A Comparison of Three Methods of Rating Red Rot Infection in Sorghum

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ONE phase of the sorghum (Sorghum vulgare) plant reaction to infection by Colletotrichum graminicolum (Ces.) G. W. Wils. is red rot in the stalk. This is one of the important diseases of this crop in the Gulf Coastal area of the United States. An accurate yet rapid method of rating stalks of sorghum for red rot is essential in screening large numbers of varieties and breeding material for resistance to this disease. Several methods have been used since comprehensive studies of red rot were initiated by the U.S. Department of Agriculture at the U.S. Sugar Plant Field Station near Meridian, Miss., in 1941. Only three of these rating methods have been studied under comparable conditions. This paper describes and compares the effectiveness of these three methods as tools in breeding for red rot resistance in sorghum.

LITERATURE REVIEW

LeBeau, et al. (1) have given a thorough literature review and discussion of this disease. They found that there are wide differences between sorghum varieties in resistance to red rot.

EXPERIMENTAL TECHNIQUES

Red rot resistance in sorghum was in each case estimated in the field by splitting the main stalk of four plants in each plot at the time of harvest. Each internode of each stalk was given a rating of 0 to 3 based on the extent of the spread of discoloration on the longitudinal area when the stalk was split into halves (see figure 1). The rating of 0 indicated an internode free of discoloration while an internode with a rating of 3 was at least 90% discolored. The ratings of 1 and 2 were intermediate but the coloration was not in exact proportion to the ratings involved. The first 2 or 3 internodes next to the ground were eliminated from the rating because characteristic discolorations did not usually occur in that section of the stalk with the exception of the most susceptible varieties. Peduncles were not rated since they usually become senescent first and have a tendency to be colored than the main part of the stalks. All of the six internodes per stalk rated for red rot.

Three types of red rot ratings were available from the data discussed above as follows: (1) Total stalk rating by internodes. This was calculated by adding the ratings for all of the internodes of each stalk; (2) The number of internodes that were discolored in each stalk; (3) A single rating per stalk. After the data for 1949 were collected, the general disease appearance of each stalk was reconstructed, and each stalk was given a single rating using a scale of disease readings of 0 to 4 (see figure 2). Only stalks free of discoloration were included in the 0 group while only those with nearly complete discoloration throughout the stalk were included in group 4. The other three groups were intermediate.

Four breeding nurseries were included in the study. The Sart selections were planted in two replications while the other three tests included three replications. The Reselected Importations were the best of many foreign introductions and were, consequently, being grown for the third year. Early maturing importations grown the second year were included in the Early Selections. The Late Selections were from similar material that was not included in the tests. All varieties were harvested when the plants and soil surfaces. Four susceptible check varieties were used in the three tests involving several important imports.