

THE REACTION AND THE INFLUENCE OF NITROGEN LEVELS ON INCIDENCE AND SEVERITY OF CURVULARIA LEAF SPOT DISEASE ON SUGARCANE (*SACCHARUM OFFICINARUM* L.)

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Abstract

The reaction of sugarcane hybrids Co.440, Co.1001, Co.997, DB.5155, CP.36/111, CP.29/116, Mex 52/29, B61208, BR.6223, BD.20/58 to *Curvularia* leaf-spot disease was studied in the Screenhouse. Mex 52/29 and BN61208 were moderately resistant to infection while others were moderately to highly susceptible. Increase in nitrogen levels from 80 to 240 kg/ha increased the severity of attack. Sugarcane leaf necrotic spots coalesced, turned brown gradually and subsequently died, resulting into significant decrease in shoot weight of sugarcane hybrid Co.1001.

Introduction

Sugarcane (*Saccharum* spp.) is the major source of raw material for the production of refined sugar in Nigeria. The crop thrives well in fertile soil along streams and river terraces, requiring a minimum of 1,100 mm of annual rainfall (Allison, 1980). At the Nigerian Sugar Estates, fertilizers Triple Superphosphate, Sulphate of Ammonia and Muriate of Potash were commonly used (Amole, 1976). The influence of these fertilizers, particularly the levels of nitrogen applied to the crop on the incidence and severity of *Curvularia* leaf-spot disease in Nigeria needs study.

Leaf-spot disease of sugarcane was first reported in two local sugarcane plantations at Numan and Ibadan, in Nigeria by Awoderu (1973, 1978) where species of *Helminthosporium*, *Pestalotia*, *Curvularia*, *Fusarium* were isolated from the leaves and stems of sugarcane. Ajogbasile & Mabadeje (1979) reported, *Fusarium oxysporium* Sch. f. sp. and *Curvularia verruculosa* Tandon and Bilgrami ex M.B. Ellis to be responsible for the sugarcane leaf blight where infected leaves gradually turned brown and progressively darkened as the infection spread on the foliage.

The present investigation reports the reaction of sugarcane hybrids to *Curvularia* leaf-spot disease and the severity of attack by the causal organism as influenced by various levels of NPK fertilizers.

Materials and Methods

Screening Experiment: Ten sugarcane hybrids viz., DB 20/58, DB 5155, Co.440, CP 29/116, Mex 52/29, B612088, BR 6223, Co.997, CP 36/111 and Co.1001 were used. Each hybrid, from single-bud cuttings, was surface-sterilized in 1.5% NaOCl solution contained in a plastic container for 10 minutes and sown in steam sterilized sandy-loam top soil mixed with pure sand in a 2:1 ratio, in perforated 5-litre plastic pots. The treatment was replicated thrice for each sugarcane hybrid. Pots were labelled and arranged randomly in a screenhouse. Three weeks after emergence, approximately 6g of calcium ammonium nitrate (CAN) was applied to sugarcane seedlings for added growth. Plants were irrigated with tap water daily.

Table 1. Influence of nitrogen levels on incidence and severity of attack of *Curvularia* leaf spot disease on shoot weight, stalk length and internode number of Co.1001 Sugarcane hybrid (Means of 4 replications).

Soil treatment	120 Days After Inoculation			Incidence** and severity of attack (%)
	Shoot weight (g)	Stalk length (cm)	Internode Number	
Test Plant + N ₀ K ₆₀ P ₀	83.30a	27.60a	3.30ab	5
Test Plant + N ₀ K ₀ P ₆₀	83.00a	30.00a	3.60ab	5
Test Plant + N ₀ K ₆₀ P ₆₀	216.60c	83.00c	7.60c	5
Test Plant + N ₈₀ K ₆₀ P ₆₀	183.30b	72.00b	6.00b	50
Test Plant + N ₁₆₀ K ₆₀ P ₆₀	166.60b	78.00b	7.00b	100
Test Plant + N ₂₄₀ K ₆₀ P ₆₀	166.60b	74.30b	6.00b	100
Control	50.00a	30.00a	3.0ab	10

Means followed by same letter, in every column, do not differ significantly ($P < 0.05$), according to Duncan's Multiple Range Test. * From ground level to the top most visible dewlap (TVD) ** Percentage of total leaf area blighted/plant.

One week later, spores of *Curvularia verruculosa* cultured on Potato Dextrose Agar were carefully washed into sterile water in sterile 250 ml glass container, and approximately 10^6 spores/ml of sterile water were sprayed on the lower leaves of each seedling using an atomizer. Plants were rated *resistant* and *susceptible* following the gradings: 0 = 0%, no leaf necrosis, Resistant; 1 = 5% leaf necrotic spots, moderately resistant; 2 = 10% leaf necrotic spots, moderately susceptible; 3 = 25% leaf necrotic spots, susceptible; 4 = 40% and above leaf necrotic spots, highly susceptible. Plants were harvested from the pots 90 days after inoculation.

Effect of Nitrogen on *Curvularia* leaf spot disease: Sugarcane hybrid Co.1001 found to be highly susceptible to *Curvularia* leaf-spot disease was used. Sugarcane setts, from single-bud cuttings were established in sterile soil in 5-litre plastic pots. Three weeks after emergence, nitrogen fertilizer was applied to sugarcane seedlings at 4 levels - 0, 80, 160, 240 using Calcium Ammonium Nitrate. Single superphosphate and Muriate of potash were applied as basal dressing at equivalent rates of 60 kg P₂O₅/ha and 60 kg K₂O/ha in perforated 5-litre pots, respectively. There were 7 treatments: N₀K₆₀P₀, N₀K₀P₆₀, N₀K₆₀P₆₀, N₈₀K₆₀P₆₀, N₁₆₀K₆₀P₆₀, N₂₄₀K₆₀P₆₀ with untreated plants as control. Each treatment was replicated 4 times and randomly arranged in a greenhouse. One week later, the lower leaves of the sugarcane plants were inoculated with fungus spores as described before. Observations on the emergence of leaf necrotic spots were recorded at one week interval. Plants were harvested from the pots 120 days after inoculation. Fresh shoot weights, stalk length and internode numbers were recorded.

Results and Discussion

Screening Trial: Sugarcane hybrid CO 1001, BR 6223, DB 20/58, Co.440, Co.997, DB 5155, CP 29/116 and CP 36/111 were moderately to highly susceptible to the disease

whereas, Mex 52/29 and B61208 were moderately resistant.

Influence of Nitrogen on severity of Disease: Leaf necrotic spots increased and coalesced as the nitrogen levels increased and this was accompanied by significant decrease in shoot weight, stalk length and internode number compared with the third treatment (Test Plant + N₀2K₆₀2P₆₀) (Table 1).

Although the influence of nitrogen fertilization on the incidence of fungal diseases on sugarcane in Nigeria has not been effectively determined; the present investigation revealed that increase in nitrogen level beyond 80 kg/ha greatly influenced the severity of attack of the crop by *Curvularia* leaf spot disease. Similar observation had been made before (Tisdale & Nelson, 1966; Kipps, 1970) that increase in nitrogen levels increases the incidence of certain fungal disease such as corn blight.

Since curvularia leaf spot has reached an epidemic level in the Nigerian Sugarcane Plantations, further investigations is thus desirable to find an effective control measure in order to avoid total crop failure.

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