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Effects of Planting Methods and Seed Setts on the Yield and Quality of Sugarcane

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ABSTRACT

Two planting methods such as(burying sugarcane seed setts under the soil and placing seed setts slantingly at about 40° in the soil with four types of sugarcane seed setts like 2- budded,4-budded, and 6-budded setts and cane tops consisting of two buds were compared for their effects on germination and yield. Germination and tillering were enhanced when seed setts were buried under the soil contributing about 20% and 33%tothe yield of both plant and ratoon crops respectively

Planting methods influenced in reducing sugars and fibre contents of the cane in plant crops .Planting methods affected reducing sugars in the ratoon crop.

Cane tops as seed gave the best germination, the highest number of tillers and millable cane with the heaviest cane in the plant crop. In both plant and ratoon crops, no significant difference in quality was observed among the seed setts.The practical implications of this study for the Nigerian sugarcane farmers are discussed.

INTRODUCTION

A major objective of the Sugarcane Improvement Programme is to increase sugarcane yield not only through breeding of improved varieties , but also through cultural practices. Although much is known about agronomy of sugarcane, the average Nigerian sugarcane farmer has not adopted improved cultural practices .

Most sugarcane farmers have tried various methods of planting and types of seed setts to improve yield. Singh and Kumar (1977) reported that sugarcane, under North Indian conditions,is planted by placing three budded seed pieces horizontally infurrows opened 90cm apart and 20cm deep.They also reported that vertical planting generally increased cane yield when compared with horizontal planting.

Humbert (1968) reported low yield when whole stalks of cane were used as planting material contrary to Lonsdale (1977) who reported that Rhodesian farmers in an effort to conserve labour planted whole stalks and obtained good stands.This was based on the work of Borden (1943) who found shallow planting to be surperior to deep planting.

In Nigeria, farmers plant sugarcane tops slantingly in ridges to conserve the main stalk for chewing. Though the effects on yield and quality have not been determined under Nigerian condition. Since the Nigerian sugar estates are now encouraging farmers to plant sugar cane to feed the mills in order to increase sugar production (Busari,1980). It is necessary to educate the farmers in the correct way of planting and in the choice of planting materials . This investigation was , therefore,undertaken to study the effect of planting methods and types of seed setts on the yield and quality of sugarcane.

MATERIALS AND METHODS

The commercial sugarcane variety Co1001 was planted on 11 March, 1977 on Iwo soil series (pH 6. 3, total N O.10%,organic matter content 1.47% and cation exchange capacity 3.11meq/100g. soil) on the experimental plots of NCRI at Moor Plantation, Ibadan. A randomised complete block design of a 2x4 factorial arrangement in three replicates was used.The two methods of planting were (i) burying seed setts under the soil and (ii) planting slantingly at about 40^{o} in the soil. While the four types of seed setts having cuttings with either 2, 4, or 6 buds and cane top consisting of two buds were used . Ten cane seed setts were planted continuously in rows spaced 1.5m apart. The plot size was 6m x 6m.

Land was prepared with one ploughing and two rotavations. Fertilizers were applied as basal dressings at the rate of 125kg/ha ammounium sulphate, 56kg/ha each of single superphosphate and muriate of potash. The germination counts were recorded 21 days after planting while tiller counts were recorded at 3, 6 and 9 months after planting. Millable canes were recorded at harvest (12 months after planting). Six months after planting and at subsequent sampling dates (9 and 12 months) five stalks were randomly selected from each plot and cut at ground level while the brix was determined with the aid of a hand refractometer. The number of joints was also recorded. Each set of five canes was ground in a Jeffcocutter grinder and 50gm samples of the brei (ground cane) were put into a jar with 100ml alcohol. The alcoholic extracts were later analysed in the laboratory for total and reducing sugars and sucrose content was expressed as the percentage difference between total and reducing sugars. The residue remaining after extraction (the fibre) was expressed as a percentage of fresh weight.

In the ratoon crop, all the operations were the same as in the plant crop except that, there were no ploughing or rotavations and fertilizers were placed around the ratoon stubbles.

RESULTS AND DISCUSSION

The long term average rainfall data show that November to February were dry months throughout the investigation. The germination count 21 days after planting is shown in Table 1. There were significant differences between planting methods and among seed setts($P=0.05$). The highest germination count was for cane tops buried under the soil while the lowest was for the 6-budded setts planted slantingly in the soil.Similar trends were observed for tiller number; the highest was that of cane tops buried under the soil while the lowest was that of 6- budded setts planted slantingly in the soil.

With regards to the millable cane/ha at harvest, there were significant differences between planting methods and among seed setts ($P= 0.05$). The interaction between planting methods and types of seed setts were not significant for either germination, tiller counts and cane number at harvest.

The components of dry matter (sucrose% cane, reducing sugars and fibre% cane) are shown in Table 1. There ware significant differences between planting methods in sucrose and fibre contents of the cane ($P=0.05$). The highest sucrose value was obtained from cane tops buried under the soil while the lowest was recorded from the 6-budded setts planted slantingly in the soil. The highest fibre content was that of 4- budded setts planted slantingly in the soil while the lowest was that of 4-budded setts buried under the soil which was just as low as the value for the cane tops buried under the soil.

For weight of cane,there were significant differences between planting materials (Table 1). The highest cane weight(2140.0g) was harvested from cane tops planted slantingly in the soil

Table 1. Effects of planting methods and seed setts on germination, tiller number, yield and its components in a plant crop.

Planting Material	%Germination* 21 DAP		Tiller No./ Plot 90 DAP		Millable cane No. 000' s/ha		Wt./cane g.		Sucrose % cane		Readucing suguars % cane		Fibre% cane		TCH	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
2-budded setts	32.5	16.3	436	228	52.8	46.9	1948.0	1982.6	20.0	18.9	0.95	1.75	16.2	15.2	74.0	65.0
4-budded setts	25.0	5.6	432	239	58.3	45.0	1929.3	1961.3	20.2	17.5	0.85	1.60	12.5	17.5	84.7	64.8
6-budded setts	12.1	2.5	461	178	50.3	36.1	1988.0	1833.3	18.5	16.5	1.35	1.97	14.7	14.7	67.4	52.9
Cane' tops	54.0	17.5	487	313	75.8	49.4	2060.0	2140.0	20.6	19.7	1.80	1.26	13.0	17.0	91.8	63.7
LSD (P = 0.05)																
Planting materials	4.2		52.3		9.7		90.2		NS		NS		NS		NS	
Methods of planting	7.5		36.9		6.9		NS		NS		0.35		1.3		10.2	
Method XMaterial	NS		NS		NS		45.1		NS		NS		NS		NS	

DAP – Days after planting

1 – Buried under the soil

2 – Planted slantingly in the soil

NS – Not significant

* LSD (P = 0.05) on%germination was calculated from the angular transformed data.

Table 2. Effects of planting methods and seed setts on tiller number, yield and its components in a ratoon crop.

Planting Material	Tiller No./Plot 90 DAH		Millable cane No. 000's/ha.		Wt/cane g.		Sucrose % cane		Reducing Sugars % cane		Fibre % cane		TCH	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2
2—budded setts	436	391	55.8	45.8	986. 7	893.3	16.2	17.0	1.85	0.80	17.2	15.9	55.0	39.7
4—budded setts	513	373	41.9	33.3	1118.0	1103.3	17.0	16.9	2.00	0.15	13.9	16.3	46.4	36.8
6—budded setts	462	305	46.1	35.0	1146.6	981.3	16.9	16.2	0.88	0.58	12.7	13.8	58.5	39.1
Cane tops	527	416	76.9	36.1	1193.3	848.0	17.6	17.3	1.65	1.52	13.5	14.9	73.5	40.6
LSD (P=0.05).														
Planting materials	37.8		9.7		NS		NS		NS		NS		NS	
Method of planting	28.9		6.8		95.1		NS		0.53		NS		7.7	
Method XMaterial	NS		12.8		NS		NS		NS		NS		NS	

1 – Buried under the soil

2 – Planted slantingly in the soil

NS – Not significant

DAH – days after harvesting.

Which was just as high as the value for cane tops buried under the soil (2060.0g) while the lowest (1833.2g) was from the 6-budded setts planted slantingly in the soil.

The differences in weight per cane between the two planting methods (Table 1) may be due to competition for survival among the numerous tillers in treatment where seed setts were buried under the soil which presumably resulted in less weight per cane among the surviving stalks. Setts buried under the soil produced more millable canes and consequently higher yields. Cane tops buried under the soil produced 91.8 tonnes/ha compared to 63. 7 tonnes/ha from cane tops planted slantingly in the soil.

Similar trends were obtained for all the seed setts except the 6-budded sett buried under the soil (Table 1).Significant interactions between planting methods and seed setts were also obtained for weight of cane (P=0.05).

Planting methods significantly affected yield with cane tops buried under the soil giving the highest yield (91.8 tonnes/ha).

There were significant differences in tiller and cane numbers between planting methods and seed setts (Table 2). in the ratoon crop.The tiller number from cane tops buried under the soil was the highest with a significant interaction between planting methods and seed setts.

Regarding the components of dry matter there was no significant difference between planting materials, methods of planting and their interaction (Table 2).

Planting methods significantly affected yields with cane tops buried under the soil giving the highest yield(73.5 tonnes/ha) while the lowest (36.8 tonnes/ha) was that of the 4- budded setts planted slantingly in the soil (Table 2).

Data show that seed setts completely buried under the soil gave better yield than planting slantingly in case of both plant and ratoon crops. Burying seed setts under the soil might have ensured better germination. Slanting method allows only one or two buds to be in contact with the soil resulting in poor germination. Moreover, high temperature and moisture during the month of planting (the average maximum temperature in March 1977 was 36.5°C and the minimum was 23.4°C), may presumably have affected the initial germination of setts planted slantingly in the soil. Gascho *et al.*(1973) demonstrated that with seed setts, temperature lower than 20°C and higher than 35°C decreased the number and height of stalk and consequently cane and sugar yield. In the present investigation germination was enhanced when seed setts were planted in the soil. The available moisture was probably enough to enhance germination where setts were buried completely under the soil.

The number of tillers counted 90 days after planting differed significantly between planting methods and seed setts in both plant and ratoon crops. These findings corroborate the results reported by Singh and Kumar (1977). The interaction effects between planting methods and types of seed setts in terms of millable cane per hectare were significant only in the ratoon crop suggesting that seed setts responded differently to methods of planting. It seems likely that environmental variations may account for the non-significant interactions in the plant crop. However, seed setts buried completely under the soil gave more millable canes per hectare which presumably could be associated with high tiller number obtained at the initial stage of growth. The differences in cane yield may be attributed to the differences in the number of millable canes.

Cane quality was found to differ in reducing sugars between planting methods in both plant and ratoon crops but only in the plant crop for fibre cane. However, the differences found in

sucrose%cane between treatments though minimal could be assumed to be real since the same variety was used and subjected to the same treatments in the experiment. Thus,the sucrose content was higher when seed setts were buried under the soil and conversely lower in terms of fibre content. It may be suggested that cane tops as planting materials buried under the soil produces greater yield and allows stalk to be sold for chewing and processing in the factory.

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