



BLIGHTS OF THE WHEAT.

CHAPTER II.

Our inquiry into the habits of the parasitic fungi, found upon the wheat-plant, will commence with one of its most common pests attacking the straw. And here it may be mentioned, that the joints of the straw are not unfrequently affected by a small and almost unobserved fungus called *dipazea*, upon which it is unnecessary to dwell, for it is not considered as making its appearance on stems in a healthy condition. It is a very minute species of *sphæria*, and may frequently be noticed if the joints are carefully examined. But in the case of the fungus now to be described, the fields, especially of late varieties in certain localities, may be often perceived to be quite blackened by its encroachments, while the grain, as well as the straw, becomes exceedingly deteriorated. On gathering a stem, it will be found completely disfigured by numerous dark blotches of the *sori*, or patches, often running its entire length. The common name of this disease is mildew, and it has been designated by botanists *puccinia graminis*, a term supposed to be derived from a Greek word (*puka*), signifying closely or thickly, and to have reference to the crowded condition in which the little fungi are packed in the several patches in which they grow. When the disease first shows itself, the stem exhibits a number of dark-coloured spots beneath the epidermis, some of which have an orange-coloured tinge, others a deep brown. In a short time, the outer cuticle splits, and dark musty clusters of spores appear in the openings. On examining these with the microscope, they manifest distinct and curious forms. They are seen to be dense masses of pear-shaped fungi with a stalk, into which each one gradually tapers.

The threads of *mycelium*, or spawn, are not visible, but they interweave themselves amongst the tissue of the straw, and it is from them that the spores emerge, and break through the epidermis. A beautiful figure of it may be seen in Corda's celebrated drawings of fungi; but it requires great skill and a very powerful microscope to see it well.



Piece of straw with mildew, as viewed under the microscope magnified 125 diameters.

The usual magnified appearance of a piece of mildewed straw is represented in the drawing, viewed as an opaque object by a good achromatic glass. The pear-shaped bodies thus clustered together are the spores of the *puccinia*. If a small quantity be scraped off with the point of a knife, and further magnified, they will be still more distinctly seen. They are well represented in the figures we have given, the round spore being one of *uredo*, or rust, mixed with those of *puccinia*.

Each of the two compartments into which these spores are divided is filled with *sporules*. The spores themselves generally make their appearance immediately beneath the *stomata*, or pores, with which the stem abounds. These *stomata*, it is well known, are the organs by which plants exhale and inhale. Under the influence of light, and in dry weather, the *stomata* are in



Spores of *puccinia* apart from straw, and magnified 240 diameters.

active exhalation; but in wet and gloomy seasons these functions are reversed, and they inhale powerfully. It is then that, in all probability, the sporules are imbibed with the moisture, and find a suitable place for vegetating in the subjacent vegetable tissue, when favourable atmospheric circumstances, neatly designated by a foreign philosopher "*cosmica momenta*," call them forth.

As some of the readers of these remarks may never have seen these beautiful organs called *stomata* in the vegetable structure, whose functions are so indispensable to the life of the plant, it may be proper here to mention the simplest method of obtaining a knowledge of their character by actual observation. They are found in the leaves of all vegetables, and in the stems of the gramineous tribes, including every sort of British corn plant. They also occur in their leaves. They are small spaces which lie between the sides of the cells in the cellular tissue, and open into intercellular cavities in that part of the tissue lying beneath them. *Stomata*, the plural of *stoma*, a mouth, is an appropriate name. When seen with a good microscope, their appearance is most interesting. They form apertures for the purposes mentioned, and these apertures are closed or opened by little elastic vesicles, whereby their action is beautifully regulated. The naked eye can never detect them, but under a good microscope no object whatever is more completely defined. Those persons who have not seen them, cannot do better than to cut with a pair of scissors a small bit from the leaf of the plant called St. John's wort. Place this little fragment on a slip of glass, with the under side, in which the *stomata* abound, uppermost. Take a good half-inch achromatic object-glass, and put on the speculum. Throw the light on with the mirror attached to the microscope, and view the leaf with an appropriate eye-piece. To the astonishment of every one witnessing this sight for the first time, the whole surface will appear closely studded with the *stomata*. Some will be found open, others shut; but the whole will be seen with the utmost distinctness. Ever after, the use of the term will present no difficulty; and if other leaves and stems be submitted to a similar inspection, whatever is said relative to these minute organs will become intelligible. A practised microscopist will show them admirably by scraping off a slight morsel of the cuticle of a leaf, and putting it on a piece of glass with a slip of very thin glass over it. The power then used should be one-eighth of an inch. The location of the spores of mildew in wheat straw, as stated, naturally induces the observer to conclude that the sporules enter by the *stomata*. In other fungi, to be noticed hereafter, it is to be inferred that the process of entering the plant is different. We now speak only of *puccinia*.

In the year 1804, the complaints of the mischief done to the wheat were of so serious a nature, that Sir Joseph Banks caused some stalks of the plants affected by what was then merely called blight, to be carefully examined by the microscope. The person employed was the celebrated Mr. Bauer, who made drawings of the fungi with his usual skill. A large volume of these productions of the pencil of that eminent observer is preserved in the British Museum. Mr. Bauer delineated the *puccinia*, which had vegetated on the straw and prevailed to such an alarming degree, with extreme accuracy. He did not, however, detect the mycelium, as Corda has done since. In 1805, a pamphlet was published on the subject, asking for observations from intelligent agriculturists on the origin and progress of the disease. This publication embodied a principle which is now more regarded than it was in those times. It was commended to the