Experiments with Potatoes Potato Rot—Profits and Losses on Fertilizers.

(A Lecture delivered by W. A. Macdonald before the Middlesex Agricultural Council.)

No. IV.

The potato rot now remains to be considered. In the various tables I have given the percentage rotten, and I shall now enquire into the causes which produced so much variation in these percentages, as well as the causes of the rot itself. There are the soil, the season, the varieties, the fertilizers, and the methods of planting to be taken into consideration.

Before the true cause of the rot was ascertained by microscopic observations, there existed a good deal of superstition concerning it, and amongst many assignable causes, the following take the lead: The cutting of the tubers for seed; propagating by the tubers instead of by the seed; changeable climate; poisoning by insects; lightning; Divine visitation, etc.

Although it is well known that the rot is caused by a minute parasitic fungus botanically known under the name of *Peronospora infestans*, yet many of the above named causes cannot be ignored. My experiments have shown that, as a rule, the older the variety the more it succumbed to the rot, which may be taken to mean that a variety becomes debilitated with age, and therefore becomes more susceptible to diseases, largely owing, no doubt, to continuous propagation by the tubers, without rejuvenating and invigorating through the seed. Weakness of constitution is also caused by high feeding, especially with manures which lack in certain constituents of plant food, and high fostering is also a source of debility. A lack of proper attention is equally disastrous. Such conditions are favorable to the development of disease and fungoid growths, although they are not the initial cause. The external conditions which favor the growth of the rot fungus are excessive heat and moisture.

Microscopists who have examined into the life history of the fungus, tell us that the minute parisitic fungus first appears on the leaves and then on the stems, presenting darkish brown spots. If the weather now continues warm and moist, the plant ripens its spores or seeds, which fall on the ground, while the plant itself, composed of thread-like tubes called "mycelium," work their way through the stems of the potato into the tubers. These thread-like tubes are of a silvery color at first, but when they extend their ramifications into the tuber, feeding on its nutrient juices, they ripen and turn black, like the smut fungus, to which it is closely related.

Some authorities say that the spores are tender and soon perish, while others hold that they aid in producing the succeeding crop of rot. They are so minute that they can be wafted in all directions by the wind, and they easily sink into the ground by the rain, where they may germinate and multiply in the tubers. It is known, however, that the mycelium is a perennial plant and is hardy enough to stand the winter, so that the future crop of rot may depend wholly upon it for its existence.

If these investigations are accurate, the remedies are obvious. Diseased tubers and tops should both be destroyed by burning; partly diseased tubers should not be fed to stock, for the fungus is not destroyed by passing through the bowels of the animal; if fed at all, the potatoes should first be boiled. It would not be safe to compost the refuse. As moisture aids in the development of the fungus, the potatoes should be stored in a dry cellar; if the cellar is damp, an application of air-slaked lime will absorb the moisture from the potatoes, and the fungus may be destroyed by the ordinary smut remedy—say 4 oz. of sulphate of copper in a gallon of water. It is also recommended to assort the potatoes several times during the winter. It is not desirable to plant in the same field for two or three years after the rot has made its appearance, and adjoining fields, especially if lying in the direction of the prevailing winds, should not be planted with potatoes. Avoid planting in clay soils, where moisture is apt to be excessive.

These are the usual directions given for avoiding the potato rot, but I had an excellent opportunity of putting them to a practical test. Following the directions given by these microscope authorities, I harvested my potatoes early in order to check the disease before it found its way from the stems to the tubers; but some older and more experienced potato-growers than myself, who had passed through the Irish potato rot of 1847, advised me not to lift the crop so soon, declaring that the disease would not spread beyond its existing limits, and that there was no occasion for gathering up the diseased tubers and tops and destroying them. These contradictory authorities lead me to do some experimenting. I opened a small hole in the warm, moist ground with a hoe, placed a few sound potatoes in the bottom, and several diseased ones on the top. I then covered the tubers with soil, and left them in this condition for over a week, the weather being pretty warm. When I opened the hill, not a single sound tuber was affected in the least. I then innoculated some sound potatoes with the diseased matter of affected ones, placing some of the matter on the skin of the potato, some under the skin, and some I placed into the heart of the potato; and, although they were placed in a damp cellar, not one of these potatoes became affected. In the same damp cellar I placed over 40 bushels of potatoes in a heap, and having assorted them after four months, although about two bushels were found to be rotten, none of the tubers contiguous with the diseased ones were found to be affected. I applied no lime or other absorbent, and I did not use any poisons to destroy the germs of the fungus. For the purpose of carrying out further experiments during the coming season, I have spread diseased tubers and tops thickly over a portion of the ground in order to ascertain what effect they will have on the next crop; on this spot I shall plant 30 varieties of potatoes, and I know the percentage of each variety which rotted in the past season, the variation being from 5 to 90 percent rotten on the same soil and in the same field, with one variety that did not suffer from the rot.

It is popularly supposed that the rot is the cause of the blight, or the blight the cause of the rot. The Bronze King variety, which did not rot, was one of the worst to suffer from the blight, the leaves and stems having turned from green to dark brown inside of 24 hours. This proves (1) that the rot did not cause the blight, and (2) that the blight did not cause the rot. All the rows that were manured with nitrogenous fertilizers remained green up to the time of digging—I should rather have said that the stems remained green, for many of the leaves were blighted—and the percentage of rotten tubers was equal to that on the other rows. The rows on which the superphosphate, the sulphate of potash, the ashes, and the unanalyzed brands were used, blighted suddenly and badly, both the leaves and the stems. These experiments are plain, practical facts, and they should induce all the authorities, practical and scientific, to unite and confess that they know nothing concerning potato rot and blight worth talking about. Has the Bronze King proved that a variety of potatoes can be produced whose tubers are proof against that fiendish destroyer, the *Peronospora infestans*, while the leaves and stems are extremely susceptible to his attacks?

Objections to the General Purpose Circular Barn.

Our prize essayist being, on the whole, favorable to the circular barn, we intended to award a second prize to the essayist who could show the greatest number of defects in the plan, but as the objectors dealt too much in minor details and too little in the principles of construction, we shall merely note the leading objections, and make a few comments thereon. The essayists took issue on the following points: A round barn is more expensive than a square. There is a great waste on account of the wedge-shaped stalls, and wide passages. A wheelbarrow is preferable to a hand car, as the manure can be dumped out of it, and both manure and food cannot be carried in the same car. It is inconvenient to haul the manure directly to the field as fast as made, for it interferes with the regular work of the team, and the lanes are often obstructed by snow, but it may be put under cover and hauled out at two or three intervals during the winter. The pigs should not be in the same building on account of the stench. A circular barn would not give as good shelter in the barnyard as a square one. The ventilator going up through the centre would interfere with the horse hay-fork. Circular eave-troughs are more expensive than straight ones. The place is too warm for sheep. The water from the roof would be insufficient.

With regard to the expense, the main question is, Can a certain quantity of stock be accommodated more easily and cheaply in a circular barn than one of any other shape? It is true that barns which any framer can build can be put up more cheaply than those of uncommon construction, but there is a corresponding saving in the quantity of material used. Unless the barn is very small, the wedge-shape of the stalls would be very insignificant, and there is no greater necessity for wide passages than in buildings of any other shape, except the two through passages for the purpose of admitting a wagon and at the same time plenty of air and light. When a hand-car is used, it should have two boxes, one for carrying food and the other for carrying manure, although specially made wheelbarrows would serve both purposes very well. The plan is specially adapted for treating the manure i