Studies on split application of Nitrogen in Sugarcane

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ABSTRACT

Studies on split application of nitrogen in sugarcane in its growing period were conducted during 1974—1975 and 1975—1976 cropping years at North Bengal Sugar Mills (NBSM) and Sugarcane Research Institute (SRI) farms respectively in order to determine the critical period and correct prescription of the recommended dose of 110 lbs. N/acre.

In both the years, split application of 110 lbs. N, 50% after 45 days, 50% after 120 days of planting improved cane yield and total sugar production though other factors like germination, cane height, weight per stalk, tillers per clump and recovery (%) of sugar were influenced differentially by different treatments. Results of the experiments indicated that the critical period for N application in sugarcane was within first 120 days after planting.

INTRODUCTION

Sugarcane is a biennial crop having great demand for nutritive elements for its proper growth and development. Timely fertilization is the key to maximum benefit from the added fertilizers (De Geus 1967, and Srivastava, 1971). Although sugarcane remains in the field for more than one year, it needs timely fertilization during its growing period for better cane yield and % recovery. Fertilization of sugarcane in early stage of its growth is advocated by many investigators (De Geus, 1967 ; Srivastava, 1971 ; Mohan Rao and Narasimham, 1956). The proper time for application of nitrogenous fertilizers is an important factor in determining their effectiveness in the nutrition of sugarcane and also for maximum return from application per unit of applied nitrogen. Untimely application often leads to considerable loss of this element through leaching, surface run off, and volatilization as gaseous ammonia and thereby results in poor crop response (Singh, 1974). Srivastava (1971) reported that although sugarcane is a long

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duration crop, the period of formative phase itself is relatively short and the foraging capacity is low at the early stage of cane plant. Therefore, to hasten the build up of shoot population, and proper plant growth, the cane plants require nitrogenous fertilizer at the formative stage of the crop.

Extensive researches have conducted in these lines in may cane growing countries, and comprehensive recommendations about the use of N—fertilizers have been formulated in order to get maximum benefit by the use of applied nitrogen. But very little research work regarding the time of application of nitrogenous fertilizer to sugarcane were made in the past in Bangladesh. An attempt has, therefore, been made to find out the critical period for application of 110 lbs. N/acre in sugarcane.

MATERIALS AND METHODS

The experiments were conducted during 1974-1975 and 1975-1976 cropping season under irrigated condition at NBSM and SRI farms, respectively. Both NBSM and SRI farm soils belong to a typical soil physiographic unit of the Ganges river flood plain. The characteristic of the NBSM soil is sandy clay texture, pH 8.0 organic matter 1.33% total N 0.061% while that of SRI is clay texture having pH 7.8, total N 0.097% and organic matter 1.66%. The soils are very soft when wet but become compact, hard and crack when dry.

The experiments were laid out in latter part of November in both years. Variety of cane Co. 1158 was used in both cases. All materials and methods were kept constant. The treatments consisted of spliting the usually applied dose of 110 lbs. N/acre as follows :

T_1—Normal practice i.e. 33.3% of N at planting, 33.3% after 1st heavy shower and 33.3% in June.

T_2—100% of N at planting.

T_3—50% at planting and 50% after 120 days of planting,

T_4—50% after 45 days and 50% after 120 days of planting.

T_5—20% at planting, 30% after 45 days and 50% after 120 days of planting.

T_6—20% at planting 30% after 45 days and 50% after 250 days of planting

In both the cases, the experiments were laid out in randomized block design. Six treatments were replicated 4 times. Three buded equal number of assorted setts were planted end to end in each plot at the rate of approximately 60 maunds/acre. Spacing of cane rows was 3.5', and the distances between blocks and between plots were 6' and 5' respectively. Present doses of 110 lbs. P_2O_5 and 97 lbs. K_2O per acre basis were applied in all the plots. Before Planting sugarcane, soil samples were collected and analysed for N and other related properties.

From the experiments, germination, tillers per clump, total millable cane, weight per stalk, cane height, yield of cane, recovery (%) of sugar and total sugar production were studied.

RESULTS AND DISCUSSION

Data of cane yield, other yield components and % sugar recovery are presented in tables 1 and 2 for first and second years' experiments respectively while figure 1 shows total sugar production for both the years.

Table 1. Effect of different treatments on yield, some yield contributing factors and % recovery of sugarcane during 1974—1975 at NBSM farm (Date presented are average of 4 observations).

Treatments	Germination (%)	No. of tillers per clump	Cane height (ft.)	Weight/ stalk (kg)	No. of millable cane/acre	Yield of cane (TCA)	Recovery of sugar (%)
T_1	36.16	3.59	8.67	0.654	48932	32.00b*	9.09
T_2	30.76	4.11	8.17	0.622	47480	29.54c	9.17
T_3	37.85	3.97	8.75	0.619	56241	34.81ab	8.86
T_4	34.36	4.31	8.93	0.660	55611	36.72a	9.02
T_5	34.88	3.70	9.00	0.717	48545	34.79ab	9.11
T_6	32.05	3.77	8.50	0.648	45592	29.54c	9.04

* Figures bearing same letters do not differ at 5% level.

Table 2. Effect of different treatments on yield, some yield contributing factors and % recovery of sugarcane during 1975—1976 at SRI farm (Data presented are average of 4 observations.)

Treatments	Germination (%)	No. of Tillers per clump	Cane height (ft)	Weight/ stalk (kg)	No. of millable cane/acre	Yield of cane (TCA)	Recovery of sugar (%)
T_1	43.98	4.40	9.46	1.035	45502	46.94	9.43
T_2	45.97	5.12	9.85	1.031	45484	46.73	9.45
T_3	43.19	4.92	9.88	1.018	47698	48.40	9.08
T_4	46.48	4.69	9.70	1.015	48134	48.72	9.25
T_5	44.49	4.86	9.59	1.014	46373	46.89	9.14
T_6	42.36	4.47	9.35	1.029	43941	45.08	9.41

Though the yield components like number of tillers, cane height, weight per stalk and number of millable cane do not always bear any distinct relationship with the yield of sugarcane, they go a longway in explaining many observations and a study on them is always desirable to evaluate the overall effects of any treatments. The treatment variation with respect to percent germination (maximum at T_3 and T_4 and minimum at T_2 and T_6 for 1974 - 1975 and 1975 - 1976 respectively) is easily acceptable when we consider that this factor is more dependent on soil moisture, texture, etc. rather than on the nutrients availability of the soil (Tisdale and Nelson, 1969). During first year, though T_2 has the second highest tiller number, it produced the highest in the next year i. e. 1975 - 1976. Similar results of enhanced tillering due to higher amount of N application at initial stage have also been reported by Dillewijn, (1952). T_1 produced

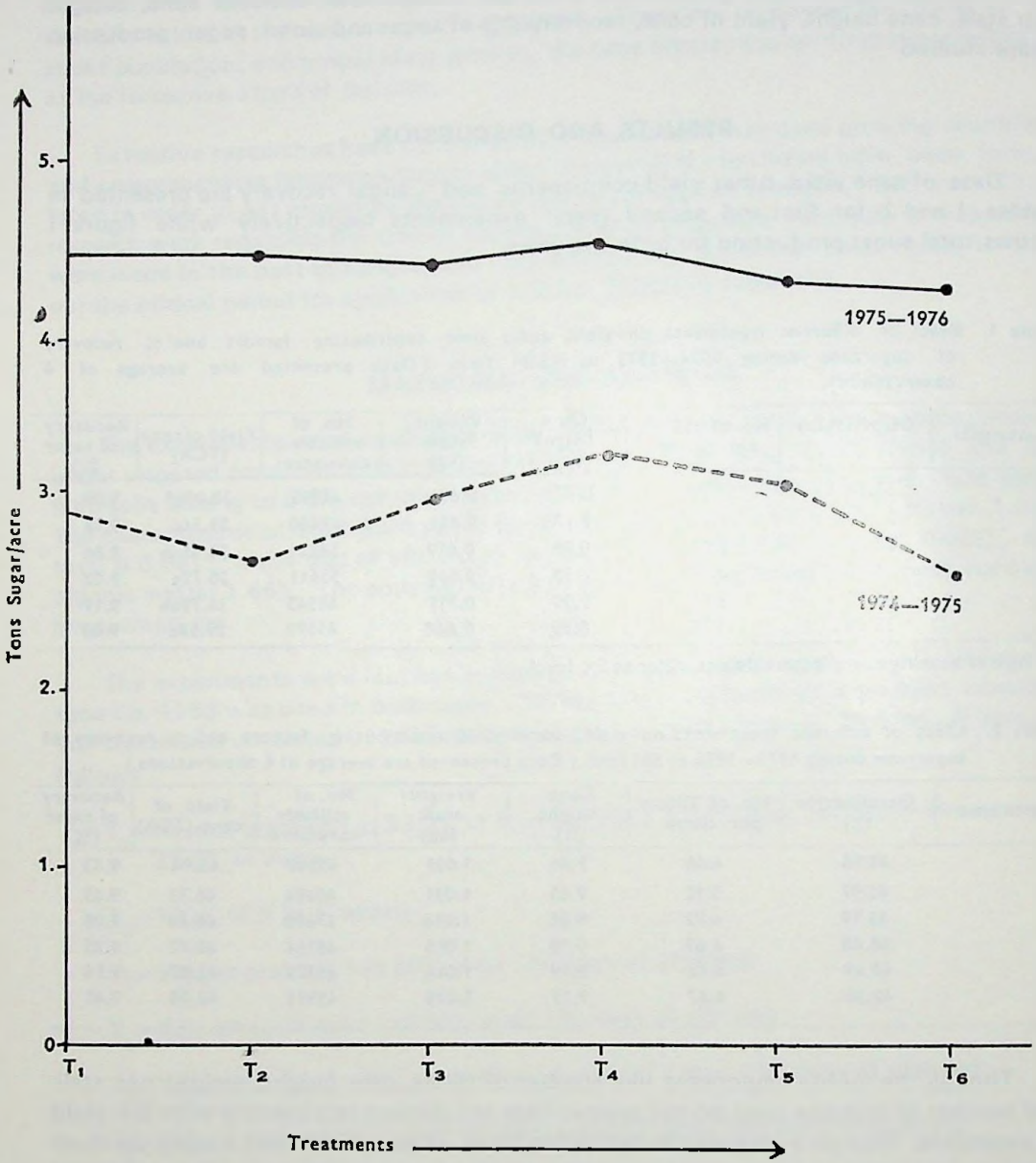

Fig. 1. Effect of different treatments on Tons Sugar per acre produced during 1974—1975 and 1975—1976 cropping seasons.

lowest tiller numbers in both the years suggesting the influence of fertility or nitrogen availability with this parameter and inferiority to all other treatments. The next two parameters in the table 1 and 2 i. e. cane height and weight per stalk show the least relationship between the treatments effect of the two years as is evident by the data. T_5 produced maximum cane height and weight per stalk in the first year while T_3 and T_1 showed the same effects for the next year. Similarly T_2 and T_3 of the former year produced results equivalent to those of T_1 and T_5 of the later year when considered in terms of smallest cane height and lightest weight per stalk.

The treatment effect has become more stabilized on number of millable canes. In both the years, T_3 and T_4 produced the highest and second highest results, though interchangeably and the lowest number was produced at T_6. The cane yield, due to treatment effect, is identical for both the years, T_4 producing the highest, T_3 the second highest and T_6 the lowest. The yield difference due to treatments for the year 1974 - 1975 is significant at 5% level though that of the subsequent year is not statistically significant. In a similar type of experiment on nitrogen nutrition of sugarcane, Mohan Rao and Narasimham (1976) reported highest yields of cane and sugar production when the N - fertilizer was applied 50% at 45 days and the rest 50% at 90 days after planting. Mohan Rao and Suryanarayana (1960) suggested that the nitrogen should be applied in two equal instalments, the 1st at 45 days after planting and the remaining between 90 - 120 days after planting depending upon the availability of irrigation water for best yield and sugar.

The split effect of N on % recovery of sugar was also studied and the results of the two experiments are again in harmony with each other. T_2 in both cases produced highest recovery. Late application of N on lowering sucrose recovery is a well established fact and in many countries including certain states of even neighbouring India, Taiwan etc. laws are in force prohibiting application of N within certain periods before harvest (De Geus, 1967; Mohan Rao and Narasimham, 1956 and Tandan and Misra, 1956).

Figure 1 shows total sugar production per acre. Though there is a difference in the base lines of the two graphs, their trend is almost same and the total sugar production for both the years is highest at T_4. The highest during 1975 - 1976 is 4.51 tons sugar per acre (TSA) and the lowest 4.24 TSA whereas the highest for the year 1974 - 1975 is only 3.31 TSA, a figure even lower than the lowest figure of the later year indicating higher yield of the 1975 - 1976 experiment due to better care and management and this also explains the difference in the base lines of the two graphs.

The above mentioned results indicated that spliting nitrogen into two equal halves and applying the 1st half after 45 days and the rest half after 120 days of planting seems to be the best for both cane yield and total sugar production when compared with the present practice of applying $\frac{1}{3}$rd at planting, $\frac{1}{3}$rd after 1st heavy shower and the rest $\frac{1}{3}$rd in June. The results further indicated that the critical period for N application in sugarcane would be within 120 days of planting under Bangladesh conditions. Further works are needed to confirm these findings.

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