

suspected as existing may be seen. It looks certainly like a case of transition. And, however, that the author can as yet venture to assert is, that some puccinia have clearly the appearance of uredo before the *septum*, or division of the spores into chambers, is fully developed. In a splendid figure by Corda, these various forms are given with great effect as they burst the epidermis; and the drawing of that incomparable delineator of fungi confirms the opinion that the last observation is the one that is safe and accurate. Questions of this kind will be viewed at first sight as purely botanical, though they certainly tend ultimately to the combination of science and practice. For if certain parasitic fungi, hitherto supposed to belong to genera entirely distinct, can be shown to be specifically identical, there will be a reasonable expectation that any remedy or palliative discovered for the disease in one stage, will preclude the necessity of seeking a different corrective in another. Rust and mildew may then be checked by a common treatment. More observations are, however, still required on this curious subject. A remark from Professor Henslow is worthy of notice. He says that the rust seems to be more common and more dreaded on the continent than the mildew, whilst with us the mildew is considered a far greater pest than the rust. "Is it," he adds, "that our climate is better suited to the more complete development of the spores of these parasitic fungi, and that our continental neighbours are more rarely favoured with the opportunity of seeing them in their most perfect form?"

The rust is perhaps the least alarming in England of all the parasites attacking the wheat. Unquestionably it passes off in the way described more readily than any other; but when that beneficial influence of sunshine is not effectually exerted, a deterioration of the crop takes place. When it is found in later stages of growth, and on the glumes and paleæ of the chaff, it is more injurious than when it merely appears in the earlier periods of growth.

This is the proper place for a few remarks on certain other fungi, not so common as the red-rust, or red-robin, which are occasionally found on the leaves of the wheat plant. One of these is the *erysiphe graminis*, almost universal on it in 1846, but which did not seem to do much harm, and upon which therefore there is no need to enlarge. On the continent, there are two species of moulds which are extremely curious, and one of them is fearfully destructive. The former, called *chionyphe*, from its being developed during snow, was discovered in Iceland, by Thieneman. Two other species have since been seen in the neighbourhood of Dresden, where they were abundant. This singular mould is found on the snow, when it just melts before the sun, without any general thaw. It consists of spreading shining fleecy patches, and the reproductive portion of it is sometimes red and sometimes green. As soon as the snow melts, it appears on the young herb in a stratum resembling a cobweb of great delicacy, which is not of long duration. It is most likely due to the existence of some animal matter in the soil, and is extremely remarkable; though by reason of its vanishing so quickly, not attended with disastrous results.

Not so the other, called by Unger *Lanosa Nivalis*, with reference also to its coming in time of snow. Unlike the last, this fungus is developed beneath the snow, and is excessively injurious both to grass and corn. During the spring of 1846, a description of it was published in the "Gardener's Chronicle." It appears in white patches, a foot, or even more, in diameter, tinging the snow with a red hue, arising from the spores of the fungus, which are of this colour. When a spore is greatly magnified, the coloured contents are very perceptible. A completely withered plot is left behind, wherever this fungus has run its course. When snows have come on without previous frosts, it has been known to destroy whole crops, particularly of barley and rye. In places where it prevails, the farmers plough up the frozen surface, so complete is the mischief effected on the young plants. Happily for us, it has not yet reached Great Britain; but that it will not, no one can predict, for all fungal diseases are very alarming, and may appear when least expected, especially in a climate where the seasons vary as they do in ours.

The next parasitic fungus is the one which so materially affects the flower of the wheat-plant, and which has in many

An ear of Barley spoiled by the *uredo segetum*.



An ear of Wheat spoiled by the *uredo segetum*.

places prevailed most extensively this summer, 1846. It is much more minute than those previously described. The name given to it by botanists, is *uredo segetum*. Farmers call it by various appellatives, as "smut, dust-brand, bunt-ear, chimney-sweeper;" the last designation evidently arising from its looking exactly like a coating of soot adhering by some gummy substance to the young ear.

It reduces the ears both of wheat and barley to the condition figured in the drawings, and has the same effect upon oats. The black masses of sooty powder are the spores of the fungus which are here delineated, magnified 375 diameters.

Spores of *uredo segetum* in wheat, magnified 375 diameters. Spores of *uredo segetum* in barley, magnified 375 diameters.



The specimens from which these drawings are made, were gathered by the author in the summer of 1845. The ears were, in both cases, completely ruined. Some farmers say they like to see a little of it, because it is always accompanied by a good crop. Certainly, as professor Henslow well observes, the "little" can only be, with any propriety, on the principle of the less the better. Undoubtedly every ear attacked is destroyed, as is evident from the first instant it emerges from its hose, or sheath. The extreme smallness of the spores of this fungus may be inferred from the drawings, but still further from M. Bauer's investigations. He says the one hundred and sixty-thousandth part of a square inch contained forty-nine of them. Hence he calculates that not less than seven millions eight hundred and forty thousand would be required to cover a square inch English measure. It has, indeed, been a question with some persons, whether these appearances are due to a mass of diseased cells, and that they are not fungi at all. But the answer to this is, that diseased cells would not germinate, which these uredines unquestionably do. There is no apparent difference, generally speaking, between the spores of this uredo in wheat and barley; but there is certainly a degree of dissimilarity in those delineated in the figures before us. This is probably due not to the difference in the fungi themselves, but to the matrix where they grow; and there is great reason to believe that the produce of fungoid matter does vary in this manner, and even to a greater extent, with the peculiarities of the matrices by which they are nourished. If the spores of this uredo are so small, what must the sporules be as to dimensions? The highest imaginable power of a microscope could only be expected to exhibit them as a vapory cloud. The next question is, how the fungus acts upon the part of the plant which it principally affects.

When the plant is attacked by this fungus, the first injuries are found upon the interior portions of the flower, which render it completely abortive. In a short time afterwards, the pedicels, or little stalks, to which the florets are attached, swell and look hard and fleshy. At length the whole is consumed; and the ear, particularly in the case of wheat, becomes dismantled of all its reproductive organs, and the remainder is powdered over with the before-mentioned black, dusty smut, which has a most disagreeable appearance. In all specimens