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Fertilizer Management for Sugarcane Ratooning

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ABSTRACT

An experiment was conducted at farmers field of Ishurdi in two consecutive cropping years to study the effects of different levels of fertilizers on sugarcane ratoon. Application of different fertilizers significantly influenced the number of millable cane, yield of cane and sugar. Increased rate of fertilizers reduced tiller mortality to a greater extent. Production of number of millable cane, yield of cane and sugar recovery percent was found maximum in treatment having 200 kg N, 125 kg P_2O_5, 110 kg K_2O and 30 kg S per hectare. Fertilizer use efficiency was as high as 207.8 and 158.3 kg cane/kg of added nutrient in 1991-92 and 1992-93 cropping years respectively.

INTRODUCTION

Sugarcane, like other perennial grass is able to regenerate shoots from stubbles producting successive crops known as ratoon crop. To cut down cost of production, ratooning has been progressively used in many sugarcane growing countries of the world (Humbert, 1968). The growing of sole plant cane is a costly farming since it must bear all the cost of seeds, land preparation and planting. Ratooning is an old system which has been practiced for many years in Bangladesh. At present almost in all the countires where sugarcane is a major crop, taking of atleast two or even more ratoon from the same plantation is a normal practice.In Hawaii, Mauritius, Philippines and Cuba, 4 to 6 ratoons are quite common (Misra and Mathur, 1983). Ratoon crops have often failed to produce satisfactory growth and yield. Yadava (1992) pointed out several reasons for lower ratoon yields than in the plant crop of which lack of moisture and nutrient are most important. In Bangladesh, about 15-20% area is under ratoon cane which is far below than other advanced cane growing countries of the world (Matin *et al.* 1989). Declining of soil fertility under continuous cropping might be responsible for low ratoon yields in our country. Adequate and timely fertilization are important in maintaining good ratoon yield. Earlier work in India and elsewhere proved that declining soil fertility, especially low nitrogen and phosphorus, and poor irrigation practice were the main causes of steadily declining ratoon yield. Tehrefore, to obtain higher yield of subsequent ratoon from same planting the present investigation was undertaken.

MATERIALS AND METHODS

After harvesting of plant cane, a subsequent ratoon crop was grown each year during 1991-992 and 1992-93 cropping season. The experiment was conducted in the farmers field condition at Ishurdi. The most important physico-chemical properites of the experimental sites are shown in the Table 1.

Table 1. Properties of initial soil.

Texture	pH	Organic carbon (%)	Total N (%)	Available P (ppm)	Exchangeable K (m.e/100g soil)	Available S (ppm)
Sandy loam	7.5	0.75	0.057	12.1	0.16	18

The experiment was laidout following RCB design with six treatments, replicated 4 times with the variety Isd 16 as test crop. The treatment combinations were:

T_1:$N_1P_1K_1S_1$, T_2:$N_1P_2K_2S_2$, T_3:$N_2P_1K_1S_1$, T_4:$N_2P_2K_2S_2$, T_5:$N_3P_1K_1S_1$, T_6:$N_3P_2K_2S_2$,. where, N_1, N_2 and N_3 stand for 120, 160 and 200 kg N ha^{-1} from urea; P_1 and P_2 stand for 125 and 156 kg P_2O_5 ha^{-1} from Triple superphosphate; K_1 and K_2 stand for 110 and 165 kg K_2O ha^{-1} from muriate of potash; S_1 and S_2 stand for 30 and 45 kg S ha^{-1} from gypsum respectively.

After harvesting of plant cane, a ratoon crop was grown following normal agronomic practices for ratooning. Spade shaving of harvested clumps was done within a week of harvesting and the fallow land between the cane rows opened by country plough. Fertilizers were applied in two instalment, whole of P and S and 50% of N and K were applied as side dressing during opening of land and the rest 50% of N and K were applied as top dressing during peak gorwth stage. Other necessary intercultural opeations including weeding, pest control etc were done as and when necessary.

Soil texture was determined by hydrometer method, soil pH was measured in soil water suspension at 1: 2.5 by a glass electrode pH meter, total N was determined by kjeldahl method (Jackson, 1973), organic carbon by Walkley and Black (1947) wet oxidation method, available P was determined by using 0.5 M $NaHCO_3$ extraction in a spectrophotometer. Exchangeable K was determined by 1M NH_4OAc in a flame photometer and available S was determined by turbidimetric method of Bardsley (Black, 1965).

RESULTS AND DISCUSSION

The results of the experiment have been presented in Tables 1,2 and in Figures 1 and 2. Data in Table 1 indicate that the initial soil was very low in organic matter, total N and phosphorus and medium to low in exchangeable K and sulphur. Data on tillering of ratoon cane (Table 2) showed that fertilizer application increased tiller production progressively though the result was insignificant. The highest number of tiller of $141.7x10^3ha^{-1}$ was recorded in the treatment T_5 during first year whereas T_6 treatment produced maximum number of tiller ($137.9x10^3ha^{-1}$) on the following year. It is further evident from the data (Table 2) that application of fertilizers at different rates significantly influenced the number of millable cane production. Application of fertilizer at the rate of 200, 125, 110 and 30 kg N, P_2O_5, K_2O and S per hectare respectively (T_5) significantly produced the highest

number of millable cane in both the year. Kanwar and Kaur (1991) reported that application of 225 kg N, 75 kg P_2O_5 and and 200 kg K_2O ha^{-1} gave significantly superior millable stalk population. Yield of cane was increased with the higher amount of fertilizer upto T_5 treatment and after that there was no further increase in cane yield. It is also seen from the Table 2 and ratoon cane yield significantly increased with the applied fertilizer in both the year and as much as 96.7 and 73.7 TCH was produced in the first and second year experiment respectively.

Table 2. Effect of fertilizer on different growth parameters of ratoon cane.

Cropping year	Treatment	Tiller ($x10^3$ ha^{-1})	Millable cane ($x10^3$ ha^{-1})	Yield (TCH)	Revovery (%)
1991-92	T_1	131.29	87.45	71.77	10.38
	T_2	133.95	91.40	79.06	10.42
	T_3	133.07	91.72	78.43	10.56
	T_4	133-48	95.21	88.07	9.78
	T_5	141.66	101.09	96.66	10.73
	T_6	136.30	97.39	92.44	10.67
LSD (P=0.05)	0.05	NS	5.369	7.474	NS
1992-93	T_1	94.43	53.12	42.50	9.86
	T_2	107.82	65.83	55.96	9.95
	T_3	117.97	74.95	63.71	9.73
	T_4	110.83	73.41	62.39	9.86
	T_5	124.22	86.61	73.62	10.74
	T_6	137.92	83.39	70.88	9.69
LSD (P=0.05)	0.05	NS	26.62	22.49	0.2235

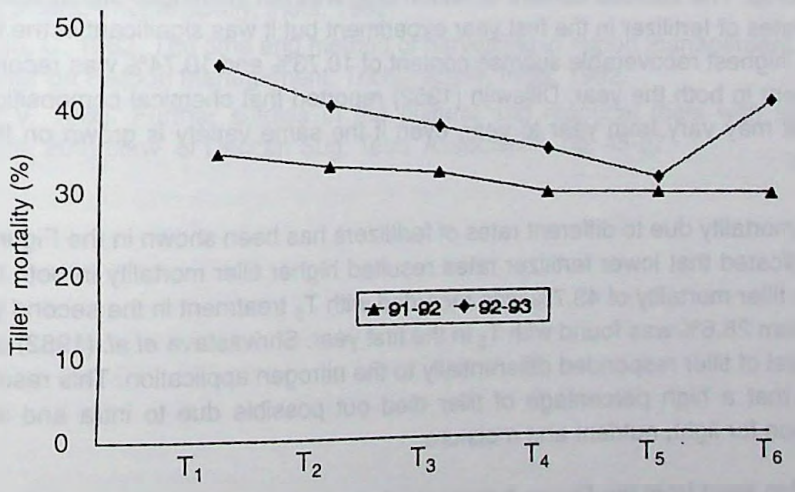

Figure 1. Effects of applied nutrients on tiller mortality of ratoon cane.

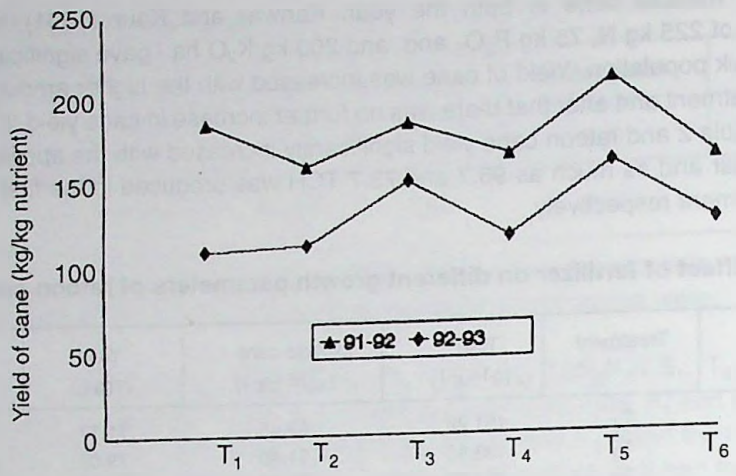

Figure 2. Nutrient use effeciency of applied fertilizers (kg cane/kg nutrient).

This is in confirmity with the findings of Vaidya (1965) where he recommended 300 kg N, 75 kg P_2O_5 and 150 kg K_2O per hectare for maximum ratoon yield. Subramanian (1982) and Thangaraju (1982) suggsted that an additional 20 to 40 kg nitrogen per hectare over the recommended doses of plant crop have to be applied to ratoons in order to make up for the exhaustion caused by the preceding plant crop and to sustain good yield. A cane crop of 100 tonnes per hectare removes approximately 130 kg N, 90 kg P_2O_5, 340 kg K_2O and 60 kg S (Anon., 1989).Thus it leaves depleted soil after harvesting. Therefore, to obtain higher yields of subsequent ratoons from same planting, it is necessary that the soil be replenished with the nutrients that have been removed by the previous crop. The sucrose content of ratoon crop was not influenced significantly due to different rates of fertilizer in the first year experiment but it was significant in the following year. The highest recoverable sucrose content of 10.73% and 10.74% was recorded with T_5 treatment in both the year. Dillewijn (1952) reported that chemical composition of the cane plant may vary from year to year, even if the same variety is grown on the same plantation.

Tiller mortality due to different rates of feritlizers has been shown in the Figure 1. The Figure indicated that lower fertilizer rates resulted higher tiller mortality in both the year. Maximum tiller mortality of 43.7% was recorded with T_5 treatment in the second year and the minimum 28.6% was found with T_5 in the first year. Shrivastava *et al.* (1982) observed that survival of tiller responded differentially to the nitrogen application. This result further indicated that a high percentage of tiller died out possible due to intra and interplant competetion for light, nutrient and moisture.

It is also seen from the Figure 2 that in both the years the fertilizer use efficiency was higher with T_5 treatment. The fertilizer use efficiency was 207.8 and 158.3 kg cane per

kilogramme of added fertilizer to ratoon cane in the frist and second year experiment respectively. From the study it may be concluded that 200 kg N, 125 kg P_2O_5, 110 kg K_2O and 30 kg S per hectare may be useful for ratoon culture in the alluvial soils of Ganges River Floodplain.

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