directed attention to the fact that the Agricultural Department of the Privy Council, Great Britain and Ireland, issued reports by experts on all these subjects, and that copies thereof were furnished to the Tasmanian Parliamentary Library. These reports embraced works dealing with the latest information, respecting both agriculture and fruit culture, and he thought the fact was not generally known that copies existed in the colony.

MR. WARD called attention to the fact that sulphate of copper contained a percentage of sulphate of iron, which was a decidedly more powerful germicide than sulphate of copper. It also appeared that the iron sulphate formed a chemical compound with the cellulose portion of the coating of grain.