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Morphological and biochemical indices for selecting sugarcane varieties resistant to smut disease

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Abstract

The qualitative and quantitative yield of Sugarcane (*Saccharum* spp. Hybrids) is significantly decreased by smut disease. The use of resistant varieties is the most cost-effective method of controlling the disease. The association between disease resistance and the underlying resistance mechanisms of the crop is not well-explained by the existing field-testing methods and not allowed the early selection of resistant varieties. Therefore, this research was carried out to identify morphological and biochemical characters as indices to select smut-resistant varieties and incorporate these indices into the existing screening methods to strengthen the varietal selection program for smut resistance. Fifty sugarcane accessions were selected from the available germplasm collection in Sri Lanka and evaluated for their resistance to smut disease by using artificial inoculation method. The inoculated sugarcane setts were established in the fields at Sugarcane Research farm, Udawalawa according to a randomized complete block design with three replicates and maintained from 2017- 2019. Three morphological characters and six biochemical characters were evaluated according to the standard protocols. The disease incidence and Area under Disease Progress Curve (AUDPC) were quantified in both plant and the first ratoon crops over a total period of 24 months. Pearson correlation coefficient test was performed to identify the relationship between AUDPC and tested morphological and biochemical characters. Principal Component Analysis was used to identify the responsible characters to be used as indices for sugarcane smut resistance and thereby to select the superior varieties with smut resistance. A significant variation was observed in AUDPC ($P \leq 0.05$) among the tested accessions. Significant negative correlations were observed in total phenols in the leaves, hardness of the bud, foliage inclination angle and number of scale leaves in the buds with AUDPC. The tested morphological and biochemical characters were grouped into four major components and the cumulative contribution rate was 66 %, revealing that total phenols in leaves, hardness of the bud, foliage inclination angle and the number of scale leaves in buds are useful, simple and non-laborious indices for early identification of sugarcane smut resistance varieties in large scale selection programs.

Keywords: Biochemical indices, Morphological indices, Principal component analysis, Sugarcane, Smut

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