RED RASPBERRIES.

1. Highland Hardy—Early, hardy, productive.
2. Cuthbert—Medium, half hardy, productive, large, a great favorite where sufficiently hardy.
3. Marlboro'—Medium, large and fine, half hardy.
4. Turner—Early, hardy, productive.

BLACK RASPBERRIES.

1. Souhegan or Tyler—Early, hardy, small but profitable.
2. Gregg—Late, rather tender, large and productive
3. Ohio—Medium, hardy, productive, inclined to be small.
4. Mammoth Cluster—Medium, hardy, productive.

BLACKBERRIES.

1. Lawton — Large, fine, productive, but tender.
2. Kittatinny—Large, productive, half hardy.
3. Snyder—Productive, hardy, but inclined to be small.
4. Western Triumph—Hardy, productive.

It is a difficult matter to estimate the profits of raspberry and blackberry culture, prices vary so much in different localities and other conditions are so unequal, but the following estimate may give some idea of what a grower should receive from a plantation in full bearing. With reasonably good culture, from 2,000 to 3,000 quarts can be raised to the acre. Raspberries should at least fetch from 8c. to 10c. per quart, and blackberries from 9c. to 11c.; then, allowing 2c. per quart for picking and marketing, and 2c. for cultivation, etc., there would remain a net profit of from 4c. to 6c. per quart on raspberries, and from 5c. to 7c. on blackberries. Now, taking 2,500 quarts as raised to the acre, then the net profit to the grower per acre would be, on raspberries from $100 to $150, and on blackberries from $125 to $175. These amounts, undoubtedly, have been far exceeded in some instances where conditions were favorable and prices good—as much as $600 and even $700 having been realized from a single acre. The latter figures, however, are merely possibilities not probabilities, but the former ought to be within the reach of the ordinary grower who is suitably located.

Vegetable Pathology.

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(Continued from February issue.)

THE BLACK-KNOT OF THE PLUM.

Plowrightia morbosa Sacc.

This wide-spread and fatal disease, so common on cultivated plums and cherries and on some species of wild cherries, is peculiar to America, being, as yet, unknown in Europe. Its characteristic elongated, black, knot-like excrescences are two well known in Massachusetts to require detailed description, since its attacks have pratically put an end to the culture of plums in many parts of the state.

The disease is caused by a fungus, *Sphaeria* or *Plowrightia morbosa*, which attacks the branches of the trees and whose mycelium lives in the swollen tissues of the knots. One of these may often extend nearly or quite around the branch, girdling it and causing the death of all above the knot. When this is not the case, the tree is greatly weakened and soon ceases to produce fruit, while the knots increase rapidly and finally kill it.

Besides reproducing itself by spores, the fungus spreads within the branch by the growth of its mycelium and the consequent gradual extension of the knot. Thus it is common to find, in the spring, a new knot immediately adjoining the remains of that of the preceding year.

The fungus produces two chief forms of spores. In spring and early summer the surface of the young knot becomes covered by a "bloom," composed of short threads which bear what we may call the *summer spores*. These germinate promptly and can probably produce fresh infections at once, though our suppositions on this point are based rather on analogy than on direct evidence. Later in the season the black surface of the knot shows to the naked eye, on close examination, a division into many minute facets or regions, separated by slight furrows. Microscopic study shows that each of these facets corresponds to a cavity which finally communicates with the exterior by a pore at the middle of its facet. In these cavities are developed the *winter spores*, which become ripe and are set free in late winter and early spring, and, presumably, produce the beginnings of new knots at that time.

Nearly all our knowledge of this fungus is due to the admirable account of it in Part V. of the Bulletin of the Bussey Institution, by Prof. W. G. Farlow, of Harvard University; but further study is needed of the manner in which the infection of the branches of the host by the spores of the fungus is accomplished, and of the early history of the development of the knots. When a tree has become badly infested with the knots not much can be done except to prevent its continuance as a spreader of contagion, by cutting it down and *burning* it. Simple cutting down is not sufficient, for Dr. Farlow has shown that knots on a tree, cut down in summer and allowed to lie through the winter, developed their winter spores as if the tree had been standing.

The treatment which has been recommended is that the knots be cut off and burned, as fast as they appear. This often leads, however, to very serious disfigurement of the tree, and a less heroic remedy is much to be desired. A treatment similar to that recommended in Bulletin No. 4, of this Station, namely, the painting of the knots with a mixture of red oxide of iron in linseed oil, has given very good results in case of young trees on the private grounds of Dr. C. A. Goessmann, Director of the State Experiment Station. This preparation seems to stop the development of the fungus so that the knots crumble and fall away, with the least possible injury to the branch. Even were its effects not so complete, such an application would be useful in preventing the dissemination of the spores of the knot-fungus. In connection with this painting of the knots, special fertilizers have been applied to the soil about the trees, with the object of lessening their susceptibility to the attacks of the fungus.

A very serious difficulty in dealing with a disease of this sort is presented by the fact that one man who is intelligently and persistently fighting it by destroying all his old trees and carefully treating the young ones, may be surrounded by and constantly exposed to old trees belonging to neighbors, who have too little energy or public spirit, or too little faith in "new-fangled notions" to co-operate in any systematic attempt to conquer the trouble. General co-operation over a considerable area is an important prerequisite to success, especially in dealing with diseases of long-lived plants, like trees. But unfortunately, there is found in almost every community, the slip-shod man who reasons that, because his trees have suffered so long from black-knot, they always must, and whose simple laziness and conservatism lessen the result of the intelligent efforts of his progressive neighbors.

But attention must be paid, in fighting the black-knot, to other than cultivated trees, merely. Since, as stated above, the disease attacks some of our common species of wild cherry, care should be taken to destroy all such trees within a considerable distance of the cultivated trees, for they may serve, as well as any others, to spread the infection. Since one species of wild cherry, the black rum-cherry, is said not to be attacked by the black-knot, it would be safe to destroy those wild trees seen to be affected and keep all others in the neighborhood under careful observation.

[TO BE CONTINUED.]

Parasitic Plants—The Farmer's Microscopic Foes.

J. HOYES PANTON, M. A., F. G. S.

(Continued from February issue.)

In our first paper we endeavored to show the position of the Fungi among plants, and then proceeded to give some of the chief characters which mark the group. We shall now proceed to discuss some of the most common forms, and in considering them attempt to glean something interesting, instructive, and practical. Let us begin at the very threshold of life and examine some minute forms, at the present time grouped with the Fungi, and about which we hear a great deal; for around their life history there gathers much of an interesting character. We refer to the tiny forms of life known by such terms as *germs*, *bactera* and *microbes*. These names are becoming household words, because it is now generally believed the forms of life so-called are closely associated with the origin and development of many diseases.

If a burning fever consumes us, if la grippe seizes us, or small-pox, cholera, diphtheria and a host of other ailments claim us as victims, we are now told some *microbe* has begun to prey upon us, and that our restoration to health will largely depend upon the condition of our system to resist and overcome this microscopic form of life, so rapidly permeating our whole body, developing at the rate of millions in twenty-four hours.

No time is lost among them in perpetuating the species, for they reproduce by a sort of division—one becomes two, two become four, the four eight, and so on. Sometimes the method is varied by a sort of budding process, the buds becoming adult forms. Whatever mode is followed the number increases rapidly. The three terms referred to above, require some explanation to the general reader. *Germ* is a very loose expression and may be used in various senses, but when applied to these minute organisms we usually speak of disease germs. *Bacteria*, too, is somewhat confusing, and was at first chiefly used in connection with the forms associated with certain diseases. *Microbe* is probably the best term of all. It means minute life, and thus covers all these tiny living objects found on the threshold of life, whether they be connected with disease or not. We are thus quite safe in using the word *microbe* when we are aware of the specific form.

It is only a few years since the first ray of scientific light flashed out from this invisible world of microbes, and since that few fields of research have been more thoroughly searched and few yielded more prolific results. The microscope has been simplified, and microscopy become one of the chief departments in the study of life. The outcome so far indicates that particular *microbes* are associated with nearly