

destruction on a wheatfield. Now each of these spores is endowed with the power of producing a patch of rust on a wheatstalk if it be furnished with the warmth and moisture that it requires for germination; and as its desires in this direction are soon and easily met, the vast majority succeed in carrying out their object in life. Beginning to grow, they send out small fibrous roots or mycelium, which seeks in the tissues of the growing wheat stem nourishment for their growth. The mycelium spreads with great rapidity, and the tension arising from this soon causes the straw to split. Soon after this occurrence the work of rapid reproduction begins.

It will be remembered that in our previous article on black knot there were two kinds of spores that had two different functions to perform in the perpetuation of the fungi. One was the summer spores (*conidia*), the other the winter spores (*ascospores*); the work allotted the former being the rapid spreading of the pest during the early summer months and the function of the latter to tide it over the winter season.

Now in the wheat rust a close analogy in this respect exists, there being spores with the same office to perform. After the straw bursts a reddish substance may be noticed with the naked eye in little strips. Examined under the microscope with a power of 325 diameters, they are seen as in figure 2, marked B. The true function of these summer spores, or technically *uredo* spores, is the rapid reproduction of this parasite during the summer months. They are light, and produced in great numbers, and if given a proper temperature and moisture they spread the disease very quickly. Each one of these summer spores will, if it obtains a foothold, and germinate on a wheat-stalk, send out mycelium, and become a manufactory of spores of its own kind, and fit them for the carrying on of their work of destruction. This accounts for the rapid transmission of this disease from plant to plant, from field to field, and district to district. Later on towards fall, the winter spore, (*teleuto spores*) take the place of the summer spores, and are produced on the same mycelium. A, figure 2, represents these spores magnified 325 times.



FIG. 2.

A, winter spore; B, summer spores, both magnified 325 times.

Both these drawings have been made by the writer from natural spores, and have been correctly engraved in every detail.

These winter spores possess vitality enough to withstand the winter's cold and serve the purpose of carrying the disease over the winter. This they do, and though the rusted straw may be fed or used for bedding, and put in the manure, their vitality is but little impaired. In harvesting the wheat, these spores being ripe and only held on the wheat stem with very slender stalks, many fall to the ground. Here they lie dormant until early next spring; when warm weather sets in and the air is full of moisture these spores germinate, as seen in figure 3.

A long tube is sent out, and on these small spores (*sporidia*) are produced, which, when ripened, are wafted in all directions by the winds. If they come



After W. Smith. Magnified 500 times.

in contact with a barberry leaf, which at this time is just nicely out, it at once springs into life and pierce the tender tissue of the leaf and thrives. These sporidia have never been known to germinate on any plant other than the barberry and its near relative, the mahonia.

As to whether rusted straw is injurious if fed to cattle, Cooke & Berkley, of England, in their book on Fungi, give the following: "Then, again, it is 'fairly open to inquiry whether in years when 'red rust' and 'mildew' are more than usually plentiful on grasses, these may not be to a certain extent 'injurious. Without attempting to associate the cattle plague in any way with fungi on grass, it is nevertheless a most remarkable coincidence that the year in which the cattle disease was most prevalent in this country was one in which there was—at least in some districts—more 'red rust' on grasses than we ever remember to have seen before or since; the clothes of a person walking through the 'rusty field soon became orange-colored from the abundance of spores. Grazers on this point again seem to be generally agreed that they do not think 'red rust' has been proved injurious to cattle."

As it is the universal custom to feed rusted straw with as free a hand as clean straw, and as no data exists as to injurious effects resulting, it is safe to form the conclusion that it does little harm, if any, in this respect.

It is to be deplored that in this case no effectual, and at the same time practical remedy, has been found so far. The barberry is without doubt one of the culprits that favor the continuance of this parasite, and on this account the growing of it for ornamental or other purposes should not be encouraged. As in all other diseases of a like nature, healthiness of the plant which they attacked, is one of the strongest safeguards against injury. Over-richness of soil that tends to produce a loose, cellular growth, predisposes plants to these attacks. A deficiency in mineral food opens the way for these attacks, and on this account the proportion of organic to the mineral constituents in a soil is of great importance.

As a result of the extensive investigations of the Royal Agricultural Society of England, the following conclusions were drawn:

1. It would appear that seasons are the chief cause of rust, and that sudden changes of temperature and rain, accompanied with close, still weather, are favorable to the spread of the disease.
2. That low-lying, rich soils are most subject to attack.
3. That high farming and too generous manuring, particularly with nitrogenous manures, promote mildew.

4. That early sowing is desirable on all lands subject to attacks.

5. That while no description of wheat is proof against disease, red wheats are generally less injured than white wheats.

6. That wheat near barberry hedges is more affected than that at a distance.

The Home.

Pet Lore for Pet Lovers.

BY OLIVE THORNE MILLER.

Canaries and parrots are so universally kept that it would seem almost unnecessary to speak of their care, yet what abuses do we not observe every day as we pass along the streets? Birds living in the glare of the hot sun, and against a burning brick wall; birds placed on the sill with the window wide open and a strong draught over their shivering little bodies; birds left out in changes of weather, and till late at night, when they have been made tender by housing; birds swathed in muslin up to their roofs, so that they can scarcely see over, with other abuses too numerous to mention. Canaries, in truth, are hardy little fellows, and will endure much neglect and carelessness, but other birds will not. People are surprised to see them die so easily, while I must confess I am often surprised to see them live.

In regard to the general care of birds there is little difference in the needs of the various kinds, and that has already been spoken of; now, as to the desirability and the peculiar necessities of different birds. The canary, treated according to the directions given, should be happy and contented, and live to a good old age.

The robin is a pleasing pet, though not much of a singer in captivity. He thrives best if allowed the run of a room, but he is always cheerful if he has only a large cage with plenty of gravel, nicely prepared food, and half a dozen meal worms daily. If not caged he grows very tame; enjoys coming to the table and partaking of the food as well as the life about him, in fact, making himself one of the family. He is not slow in expressing his opinion of things that go on about him, and though you may not always understand just the point he makes, you can readily see that he has clear ideas of his own. He has also well-defined notions about the fitness of things. One that I know of, seeing sliced cucumbers in the dish that he considered suitable for his bath, deliberately lifted out each slice, threw it on the floor, and then proceeded to bathe in the water left in the dish.

The thrushes are all charming pets. Though shy about singing, they utter so many soft, liquid notes and calls, indulge in so much exquisite "whisper singing," that one forgives their reserving the song for the great out-of-doors. They require the same treatment as the robin, soft food, fruit, and meal worms; but, not being so self-assertive as he, they need looking after more carefully. They are never jolly, like their better known relative, but are so lovely and gentle that one becomes deeply attached to them.

Blue birds are pretty and winning, and will sing their delicious little warble all day long. They are not so easily frightened as thrushes, not so timid, but neither do they impress one as quite so intelligent. They must have the same care as the birds above mentioned, and like them, also, are very fond of the bath.

The Baltimore oriole is, as every one knows, brilliantly beautiful, and two or three together make a fine show; they are bright and lively in a cage, but they do not sing much, excepting for a short time in the spring. Their care is the same as the robins, only they have more need of fruit than he; all winter they must have fresh slices of apple, and they much enjoy grapes, currants, and small berries like huckleberries.

A satisfactory pet is the red-wing blackbird, who will flute his "O-ka-kee" all winter in the house. He is shy at first, but soon learns confidence, and becomes fearless and tame. Especially is he attractive when allowed the freedom of the house, making himself one of the household, and attending the family meals with perfect regularity.

One of the hardest birds to keep in a cage is our brilliant scarlet tanager. He is shy and hates to be looked at; he is dainty, and will not eat unless his