BIPOLARIS SOROKINIANA ON SNAP BEANS IN NEW BRUNSWICK[1]

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Abstract

A leaf and pod spot caused by Bipolaris sorokiniana (Sacc. in Sorok.) Shoemaker was found in 400 acres of snap beans near East Florenceville, New Brunswick, during 1963. An isolate of the pathogen caused crown rot symptoms on certain varieties of barley and oats, crops which are grown frequently in rotation with potatoes and beans. The source of inoculum for the outbreak was probably adjacent cereals or cereal stubble. The disease is not considered important at the present time because pod symptoms disappear during the blanching process.

Introduction

In September, 1963, snap bean plantations encompassing some 400 acres in Carleton County, New Brunswick, showed extensive spotting of the pods. The lesions (Fig. 1) were lenticular, crateriform, brown to black in color, and varied in size from 1-5 mm. They apparently began as black pinpoints surrounded by a watersoaked halo. Inspectors mistook them for symptoms of bacterial blight or anthracnose, although ooze and spores were not present. Leaf lesions were evident in July as inconspicuous reddish brown pinpoints which enlarged in August and September to gray, circular spots with black margins. Sometimes the centres dropped out to produce a shothole effect. Stem lesions were similar to those in pods.

The fungus isolated from the pod lesions matched stock cultures of Bipolaris sorokiniana (Sacc. in Sorok.) Shoemaker (=Helminthosporium sativum Pamm., King & Bakke), the conidial state of Cochliobolus sativus (Ito & Kurib. in Kurib.) Drechs. in Dastur.

Although processors feared that the disease would cause considerable economic loss, it proved to be of little importance. Pod symptoms disappeared during the blanching process which precedes freezing of the product. A brief investigation of the disease was undertaken in anticipation of possible future complications.

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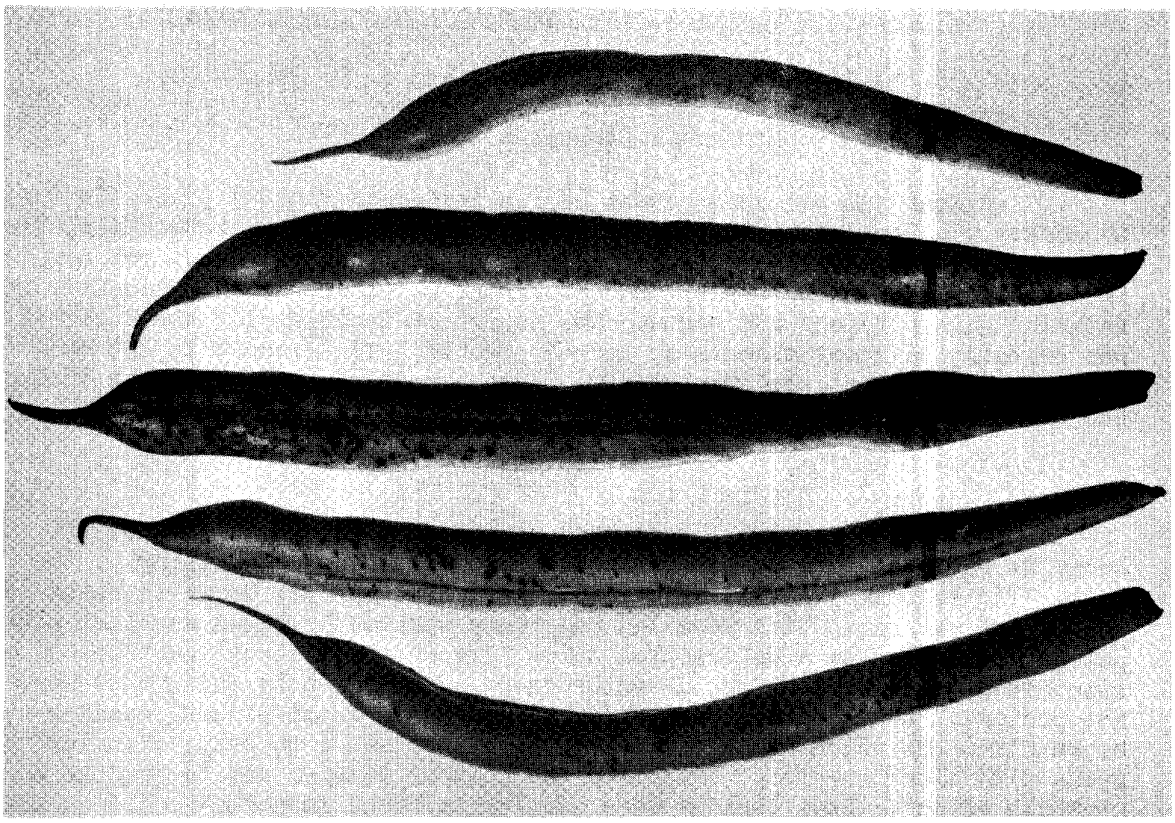

Figure 1. Symptoms of pod spotting due to *Bipolaris sorokiniana* on Tendergreen snap beans.

Methods

The fungus was propagated on 2% PDA and on corn meal sand. The latter was prepared by adding water to the medium, composed of 10% corn mean and 90% washed white sand, until the mixture was crumbly but not wet. It was then dispensed into 250 ml wide-mouth Erlenmeyer flasks at the rate of 200 cc per flask. The medium was then sterilized in an autoclave for 1 hour at 15 lbs pressure. The fungus was incubated for two weeks in the flasks and then added to sterilized greenhouse compost soil at the rate of 25 cc per pound of soil.

In an attempt to reproduce symptoms of the disease, three bean varieties, Tendercrop, Kinghorn, and Bush Blue Lake were inoculated with a spore suspension of the isolated fungus and put in a moist chamber for 24 hours at 60-65°F. A few representative varieties of oats, barley, wheat and rye were also inoculated. 100 seeds of each test variety were planted in separate pots of infested soil, with similar plantings of 100 seeds in noninfested sterilized soil to serve as controls. One month after planting the seedlings were dug and examined for crown rot.

Results

Symptoms on the green-podded snap bean varieties Tendercrop and Bush Blue Lake were similar to those on field-collected samples of the variety Tendercrop. No symptoms could be detected on the yellow-podded variety Kinghorn, and it is presumed to be resistant.

The barley varieties Charlottetown 80 and Parkland, and the oat varieties Abegweit, Fundy, and Russell all showed symptoms of crown rot, while Sangaste rye and Selkirk wheat were free of disease (Table 1). Victoria oats was not attacked. On the basis of these pathogenicity tests the identification of the pathogen as Bipolaris sorokiniana is confirmed.

Table 1. Pathogenicity of Bipolaris sorokiniana on certain bean and cereal varieties.

Crop	Variety	Infection
Beans	Tendercrop	+
	Bush Blue Lake	+
	Kinghorn	-
Barley	Charlottetown 80	+
	Herta	-
	Parkland	+
Oats	Abegweit	+
	Ajax	-
	Fundy	+
	Garry	-
	Russell	+
	Victoria	-
Rye	Sangaste	-
Wheat	Selkirk	-

Discussion

The New Brunswick disease is considered quite distinct from a leaf and pod spot of snap beans described by Winstead and Hebert (8) in Pender County, North Carolina. The pathogen in that case was Bipolaris victoriae (Meehan and Murphy) Shoemaker (= Helminthosporium victoriae Meehan and Murphy), and the source of inoculum was traced to an adjacent field of Victorgrain oats heavily infested with Victoria blight. Furthermore, leaf lesions of the North Carolina disease were small, narrow, black streaks on veins.

Spurr and Kiesling (7) were able to produce symptoms similar to the local disease on beans with Bipolaris sorokiniana. Their investigation was prompted by finding the pathogen on wheat which had followed beans in rotation. They were also able to produce lesions and sporulation on cowpeas, cucumbers, pumpkins, peas, sunflowers, and tomatoes.

Renfro (6), working in Minnesota, found that isolates of Bipolaris sorokiniana from stems of alfalfa and yellow sweet clover were pathogenic to oats, wheat, and barley, and he suggested that the fungus was part of the black stem disease complex of forage legumes in the north-central area of the U.S.A.

The local disease closely resembled, in some respects, a leaf spot of snap beans (haricots) described by J. A. Meyer (2) from Westmeerbek, Belgium. Spots on the leaves were reddish brown, with the centres becoming light gray with gray-brown borders as they enlarged. Eventually the centres fell out and left the leaf perforated. The fungus sporulating on the gray central portion was determined as Drechslera siccans (Drechs.) Shoemakes, and the author linked its occurrence on beans with the presence of ryegrass, (Lolium sp.), another susceptible host, in an adjacent pasture.

Olive, Bain, and Lefebvre (3) found a leaf spot of cowpeas and soybeans at locations in Louisiana, North Carolina, and South Carolina. They attributed the disease to a new species, Helminthosporium vignae Olive, Bain, and Lefebvre. However, Jones (1) considered that this fungus was really Corynespora cassiicola (Burk. et Curt.) Wei, a cotton pathogen that had been present in the Mississippi Delta and probably in other cotton-growing areas of the southern U.S.A. for 25 years previous to 1961. He demonstrated that his isolates could attack both cowpea and soybean and presumed the source of inoculum to be cotton.

Evidence from the literature indicates that legumes, particularly beans, are secondary or "catch-all" hosts for various species of Bipolaris, Drechslera, and Corynespora which propagate on cereals and occasionally on dicotyledonous plants. In the bean-growing area of New Brunswick, the rotation commonly practised is grass-oats-potatoes-beans. Fields of oat and barley varieties susceptible to Bipolaris sorokiniana were found interspersed throughout the area, often close to bean fields. Orlob and Bradley (5) in their 1960 survey observed Bipolaris sorokiniana on 6-rowed barley but gave no locality. Although cursory observations in September, 1963 did not indicate that Bipolaris leaf spot was prevalent on cereals, inoculum could have been generated from crop debris or stubble left from previous crops.

Orlob and Bradley (5) also found Drechslera avenacea (Curtis ex Cooke) Shoemaker on oats and D. teres (Sacc.) Shoemaker, on barley. Orlob (4) also noted D. tritici-repentis (Died.) Shoemaker on quackgrass, D. bromi (Died.) Shoemaker, on smooth bromegrass, D. dictyoides (Drechs.) Shoemaker, on fescue, and D. poae (Baudys) Shoemaker (=D. vagans (Drechs.) Shoemaker), on bluegrass. All of these grasses can be found along roadsides and in headlands and pastures in the bean-growing area and the species of Drechslera found on them could be implicated in the outbreak of leaf spot on beans. Checks on their pathogenicity might be worthwhile.

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