BLACK ROOT ROT

Left—Resistant
Right—Susceptible
Black root rot is one of the oldest tobacco diseases known and is found in all major tobacco-growing regions of the world. Previous to the development of resistant varieties the disease caused severe losses to tobacco in Virginia. Even with the use of resistant varieties, stunting of the plants may occur. The loss caused by black root rot varies considerably from season to season. In 1956 and 1957, only a few fields were observed that had stunted plants caused by black root rot, and the areas affected were small. In 1958, however, severe damage was observed in several counties. In 1959, there were only a few scattered reports of stunted tobacco; but again, in 1960 there was a great increase in root rot. Black root rot can be a major disease problem, even with the use of the moderately resistant varieties, unless growers practice additional control methods. Crop rotation, proper application of manure and the proper handling of winter cover crops are some additional control methods.

Caused By A Fungus

Black root rot is caused by a fungus. It is believed that this fungus is present in most fields where tobacco is grown in Virginia and can live in the soil for an indefinite period of time even in the absence of tobacco. Tobacco is not the only crop susceptible to black root rot. Reports indicate that this fungus will attack over 100 different species of plants, including most legumes, such as garden peas, soybeans, field peas, clovers, and alfalfa. Cereal crops are regarded as resistant.

In the plant bed, black root rot is not easy to recognize; however, the occurrence of stunted, dull green plants may indicate its presence. An examination of the root system will help in recognizing the disease.

*Much help has been secured from Dr. R. G. Henderson of the Virginia Agricultural Experiment Station in the preparation of this circular.
Normally the young roots of tobacco plants are white in color; but, on black root rot diseased plants, roots are brown to black either in part or throughout the total area of the root system. The smaller roots are usually rotted throughout but on the large roots the diseased areas may occur as brown to black irregular shaped spots or streaks.

Symptoms

In the field, stunted plants are the most characteristic symptom of this disease. This stunting occurs during the early part of the growing season. The extent of stunting varies considerably from field to field and in different areas of the same field. Diseased plants, in affected areas, are uneven in development; some may be only knee high at the time of flowering, whereas others are almost normal in height. On hot, dry days the leaves of diseased plants wilt more quickly than those of healthy plants.

The above-ground symptoms of black root rot infected plants may be confused with those of certain other diseases. An examination of the root system is necessary to determine the particular disease present. In many cases, it is necessary to make a microscopic examination for definite diagnosis.

Temperature Affects Severity

Temperature is an important environmental factor affecting the severity of black root rot in tobacco. The disease causes most damage during growing seasons characterized by late springs. Observations indicate that if the average temperature during May is 4-6° below normal, black root rot may cause serious damage. On the other hand, if the average May temperature is 4-6° above normal, very little stunting will be observed in resistant varieties. Research workers have reported that black root rot injures tobacco if soil temperatures are below 70° F. When the soil temperature is above 78° F., the disease seldom causes damage.

Soil Reaction

Another important factor that influences black root rot severity is soil reaction. Since soil reaction is a great factor in root rot development, the soil pH should be determined and properly adjusted before plant-
ing tobacco. Lime, if needed, should usually be applied after the tobacco crop in the rotation. A soil pH of 5.4 to 5.6 is unfavorable for black root rot and will still produce good growth of tobacco. The addition of lime raises the soil pH and favors the development of black root rot.

**Toxins In The Soil**

A third factor in the development of black root rot is the presence in the soil of toxins from partially decomposed organic matter, such as manure. It has been shown that in the presence of these toxins the highly resistant varieties may lose their resistance. The toxins alone may cause some injury to the roots of tobacco plants even in the absence of the black root rot fungus. In controlling black root rot the time of application of manure to the land must be considered.

**CONTROL**

Best control of this disease can be obtained by planning a complete program which involves the use of resistant varieties (see cover page), proper plant bed management, crop rotation, proper use of winter cover crops and manure, control of insects and the proper application of fertilizer. No single practice will give adequate control of black root rot during seasons that favor the disease.

**From the Plant Bed**

The first step in control of black root rot is to start the crop with disease-free transplants. Black root rot can be controlled in the plant bed by selecting a site that is well drained and free of the black root rot fungus or has been treated with methyl bromide gas at the rate of 1 lb. per 100 sq. ft. Calcium cyanamide soil treatment does not control this disease.

**Resistant Varieties**

Most varieties now used carry some resistance to black root rot. During most seasons, this resistance appears adequate; however, under some conditions, especially where no rotation is used and during seasons when the soil temperature is below normal, the level of resistance is not adequate to take care of the problem in some fields.
Crop Rotation

The use of a crop rotation is a very important part of the black root rot control program. Care must be taken in selecting the kind of crops to use in the rotation with tobacco to give a reduction to the black root rot disease. Crops that will reduce black root rot include all of the grasses, small grains, and corn. These include fescue, oats, wheat, barley, orchard grass, bluegrass and milo. Best results are obtained with a long rotation (three or four years) between crops of tobacco, but a two-year rotation may be helpful.

A high soil pH favors the development of the disease. The most resistant varieties available may suffer heavy losses on alkaline soils. The development of root rot becomes more severe as the soil pH increases above pH 5.8 and decreases as the soil becomes more acid.

Soil Management

Manure should be applied and turned under several months in advance of the anticipated date of setting tobacco. The cover crop or heavy residue from the previous crop should be plowed down early. It is often advisable to apply a portion of the tobacco fertilizer to the land at the time crop residue is turned under. The fertilizer may be needed to hasten decomposition of the organic matter to free the soil of toxins prior to setting the tobacco.
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