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Nutrients Requirement of some Sugarcane Varieties under Gangetic Alluvial Soils

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ABSTRACT

An experiment was conducted under Gangetic alluvial soils of SRTI farm with a view to study the response of some newly released sugarcane varieties to different rates of fertilizer nutrients. Application of N_{160} P_{54} K_{92} S_{30} kg ha^{-1} rate produced maximum yield irrespective of vanety. Among the variety, Isd 21 gave the highest yield of 113.10 TCH. Application of fertilizers significantly increased tiller, millable cane and yield of cane but it did not affect recoverable sucrose content of sugarcane. The treatment T_2 (N_{160} P_{54} K_{92} S_{30} kg ha^{-1}) was found to be most profitable rate in this study.

INTRODUCTION

The limiting factors of crop production in relation to yield, variety itself and fertilizers & fertilizer management are of great concern. Crop response to fertilizer nutrient may be influenced by varieties grown. Sugarcane varieties differ in nutrient requirement from place to place according to soil and agroclimatic conditions (Raghavaiah and Singh, 1980: Trivedi and Saini, 1986). Sugarcane is a voracious feeder of plant nutrients. Some varieties have ability to absorb and utilize more nutrients from a soil under same climatic condition and produced more cane and sugar (Humbert, 1968). Yield potentiality of a crop would not reach to a maximum unless some sorts of fertilizer management is made. Sugarcane varieties after a considerable period of cultivation show a tendency to decline in yield and vigour which needs to replace the existing varieties every few years with new one. So it is necessary to determine fertilizer requirement of newly released varieties to ascertain potential yield. Therefore, the present study was undertaken to determine the fertilizer requirement of some sugarcane varieties for their optimum yield under Ganges river floodplain soils of Bangladesh.

MATERIALS AND METHODS

The experiment was conducted at Sugarcane Research & Training Institute Farm during 1988-89 and 1989-90 cropping season. Four sugarcane varieties Isd 18, Isd 19, Isd 20 and Isd 21 were used as test varieties against four fertilizer treatments. The treatments were as follows:

T_o : No fertilizer (control)
T_1 : N_{120} P_{37} K_{92} S_{30} kg ha^{-1}
T_2 : N_{160} P_{54} K_{92} S_{30} kg ha^{-1}
T_3 : N_{200} P_{72} K_{137} S_{30} kg ha^{-1}

The experiment was set up following randomized complete block design and each treatment was replicated four times. The soil characteristics of experimental site is sandy loam having pH 7.5, organic carbon 0.62%, total N 0.060%, available P 12.03 ppm, exchangeable K 0.16 meq% and available S 32.1 ppm.

Three eyed assorted setts of each variety were planted in trenches during November each year and the crop of the experiment was harvested in December of the following year. Full doses of P and S and 1/3rd of each of N and K were applied in trenches and mixed with soil properly prior to plantation. Rest of N and K were applied in two equal instalments as top dressing after 90 d and 120-150 d of plantation. Soil samples were collected from experimental site before setting up of experiment and after harvesting of crop for determining its texture, organic carbon, CEC, total N, available P, exchangeable K and available S.

Soil texture was determined by hydrometer method, organic carbon by oxidation method, pH by a glass electrode pH meter and total nitrogen by kjeldahl method. Available P was determined by using 0.5 $NaHCO_3$ extraction in spectrophotometer, exchangeable K was determined by 1M NH_4OAc extraction in flamephotometer. Available S was also determined by turbidimetric spectrophotomere method (Black, 1965).

RESULTS AND DISCUSSION

Results obtained on different growth parameters and yield of different varieties under different fertilizer doses are presented in the Table 1. Different NPKS rates showed different effects on tiller production of sugarcane varieties. Application of fertilizers significantly produced higher tiller in all treatments. Results showed that application of N_{160} P_{54} K_{92} S_{30} kg ha^{-1} (T_2) produced maximum tiller in all the varieties. Production of tiller significantly increased upto the rate of N_{160} P_{54} K_{92} S_{30} kg ha^{-1} thereafter it decreases at higher rates of fertilizers application. The variety Isd 19 produced as much as 163. 7 X 10^3 number of tiller per hectare in the first year experiment but the variety Isd 21 produced as much as 161.4 X 10^3 per hectare in the second year. Millable cane production was significantly influenced by fertilizer application. Interaction between varieties and fertilizer rates for millable cane revealed that varieties Isd 18, Isd 19 and Isd 21 showed similar response under both lower and higher rates of fertilizer application in first year experimentation but in the second year, the varieties Isd 19, Isd 20 and Isd 21 showed similar response. The variety Isd 18 produced maximum number of millable cane of 124.5 X 10^3 ha^{-1} in first year whereas the variety Isd 21 produced the maximum number of millable cane of 102.8 X 10^3 ha^{-1} in second year. On the contrary, the minimum number was produced by Isd 21 (68.4 X 10^3 ha^{-1}) and Isd 18 (41X 10^3 ha^{-1}) in the first and second year experimentation respectively. The various number of millable cane of different varieties might be due to varietal characteristics and their response to the environment. This findings partially agreed with the findings of Miah *et al.* (1986) where they reported differential response of sugarcane varieties for millable cane production. The highest yield of 113.1 TCH was recorded with the variety Isd 21 in first year but it was 86.5 TCH with the variety Isd 19 in second year experimentation. Interaction between varieties and fertilizer rates for cane yield revealed that varieties Isd 18, Isd 20 and Isd 21 showed similar response under both lower and higher rates of fertilizer application in both the years. Results showed that application of 160 kg N, 54 kg P, 92 kg K and 30 kg S ha^{-1} (T_2) gave maximum cane yield in both years irrespective of varieties and it was significant over control (Table 1 & Figure 1).

Table 1. Effects of different rates of nutrients on yield and some grwoth parameters of different sugarcane varieties.

Year	Variety/Treatment	Tiller (000/ha)	Millable cane (000/ha)	Cane yield (t/ha)	Recovery (%)	Sugar yield (t/ha)
1988-89	Isd 18 T_0	94.9 c	76.9 b	61.5 b	9.33 a	5.7
	T_1	124.2 b	113.4 a	87.0 a	9.87 a	8.5
	T_2	144.2 a	124.5 a	90.7 a	9.11 a	8.2
	T_3	125.4 ab	116.8 a	88.5 a	9.94 a	8.8
	Isd 19 T_0	100.4 b	73.1 b	58.3 b	9.17	5.4
	T_1	122.0 ab	97.5 a	83.8 ab	8.92 a	7.4
	T_2	153.7 a	98.2 a	96.3 a	9.70 a	9.2
	T_3	140.6 a	92.4 ab	88.1 ab	9.75 a	8.7
	Isd 20 T_0	85.3 a	69.3 c	62.1 b	9.77 a	6.1
	T_1	128.8 a	87.2 b	102.7 a	9.31 a	9.5
	T_2	130.7 a	117.1 a	109.7 a	9.93 a	10.8
	T_3	128.1 a	95.5 ab	103.3 a	9.62 a	9.9
	Isd 21 T_0	75.7 a	68.4 b	60.3 b	10.67 a	6.3
	T_1	105.3 a	94.6 a	99.4 a	10.44 a	10.3
	T_2	118.4 a	111.5 a	113.1 a	10.65 a	12.0
	T_3	106.6 a	97.5 a	102.3 a	10.54 a	10.0
1989-90	Isd 18 T_0	77.8 b	43.2 a	28.6 b	10.7 a	3.1
	T_1	100.2 a	41.8 a	73.0 a	11.4 a	8.3
	T_2	105.2 a	50.2 a	82.7 a	10.9 a	9.0
	T_3	102.8 a	76.0 a	76.0 a	10.9 a	8.3
	Isd 19 T_0	89.9 c	44.3 b	24.3 c	10.7 a	2.6
	T_1	105.1 b	78.2 b	61.1 b	10.4 a	6.4
	T_2	110.5 a	82.7 a	86.5 a	10.4 a	9.0
	T_3	106.9 b	77.7 a	63.7 b	10.3 a	6.6
	Isd 20 T_0	120.6 c	73.5 b	36.1 a	9.6 a	3.5
	T_1	143.6 b	90.6 a	61.0 a	10.2 a	6.2
	T_2	160.3 a	101.1 a	66.1 a	10.1 a	6.7
	T_3	148.5 a	94.3 a	55.3 a	10.1 a	5.6
	Isd 21 T_0	121.4 c	76.7 b	44.1 b	10.1 a	4.5
	T_1	143.8 b	96.6 a	61.0 a	10.2 a	6.2
	T_2	161.4 a	102.8 a	81.1 a	10.7 a	8.7
	T_3	135.3 b	95.3 a	76.3 a	11.1 a	8.5

Figures accompanied by the same letter(s) do not differ significantly at 5% level of probability as per DNMR test.

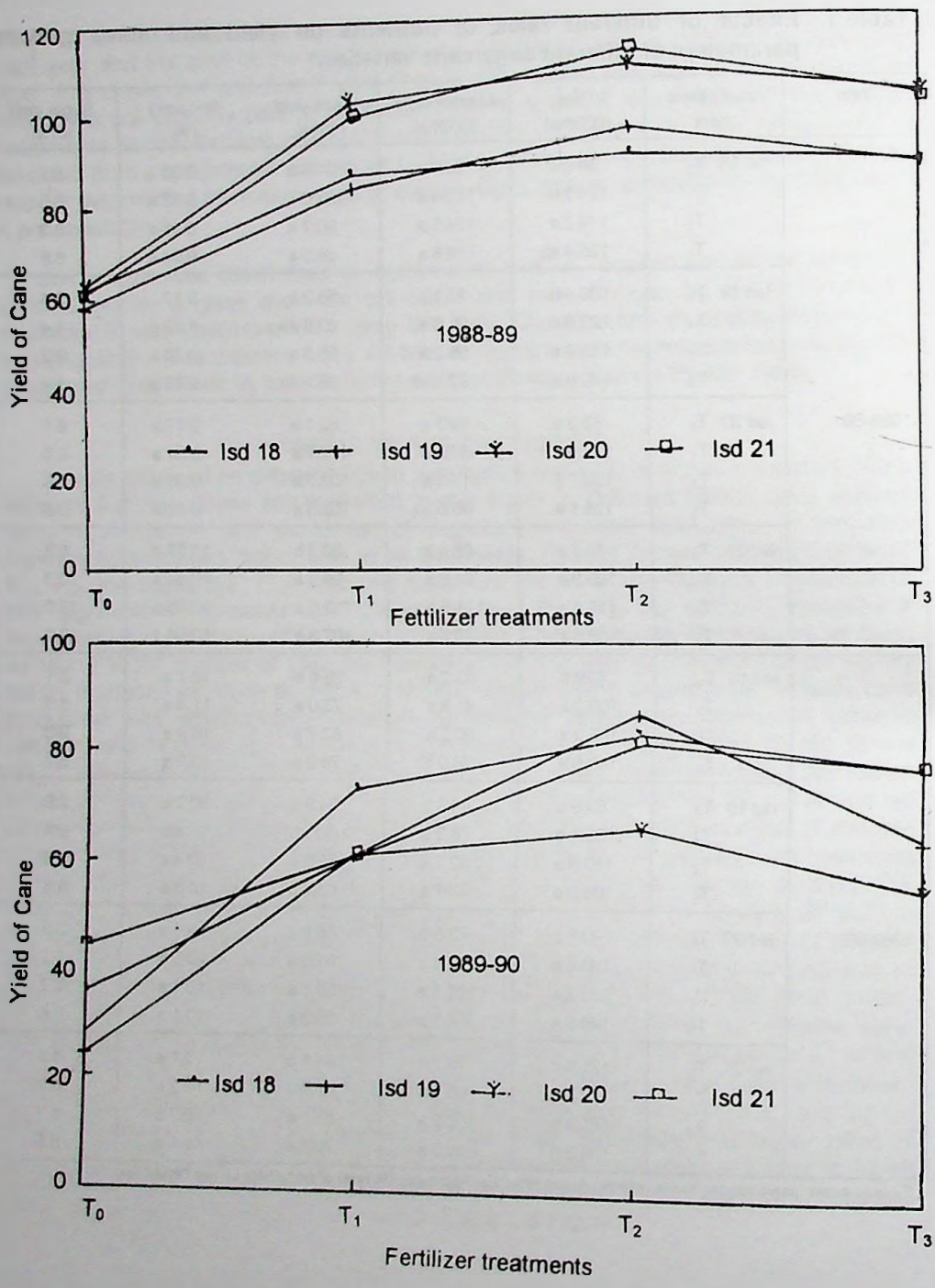

Figure 1. Yield of different cane varieties as affected by different rates of fertilizer.

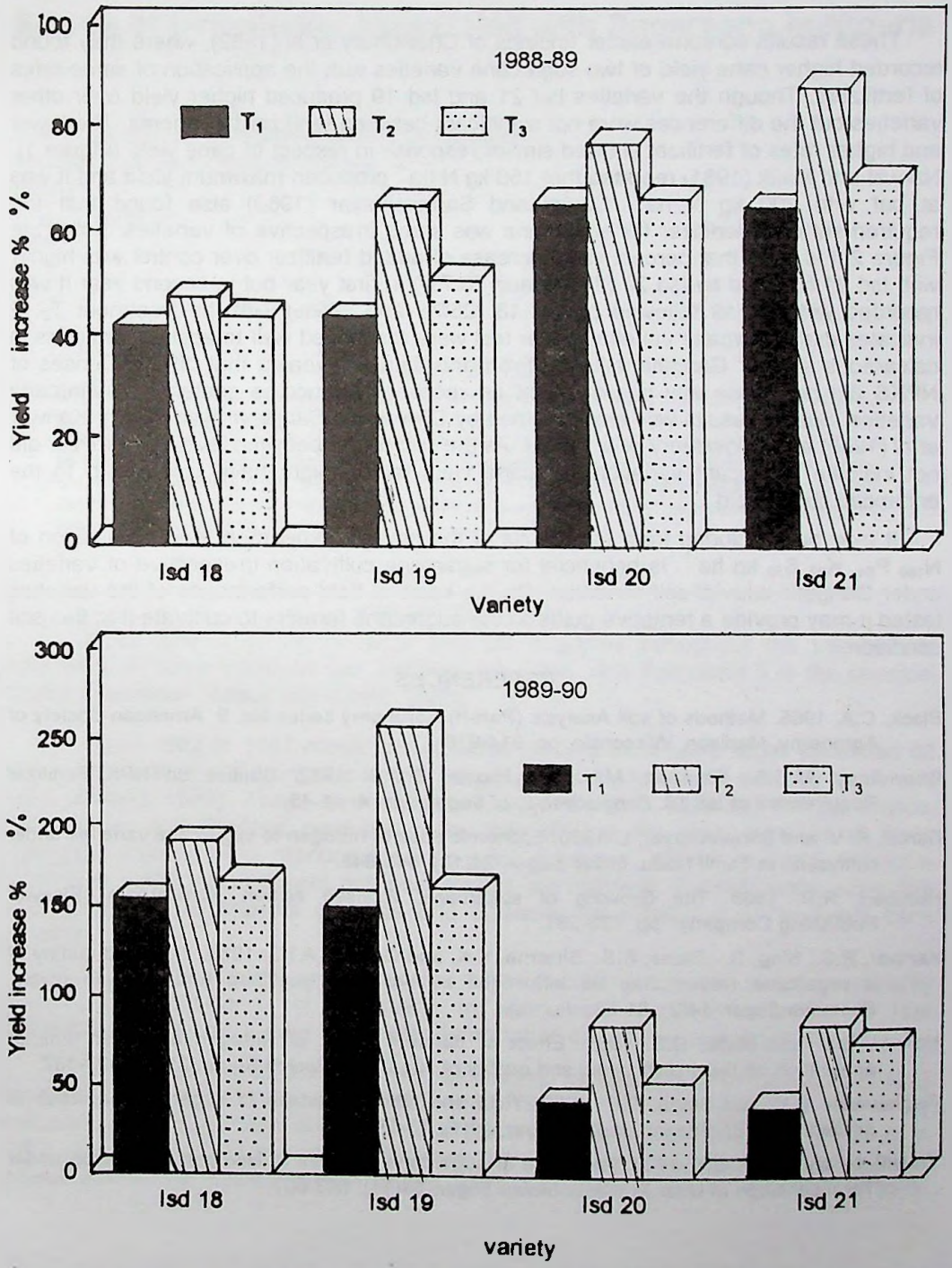

Figure 2. Yield increase % over control by different varieties under different rates of fertilizer.

These results conform earlier findings of Chowdhury *et al* (1982), where they found recorded higher cane yield of two sugarcane varieties with the application of same rates of fertilizers. Though the varieties Isd 21 and Isd 19 produced higher yield over other varieties but the differences were not significant between fertilizer treatments. The lower and higher rates of fertilizer showed similar response in respect of cane yield (Figure 1). Narwal and Malik (1981) reported that 150 kg N ha^{-1} produced maximum yield and it was at pat with 200 kg N ha^{-1}. Daniel and Sanjeevirayar (1980) also found that the requirement of N fertilizer for sugarcane was same irrespective of varieties. From the Figure 2 it is seen that percent yield increase of added fertilizer over control was higher with Isd 21 followed by Isd 20 (87.6% and 76.7%) in first year but in second year it was recorded with Isd 19 followed by Isd 18 (256% and 189%) with the treatment T_2. It indicates that sugarcane varieties under test were responded well to applied fertilizers in calcareous soils of Gangetic alluvial. From the data it revealed that different doses of NPKS did not cause any improvement on recoverable sucrose content of sugarcane varieties. Similar results was also obtained by Daniel and Sanjeevirayar (1980); Kanwar *et al* (1988) and Chowdhury *et al* (1982). As the sucrose % between levels of fertilizer did not indicate significant variation the cane yield factor might have contributed to the enhanced sugar yield.

It may be concluded from the results of the present experiment that, application of N_{160} P_{54} K_{92} S_{30} kg ha^{-1} is beneficial for sugarcane cultivation irrespective of varieties under Gangetic alluvial soil condition. On the basis of field performance of the varieties tested it may provide a tentative guide to the sugarcane farmers to cultivate it in this soil condition.

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