DISTRIBUTION AND OCCURRENCE OF SCLEROTIUM ORYZAE ON RICE IN CALIFORNIA

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INTRODUCTION

Stem rot was reported from Italy in 1876 by A. Cattaneo (2) as a new disease of rice caused by Sclerotium oryzae Catt. Subsequently it has been reported in Ceylon (5), India, Burma, Madras (1, 6), Philippines (7), Japan (4), North Carolina (3), Arkansas (10), and Louisiana (8). Tullis, et al. (9) observed S. oryzae on only one rice plant in 1932 at the Biggs Rice Research Station, Butte County, California; but by 1933 it had been found in several commercial fields in California. Tullis postulated that S. oryzae had been introduced into California in 1931 from Arkansas on 'Early Prolific' rice seed. No subsequent reports of S. oryzae or stem rot in California have appeared.

S. oryzae now occurs throughout the northern California rice-growing region, and to a lesser extent in other areas where rice is grown in the State. In recent years stem rot has caused significant losses to the rice crop and is now a concern of growers. The purpose of this report is to record the prevalence and distribution of S. oryzae in California insofar as is presently known.

MATERIALS AND METHODS

To determine prevalence and distribution of S. oryzae, surveys were conducted on a county basis. Rice fields were selected at random to obtain as complete and accurate a coverage of each county as possible. The number of fields examined per county depended for the most part on the amount of rice grown in that county.

Stem samples were selected randomly at 10-foot intervals within each field. Approximately 15 observations per field were made, but this was increased when stem rot was not found in the first sampling. Most of the surveys were made late in the season before the time when the water was drained from the fields prior to harvest. In some instances, fields were surveyed after harvest. Because S. oryzae infects the rice stem at the surface of the water, search for signs and symptoms of the disease was concentrated on the plant parts at or near the water level. Occurrence of S. oryzae in a particular field was readily determined by the characteristic sclerotia produced just under the leaf sheath. When typical sclerotia were found, three or more samples were collected from each field and taken to the laboratory for verification.

To identify the causal fungus, stems or leaf sheaths were soaked in 2% sodium hypochlorite for 3 to 5 minutes, then rinsed in sterile distilled water. Smaller sections were cut and placed on potato-dextrose agar (PDA) and/or 2% H_2O agar containing 100 ppm streptomycin and 100 ppm penicillin which retarded bacterial growth. Petri dish cultures were incubated at 27°C for 2 to 3 days. When hyphal growth became evident from the pieces of rice tissue, hyphal tips were removed with glass needles and placed on fresh PDA, grown out and identified. When available, sclerotia from infected stems were plated directly onto water agar containing antibiotics. Identification of the causal fungus is facilitated by culturing sclerotia because the conidial stage, Vakrabeeja sigmoidia (Cov.) Sub., is usually produced within 3 to 4 days.

RESULTS AND DISCUSSION

The percentage of fields in which stem rot and the causal organism were detected varied in different counties (Table 1). In Butte County, where Tullis postulated that S. oryzae was originally introduced, stem rot disease was verified in 79% of the fields surveyed. In most of the Butte County fields, detection of stem rot was relatively easy because of prevalence and severity of the disease, particularly in the central part of the county where rice is grown in many fields year after year without rotation. In other areas in the county where rotation schedules are usually practiced, the disease was not encountered so frequently. This was also true in Colusa, Glenn, and Sutter counties.

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Table 1. Distribution of Sclerotium oryzae in California as related to county and total acreage of rice grown in 1970.

County	Total rice acreage[a] 1970	Number of fields examined	% Fields infected w/stem rot
Butte	58,206	62	79
Colusa	82,247	23	69
Glenn	44,857	21	62
Sutter	61,378	45	24
Fresno	14,911	11	0
Merced	6,152	6	33
San Joaquin	6,990	6	17
Yolo	23,387	13	15
Placer	4,084	7	0
Sacramento	9,383	15	53
Totals	311,595	209	35.2

[a]Represents 93.7% of the total acreage of rice grown in California in 1970.

Our failure to detect stem rot in Placer and Fresno counties does not prove that the disease does not occur in these counties. A relatively small amount of rice is grown in these counties and soil conditions and other factors allow rotation with other crops. Thus our failure to detect the disease is probably due to scarcity of the disease, which makes it more difficult to find. The same explanation may apply to Yolo, Sutter, Merced, and San Joaquin counties, in which a relatively low percentage of fields were infected with stem rot. Generally, in fields where disease incidence and severity was low, stem rot occurred most frequently around water inlet and outlet boxes. In these cases, where stem rot was not found in one area of a field after continued observation in several checks, a sparse occurrence of the organism could be detected in other areas. Thus, it is possible that in fields where the organism was not detected we might have found it if the search had been more extensive.

In other areas where stem rot is prevalent as an important disease of rice, one of the most frequently recommended methods for control is burning the crop residue after harvest. In the past, burning of rice straw in California has been the usual practice. Only recently, a larger number of growers have attempted disposal of the residue by other means. If, in fact, burning of residue has been effective in minimizing the inocula of S. oryzae, this may account for the previous low incidence and severity of stem rot. It now appears that open burning of rice residue will no longer be allowed. Thus, if burning has reduced inoculum levels and subsequent disease severity in the past, we expect stem rot to increase as burning is curtailed.

Recently studies have been initiated to determine the amount of loss presently caused by S. oryzae and the effect of various residue management practices on inoculum level and disease incidence and severity.

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ASSOCIATION OF VIRULENCE AND MATING TYPE AMONG HELMINTHOSPORIUM MAYDIS ISOLATES COLLECTED IN 1970[1]

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Abstract

Helminthosporium maydis isolates collected from Southeastern United States were genetically more diverse than isolates from the Midwest. Forty-one of 45 Southeastern isolates and 25 of 26 Midwestern isolates were Race T. All 25 Race T isolates from the Midwest were mating type A. From the Southeast, 33 Race T isolates were mating type A and 8 were a. Four Southeastern isolates were Race O. The preponderance of mating type A among the Race T isolates suggests that the virulent strain of Race T responsible for the 1970 southern corn leaf blight epidemic is of recent occurrence in the United States.

INTRODUCTION

The southern corn leaf blight epidemic of 1970 resulted from the extensive buildup of Race T of Helminthosporium maydis Nisikado & Miyake (Cochliobolus heterostrophus Drechs.). Race T was first identified in 1969 when it was found that corn with Texas male-sterile (Tms) cytoplasm was highly susceptible to isolates of H. maydis collected in 1969 but moderately resistant to isolates collected in 1963 (4). Plants with normal (N) cytoplasm were moderately resistant to the 1969 isolates and the 1963 isolates. The association of Tms cytoplasm with extreme susceptibility to H. maydis was first reported in the Philippines (1). Apparently, Race T has been the predominant race of H. maydis in the Philippines since at least 1960. In the United States, however, Race T was of little or no importance before 1969. Nelson, et al. (3), however, identified Race T among isolates collected between 1955 and 1964 in the United States and in many other parts of the world. Moore (2) presented evidence that the 1970 epidemic originated in corn grown near Belle Glade, Florida. From there the pathogen apparently spread rapidly along the Gulf Coast and up the Mississippi Valley. Spread northward along the Atlantic Coast occurred more slowly.

MATERIALS AND METHODS

Isolates of H. maydis from North Carolina, Mississippi, Kentucky, Ohio, Indiana, Illinois, Iowa, and Nebraska were tested for virulence on corn lines with Tms and N cytoplasm. Compatibility type of the isolates was determined in mating tests.

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