HIGH SEED PROPAGATION RATIOS BY THE USE OF LOW SEED RATES IN SUGARCANE

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ABSTRACT
In an experiment aimed at studying the effects of seed rate on crop-formation and yield of square-planted sugarcane, the output of buds per planted bud was assessed. It was found that, at the age of 15½ months, the stalk population per hectare could reach nearly the normal 100,000 even when buds were planted at 90 x 90 cm spacing. At this spacing the propagation ratio of buds produced to buds planted increased to 172:1.

It is suggested that, in commercial seed-production, two-budded setts could be planted at this spacing and, if good growing conditions were provided, this ratio could be increased to about 200:1. The system could be adopted for the propagation of new clones by agronomists, seed-growers and farmers.

INTRODUCTION
Under commercial conditions, the propagation rate from one crop of sugarcane to the next is usually about 1:20. Scientists of the former Java Sugar Industry tried out various methods of rapidly propagating sugarcane; they suggested the rayungan, the tjeblok, and the seblang methods of propagation (Dillewijn). With rising costs of labour and the shift to mass-handling of material, these techniques have lost their significance.

When seed cane of a new clone first becomes available, it is very necessary to multiply it rapidly at every stage, and a method to do this without using excessive labour is a great advantage. Panje suggested that by reducing the seed rate, it should be possible to increase the rate of propagation of cane considerably. This simple method is neither new, nor ingenious; it is necessarily used by breeders at the first propagation of their seedlings. There seems no reason why it should not be adopted for the earliest stages of propagation of seed material by agronomists, seed-growers and farmers and, therefore, an estimate is attempted of the possible rate of multiplication that can be achieved through low seed rates.

MATERIALS AND METHODS
The assessment of the propagation rate was made in an experiment laid out to study the effect of seed rates on the yield of cane under square-planting conditions. The square spacings employed were 30, 45, 60 and 90 cm and the corresponding seed rates were approximately 110,000, 49,000, 28,000 and 12,000 buds per hectare. There were 3 replications. The crop was planted 1st–4th August 1971 and harvested 23rd–29th November 1972. As single-bud setts are slow in germination and primary shoot growth, 3-node cuttings with the end-buds scratched out were used as seed. Failures of germination were
made good by transplanting nursery-germinated setts of equal age. At harvest all the buds of all the stalks, starting with the bud in the axil of the 4th dewlap leaf from the top were counted. The data were tested by analysis of variance. The crop suffered from a shortage of water during April and May, which may to some extent have depressed the growth and yield.

**TABLE 1.** Sugarcane stalk and bud production under different seed rates.

<table>
<thead>
<tr>
<th>Square-spacings and approximate seed-rates/ha</th>
<th>Critical difference at 1% level</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 x 30 cm</td>
<td>45 x 45 cm</td>
</tr>
<tr>
<td>110 000 buds</td>
<td>49 400 buds</td>
</tr>
<tr>
<td>Stalks produced per meter²</td>
<td>10,0</td>
</tr>
<tr>
<td>Buds per stalk</td>
<td>24,1</td>
</tr>
<tr>
<td>Buds produced per meter²</td>
<td>242</td>
</tr>
<tr>
<td>Stalks produced per planted bud</td>
<td>0,83</td>
</tr>
<tr>
<td>Buds produced per planted bud</td>
<td>21,8</td>
</tr>
<tr>
<td>Stalks produced per effective bud</td>
<td>1,71</td>
</tr>
<tr>
<td>Buds produced per effective bud</td>
<td>40,6</td>
</tr>
</tbody>
</table>

**RESULTS AND DISCUSSION**

The results are given in Table 1. It is observed that with decrease in seed rate, there is a slight fall in stalk population per hectare; the number of buds per stalk also decreases slightly. This is because, as more space becomes available per clump, more tillers of lower age are included in the harvest. But because of greater tillering and better stalk survival per clump, under reduced seed rates, the number of canes and the number of buds produced per bud planted show a striking increase; thus whereas the ratio is 21,8:1 when the seed rate is 110 000 buds/ha, it rises to 171,7:1 when the seed rate is reduced to 12 000 buds/ha. Since the number of clumps at harvest is less than the number of buds planted, the number of buds produced per surviving clump in the 90 x 90 cm spacing rises to 191,7.

At present, seed cane is grown with more or less the same seed rates as ordinary commercial cane. In good crops, up to 100 000 buds are planted and a more or less similar number of stalks are produced per hectare. Assuming each full-grown stalk to have 25 buds, the number of buds produced per planted bud comes to less than 30 whereas with a reduced seed rate, as seen above, a bud can give rise to about 190 buds.

The seed used in the present experiment was 3-node setts with the end-buds scratched out. In an earlier paper, the author (Panje et al.) showed that, under subtropical conditions, in which setts are deficient in moisture, the growth of the functioning buds is promoted when they are provided with additional (auxiliary) internodes/nodes. Under more humid tropical conditions and with adequate irrigation, the effect of such auxiliary internodes or nodes is relatively
less. However, even if allowance is made for the buds scratched out, at the seed rate of 12,000 buds/ha the bud multiplication rate comes to well over 60.

Two other factors which could have affected the results are the drought in April-May 1972, and the longer growing season (15½ months). These would to some extent balance each other in their effect on the ratio. On the other hand, had the cultural conditions been better, buds per stalk could well have been as high as 30, and a ratio of 200:1 could easily have been obtained. Humbert2 quotes a case in which clumps spaced about 150 cm each way had as many as 20 canes each, and the crop yielded about 250 tons/ha in 9 months. The buds-produced to buds-planted ratio in this case may have been as high as 400:1.

It is to be noted that in this method of propagation, it is the seed alone that is economised, not the area of land.

CONCLUSIONS

By using very low seed rates, it is possible to propagate seed material of cane about 200-fold in a year. Under commercial conditions, the best way to raise seed in the tropics would perhaps be to plant 2-budded setts at intervals of 90–100 cm rows 90–100 cm apart, and provide the crop with cultural and nutritional conditions of a high order. The spacing between clumps in the row might have to suit the tillering propensity of the variety.

REFERENCES


ALTAS PROPORCIONES DE SEMILLA DE PROPAGACION OBTENIDAS MEDIANTE EL USO DE BAJAS PROPORCIONES DE SEMILLA EN CANA DE AZUCAR

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RESUMEN

En un experimento llevado a cabo para estudiar los efectos de proporción de semilla sobre la formación de la cosecha y rendimiento de caña de azúcar sembrada en cuadro, se determinó la nacencia de yemas por yema sembrada. Se encontró que a la edad de 15½ meses la población de tallos por hectárea pudiera llegar a casi lo normal de 100,000/ha aún cuando se sembraron las yemas con espacios de 90 x 90 cm. A este espaciamiento la proporción de yemas producidas por yemas sembradas alcanzó 1:172.

Se sugiere que en la producción de semilla comercialmente, se pudieran sembrar semillas con dos yemas a este espaciamiento, y si se le da buen cultivo, esta proporción pudiera aumentarse a más ó menos 1:200. El sistema se pudiera adoptar para la propagación de nuevas variedades por agrónomos, productores de semilla y cañicultores.