

Effect of Liming on the Productivity of Sugarcane

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ABSTRACT

The study was conducted at Panchagarh Sugar Mills (PSM) and Zeal Bangla Sugar Mills (ZBSM) farms to observe the response of lime on sugarcane. Four different doses, namely, 0.5, 1.0, 1.5 and 2.0 tons of lime/ha were used along with normal doses of NPK. Significantly higher percent germination, number of tillers/ha, number of millable cane/ha, yield of cane, percent recoverable sugar and yield of sugar were obtained where 1.5 tons lime/ha were used at both PSM and ZBSM.

INTRODUCTION

Marked response of a crop cannot always be guaranteed through sound fertilization practices, since some chemical and biological factors in the soil may render them ineffective. One of the most important chemical factors influencing sugarcane yield is the soil pH. The most favourable pH range for sugarcane is from 6.2-7.8 (Hernandez, 1967) and the reported optimum pH is 6.8 (Demeterio, 1961). Too acidic soils have some adverse effect on the growth and recovery of sugarcane. Many investigators in cane growing areas of different countries have conducted extensive experiments to determine the effects of lime on yield and quality of cane (Davidson, 1965). Laroche defines liming as quoted by Santos *et al.* (1980) as a technique of incorporating carbonates, hydroxides and oxides of calcium and magnesium into the soil in order to increase the supply of calcium and magnesium to correct the noxious effect of acidic pH. Liming of the soil raises the soil pH and reduces the availability of iron, manganese and aluminium; on the other hand it makes phosphorus and molybdenum more available, improves the soil tilth and is helpful to the microbial population in the soil (Babu, 1979). Vallance (1953) and Leverington (1970) observed generally higher yields of sugarcane associated with lime treatment.

The soil of a considerable area of the Sugar Mills Zones of Bangladesh is acidic in nature. The yield of sugarcane in some of these areas is poor probably due to high acidity. Impact of liming has not yet been studied in those problem areas in Sugar Mills Zone of Bangladesh. Hence, a study was undertaken to observe the response of sugarcane to lime in acid soils of two Sugar Mills Farms.

MATERIALS AND METHODS

The experiment was conducted at Panchagarh Sugar Mills (PSM) and Zeal Bangla Sugar Mills (ZBSM) farms following randomized complete block design replicated thrice. The treatments used were:

T₀-No lime (control).

T₁-0.5 tons lime/ha.

T₂-1.0 tons lime/ha.

T₃-1.5 tons lime/ha.

T₄-2.0 tons lime/ha.

The variety Isd-2/54 was used. Required amount of lime was added and properly incorporated in the soil 15 days before planting at both the locations. The end to end method of planting was followed. Recommended doses of NPK were applied in all the treatments. Intercultural operations and pest and disease control measures were performed as and when required.

Data on germination, tillering, number of millable cane and yield of cane were recorded. Ten randomly selected canes were taken as samples from the experimental plots. The samples were analysed for percent recovery of sucrose following Hoin's Dry Lead Method (Meade, 1963). The soil pH was determined thrice - (i) before plantation, (ii) 150 days after plantation and (iii) at harvest. The collected data were statistically analysed and the significance of mean difference was adjusted as per LSD (Steel and Torrie, 1960).

RESULTS AND DISCUSSION

Liming with 1.5 tons/ha produced significantly higher percent germination and higher number of tillers/ha at both the locations (Tables 1 and 2). The number of millable cane production differed to a considerable extent at both the locations under varied levels of liming. Significantly higher number of millable cane/ha was obtained with T_3 both at PSM (76.97 thousand) and ZBSM (103.12 thousand) followed by T_2 .

The variations in sugarcane yield due to different liming treatments were found to be significant both at PSM and ZBSM (Tables 1 & 2). These results are in conformity with those of Davidson (1965). The increase of yield is due to the increase of soil pH (Figs. 1 & 2) which makes Ca and P in the soil more available. Increased mineralization of soil-N following the application of lime, might be a factor leading to increased N-uptake by the plant, which in turn favours the growth of cane and consequently giving higher TCH (Anon. 1976-77).

Table 1. Effect of liming on the yield parameters of sugarcane at ZBSM.

Treatments	Germination (%)	No. of tillers/ha ('000')	No. of millable cane/ha ('000')	TCH	% Recoverable sugar	TSH
T_0	48.60	152.44	88.12	71.87	7.52	5.40
T_1	51.53	157.73	92.49	76.55	7.48	5.71
T_2	52.28	160.50	95.30	78.12	7.43	5.80
T_3	53.80	171.24	103.12	80.93	7.35	5.94
T_4	49.06	154.98	90.31	75.62	7.29	5.51
LSD (0.05)	0.94	1.64	7.02	4.50	0.13	0.36

Table 2. Effect of liming on the yield parameters of sugarcane at PSM.

Treatments	Germination (%)	No. of tillers/ha ('000')	No. of millable cane/ha ('000')	TCH	% Recoverable sugar	TSH
T ₀	41.11	132.66	68.12	43.8	9.39	4.17
T ₁	45.41	133.66	68.74	44.9	9.19	4.13
T ₂	45.53	142.66	74.05	52.6	9.02	4.75
T ₃	50.76	148.33	76.97	56.2	8.75	4.91
T ₄	41.15	146.66	75.31	53.1	8.64	4.58
LSD(0.05)	2.29	5.76	3.22	2.89	0.14	0.24

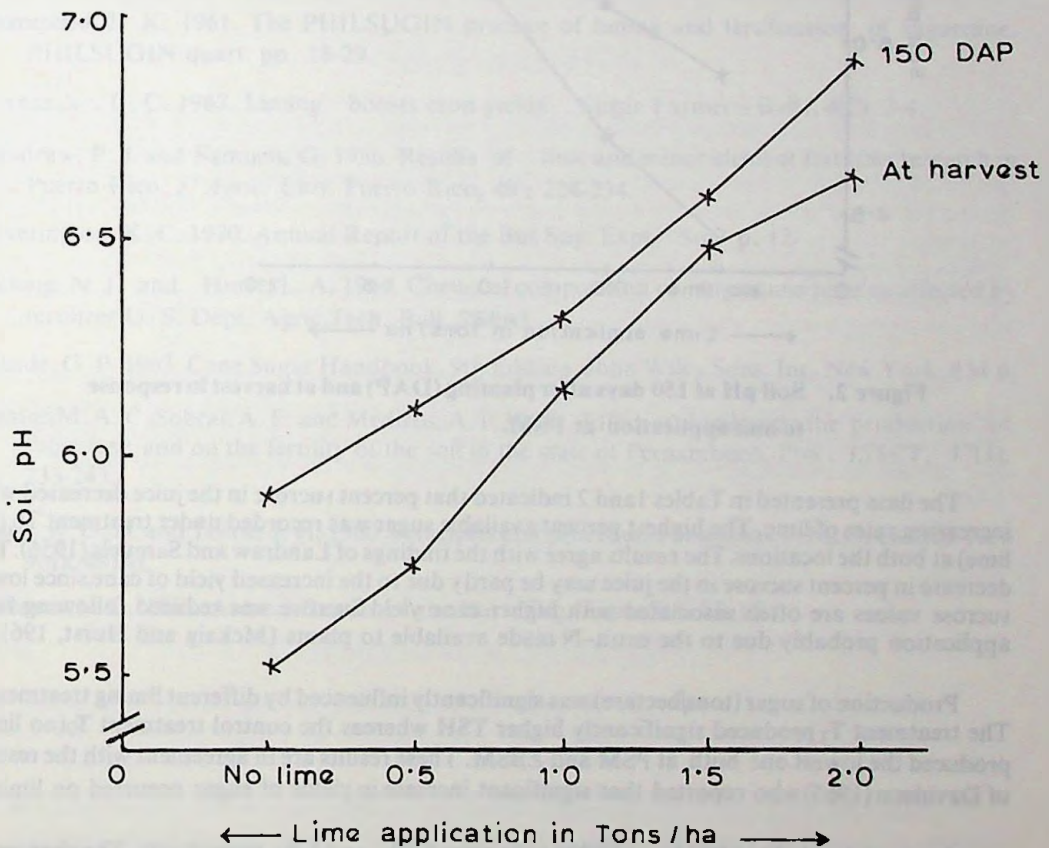


Figure 1. Soil pH at 150 days after planting (DAP) and at harvest in response to lime application at ZBSM.

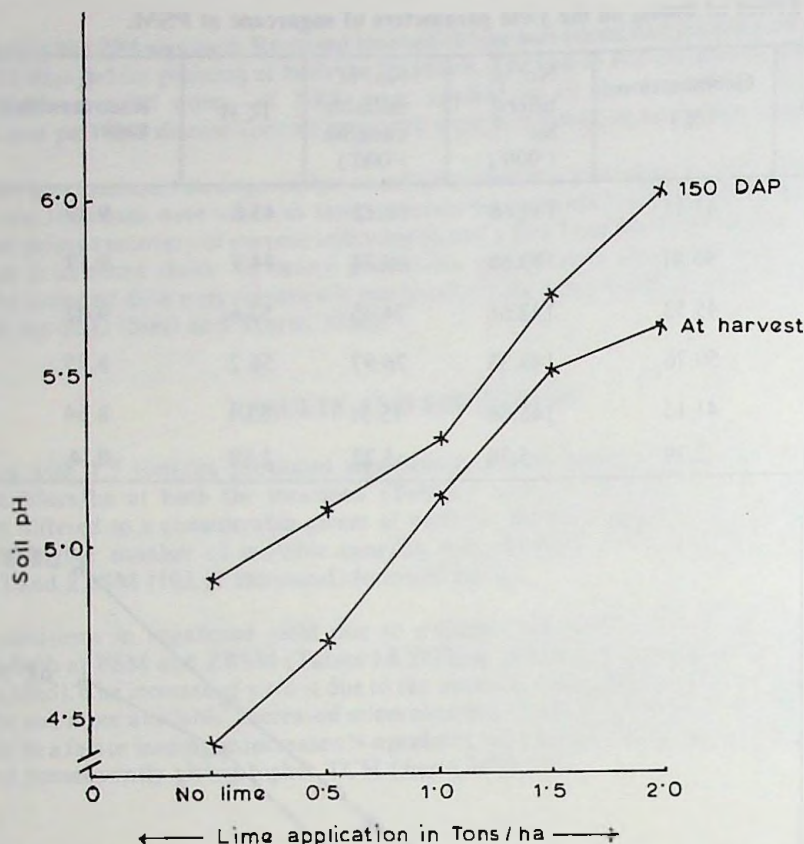


Figure 2. Soil pH at 150 days after planting (DAP) and at harvest in response to lime application at PSM.

The data presented in Tables 1 and 2 indicated that percent sucrose in the juice decreased with increasing rates of lime. The highest percent available sugar was recorded under treatment T_0 (no lime) at both the locations. The results agree with the findings of Landraw and Samuels (1956). The decrease in percent sucrose in the juice may be partly due to the increased yield of cane, since lower sucrose values are often associated with higher cane yield. Sucrose was reduced following lime application probably due to the extra-N made available to plants (Mckaig and Hurst, 1961).

Production of sugar (tons/hectare) was significantly influenced by different liming treatments. The treatment T_3 produced significantly higher TSH whereas the control treatment T_0 (no lime) produced the lowest one both at PSM and ZBSM. These results are in agreement with the results of Davidson (1965) who reported that significant increase in yields of sugar occurred on liming.

The initial soil pH of PSM and ZBSM soils were 4.90 and 5.90 respectively. The changes in soil pH at 150 days after planting and at harvest in response to lime application are shown in Figs. 1 and 2 for ZBSM and PSM respectively. It is seen from the figures that the soil pH increased with

the increase of lime application at 150 days after planting. But the soil pH decreased at harvest to some extent in all the treatments at both the locations. This might be due to the utilization of Ca by the crops.

From the results of the experiment it may be suggested that application of 1.5 tons lime/ha in addition to the normal recommended doses of NPK fertilizers would give significantly higher yield of cane (TCH) and sugar (TSH) at the two farms considered.

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