

Diseases of Potatoes

By H. L. Rees, Plant Pathologist of the State College of Washington.

RHIZOCTONIA or little potato disease, also known as rosette, is with the exception of the late blight the most serious disease of potatoes in Western Washington. It is widely distributed in the United States, Europe and Asia and is of wide interest. It has been known in Europe since 1851 and was first described in America in 1891. It seems to be general on the Pacific Coast and is certainly prevalent in Western Washington, causing losses last year as high as 50 per cent in some fields.

Symptoms—There are several characteristic symptoms of this disease, some of which however may be the result of some other cause. When the plant is attacked the stem is affected at the ground, showing as black discolorations and may girdle the stem for a half to an inch above the ground. A gray, moldy growth appears on this area. A discoloration exactly like this results from an attack of the black leg disease but is not accompanied by the gray, moldy growth. If the attack of the Rhizoctonia disease is serious the stem is rotted and the top wilts and dies early in the season exactly as is the case with the black leg and Fusarium disease. However, with the latter the disease is not evident on the stem, the leaves roll and the plant may or may not be killed at this time.

When Attack Comes Later.

If the attack of Rhizoctonia is not severe enough to kill the plants, or the attack comes on later in the season as is usually the case in Western Washington, only the outer part of the stem will be killed. In this case the discoloration and the gray moldy growth appear but the plant remains alive. The tops usually develop peculiar twisted leaves with the leaves crowded together in a compact rosette-like appearance, not found associated with any other potato disease. Aerial tubers—small potatoes on the vines—are formed and the potatoes in the hill are small and very numerous. This is caused by the girdling of the outer part of the stem at the ground.

The raw food material from the roots ascends on the inside of the stem to the leaves where it is manufactured into starch. But because the starch can only descend on the outside of the stem to reach the roots and tubers, and since this part is dead at the ground and prevents the descent of the starch, the starch collects on the vines and forms little potatoes. Since little food reaches the tubers in the soil those developed there are small and numerous.

Attacks of Black Leg.

Attacks of black leg result in much the same way except that it kills the plant early and only a few tubers develop either on the vines or in the ground, and those in the ground are usually rotted at the stem end. If the plant is alive late in the season and the tubers are numerous and not rotted at the stem end the Rhizoctonia disease has in all probability caused the trouble.

This disease causes the formation of a network of fine, hair-like, brown threads on the surface of the tuber, which may or may not be large enough in diameter to be visible to the naked eye. These can only be observed, however, as the tubers are maturing and not after digging. At digging time the disease shows as brown, superficial, elevated irregularly shaped masses, varying in size from a small dot to a spot as large as a quarter of an inch wide and half an inch long. These may be mistaken at first for soil particles but upon rubbing they will be found to adhere. If washed these masses are found to be dark brown and adhering with a tenacity which necessitates hard scrubbing or picking to get them off. Either of these last two symptoms are peculiar to this disease alone and their presence is a positive means of identification. This disease as far as is known does not further affect the potato except that there are indications that it may spread in storage, and most important its presence enables rot-inducing organisms to enter and rot the tubers.

Parasitic Fungus.

Cause—This disease is caused by a parasitic fungus which lives, and may remain alive, in the soil for years. Previously it has been thought that the

only manner by which it became present was by being introduced on diseased seed, but investigations of Dr. Wollenweber of the U. S. Department of Agri-



DEY ROT—Showing Appearance of Healthy and Diseased Tops.

culture, in Western Washington indicate that it is possibly present even in the virgin soil. When seed is planted in infected soil, this fungus infects them regardless of whether the seed have been treated, or not. The potato stems are attacked and fungus spores are produced

the ripening is premature and consequently results in a reduction of the yield. If the diseased plants are pulled up, the roots are found to be partly dead brittle and frequently bearing a white or pink mold. If the underground portion of the stem is cut across, a pro-



DEY ROT—Storage Rot Caused by This Fungus.

in the gray, moldy growth before noted. Later the fungus attacks the surface of the tuber and forms the irregularly shaped masses described and known as sclerotia. These are very resistant to unfavorable conditions and infect the soil if diseased tubers are planted.

Control and Prevention—There are three points connected with this disease which make the problem of control not an easy one for solution, i. e., (1) the possibility of the fungus being present in the virgin soil, (2) the possibility that the fungus may remain alive in the soil for several years even when other crops, if possible avoiding root crops and the present methods of seed disinfection used will not kill the fungus as it exists in the sclerotia. But the following recommendations if carefully followed out, have been found to be valuable in eliminating and preventing this disease.

Rotation of Crops

If the soil is badly infected rotate for three years at least, with some other crops, if possible avoiding root crops and using cereals or grass. In any case always rotate crops, select the lighter types of soil for potatoes, avoiding heavy, poorly drained soils, and maintain a good physical condition of the soil by deep preparation and culture. Keep down the weeds. Do not plant affected seed whether treated or not. Burn the diseased refuse potato crop material. Clean culture methods are very important and highly valuable in the control of this disease.

Potato Wilt or Dry Rot.

Potato wilt or dry rot, otherwise known as the Fusarium disease, is not equal in importance with the Rhizoctonia disease in Western Washington, although the fact that it is present necessitates a warning. This disease seems to be rather generally distributed over the United States and appeared in Western Washington last year in widely separated regions. In the whole country the loss amounts to millions of dollars annually, but the loss in Western Washington is as yet unknown since many growers are not aware of the presence of the disease.

Symptoms—If the infection is severe the disease first becomes noticeable when the plants are about a foot high, or if not, a little later. The leaves assume a lighter green color than those

of healthy plants, lose the bright glistening appearance, become dull and roll up, the roots are found to be partly dead, are attacked early. Progress of the disease finally turns the leaves yellow or brown, and the top falls over. Probably this action on the part of the affected plant has been the cause of not recognizing the presence of this disease as it is similar to that of ripening. But

Occasionally the stem end may be rotted similar to the rot caused by black leg, but when placed in storage and left the disease usually becomes apparent. Beginning at the stem end the tuber shrivels, the inside becoming brown and rotted. The rot is not particularly soft nor does it possess a materially objectionable odor. But the presence of this fungus makes the entrance of rot-inducing bacteria easy and if these enter they will cause a wet rot accompanied by a very disagreeable odor. Affected tubers may be detected by slicing them, beginning at the stem end. If there is a brown discoloration underneath the skin and more or less parallel to the surface this disease is probably present. This discoloration may be in shape of a continuous ring or it may be discontinuous (See illustration). The distance to which the discoloration extends from the stem end depends entirely on the length of time since infection occurred and the environmental conditions.

Cause—This disease is caused by a parasitic fungus which lives in the soil, how long is unknown. The fungus enters the plants through the small roots and works upward in the vessels which conduct the sap. These vessels become filled and plugged with the fungus itself and the flow of sap is prevented. This results in the wilting and premature death of the plants.

Rotate With Other Crops

Control and Prevention—After the soil becomes infected rotate with other crops for four or five years. Do not use manure, on which diseased tubers or vines have been thrown, for the potato land. This disease apparently does not exist in the virgin soil and can only be introduced by planting diseased seed. Keep the disease out of the fields by planting only clean seed. This may be insured by using potatoes for seed which do not show a discoloration at the stem end when cut. Treat as for scab so that all spores on the surface may be destroyed. Probably the best method of control is to plant only white varieties of potatoes since in Western Washington the red varieties seem to be particularly susceptible while the white varieties are either not susceptible or only slightly so.

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