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Sugarcane Mosaic Virus Disease [1]

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The disease caused by sugarcane mosaic virus (SCMV) is commonly referred to "mosaic." It has, at one time or another, occurred in virtually every important sugarcane growing country. Estimated yield losses due to the disease vary greatly depending on the time period and sugarcane growing area involved. Historically, it has been a serious disease problem in Louisiana. In fact, mosaic, superimposed on already established diseases in Louisiana, caused a near collapse of the industry in the mid-1920s. Until 1996, mosaic had not been a problem in Florida. In 1996, sugarcane mosaic was observed in grower fields on CP 72-2086, a major commercial cultivar. The epicenter of the disease was near where Hatton Highway intersects with US 98. Presently only traces of mosaic have been found in the western part of the industry. In 1996, at the epicenter more than 75% of the plants of CP 72-2086 were infected with mosaic. The incidence of mosaic in other cultivars is either undetectable or very low.

SYMPTOMS

Mosaic is identified primarily by its leaf symptoms. As with most sugarcane diseases, the symptoms may vary in intensity with the cane variety, growing conditions, and the strain of the virus involved. The most distinctive symptom is a pattern of contrasting shades of green, often islands of normal green on a background of paler green or yellowish chlorotic areas on the leaf blade (Figure 1). Generally, the chlorotic areas are diffuse, but they may be sharply defined in some clones infected with certain strains of the virus. The infection may be accompanied by varying degrees of leaf reddening or necrosis. Chlorotic areas are most evident at the base of the leaf. Chlorotic areas may also be present on the leaf sheath, but rarely on the stalk. Young, rapidly growing plants are more susceptible to infection than more mature, slower growing plants.

CAUSAL AGENT

Mosaic is caused by a virus. Mosaic has been extracted from host tissues and studied. The mosaic

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Figure 1. Sugarcane mosaic virus leaf chlorosis symptoms.

virus exists in at least four serotypes and several strains. Mosaic has been broken down into four distinct diseases: sugarcane mosaic, sorghum mosaic, maize dwarf mosaic and Johnsongrass mosaic. The strain system of identification predates the division into the different diseases. The various strains differ in their host range, ability to cause infection and in the degree of injury they cause. Strains can be separated by distinctive symptoms shown on selected indicator clones. Fourteen strains have been identified and designated by the letters "A" through "N." The most common strains that have been found in the United States are sugarcane mosaic strains A, B, D, E (actually sugarcane mosaic) and sorghum mosaic strains H, I and M. Sugarcane mosaic strain E (the strain found on CP 72-2086) is present in Florida and sorghum mosaic is present in Louisiana and Texas.

Natural infections of SCMV have been reported on a number of cultivated and wild grass species. Corn and sorghum, if planted next to sugarcane, may serve as an infection source. The importance of transmission of the disease from alternate hosts is not well understood. In Florida, certain weed species have been infected with strain E mosaic for over 20 years with no extensive build up of mosaic in a commercial cultivar until 1996 on CP 72-2086.

SPREAD OF THE DISEASE

There are three principal modes of spread of SCMV: (1) by aphid vectors, (2) by infected seed cane and (3) by mechanical inoculation. Only aphid vectors and infected seed cane are important in the field. Mechanical transmission, for the most part, is important only in greenhouse and laboratory research.

There are at least 12 species of aphids that can transmit SCMV from diseased sugarcane to healthy sugarcane. The spread of mosaic is most rapid when vector populations are high, susceptible sugarcane varieties are grown, and SCMV-infected plants are plentiful. Mosaic is primarily spread by planting infected seed cane in Florida. The relative importance of spread of mosaic by seed cane is indicated by the incidence of mosaic in adjacent fields of CP 72-2086 established from different sources. The incidence in one field was 95% while only 22% in the adjacent field. These second ratoon fields had been planted with seedcane from different sources that had been grown in proximity to each other since the cultivar was released more than fifteen years prior. The vast difference in incidence of mosaic clearly indicates aphid transmission had not been extremely rapid.

PREVENTION AND CONTROL

The use of resistant varieties is the most effective method of mosaic control. Periodic surveys of SCMV strains are necessary so that all clones may be tested against prevalent strains. Natural infection tests are being conducted to evaluate clones in the development program at the Sugarcane Field Station and US Sugar Corporation.

Management practices targeting insect vectors and control methods aimed at eradication have not been very effective. For example, applications of insecticides have thus far failed to prevent the aphid vectors of SCMV from spreading the virus. Also, the practice of roguing, i.e., digging out and destroying

diseased plants, is generally not considered feasible if the infection level exceeds 5%. Control of mosaic through heat treatment of cuttings is partially effective but is only practical in quarantine situations.

It has been noted that some sugarcane plants recover from mosaic. A sugarcane plant which has recovered is not only symptomless, but the virus can no longer be detected in the plant. The recovered plant remains susceptible to reinfection by the same strain or from other strains.

There has not been any evidence indicating that there is yield loss in CP 72-2086 due to sugarcane mosaic. The effect of mosaic on the yield of other cultivars is unknown. Infected plants of CP 72-2086 serve as an inoculum source to infect other cultivars. After a replacement cultivar is found for CP 72-2086 is found, growers in the eastern half of the industry should replace it to reduce the inoculum levels.