A NEW TECHNIQUE FOR PLANTING SUGARCANE IN EGYPT

Mohamed Owais Ahmed Galal

Sugar Crops Research Institute, Agricultural Research Center, Giza, EGYPT

ABSTRACT

Egyptian Farmers traditionally propagate sugarcane using stalk cuttings containing 3 to 4 buds. It takes 5–6 tons of seed cane /feddan (1 feddan = 4200 m²) is consumed for planting. This work was carried out at El-Mattana research station, Luxor Governorate, Egypt to examine replacing cane cuttings with bud chips for crop establishment. The dominant cultivar G.T.54-9 was used in this study. Bud chipping machine was used to prepare bud chips that was planted in trays filled with peat moss and vermiculite mixture, or planted in mini plots near the permanent planting field. Direct set planting (conventional method) was carried out using three budded cane sets planted directly in the main field at the same date of nursery preparation. The study indicated that planting sugarcane using seedlings from bud chips saved about 97% by weight of stalk material. Bud chips planted in trays along with chips planted in mini-plots were statistically higher than conventional method on sprouting and germination percentage. Seedlings arising on tray recorded higher field survival of 95% as compared to those arising on mini plot (82.5%) under field conditions. The study showed that bud chip is a viable and economical planting technique for reducing total sugarcane production costs.

INTRODUCTION

Sugarcane is planted commercially using stalk cuttings or setts (25-30 cm stalk pieces having 2-3 buds each). This method of cultivation is gradually becoming uneconomical as the cost of seed cane used for replanting accounts for over 20 percent of the total cost of production. In conventional system prevailing in Egypt, about 5 – 6 tons of seed cane /feddan (1 feddan = 4200m²) is used as planting material. This large mass of planting material imposes hardship in transport, handling and storage. It also undergoes rapid deterioration that could reduce buds’ viability and subsequently their germination percentage in field.

One alternative to reduce the mass and improve the quality of seed cane would be to plant excised axillary buds of cane stalk, popularly known as bud chips. These bud chips are less bulky, easily transportable and more economical seed material. The bud chip technology holds great promise in rapid multiplication of new cane varieties. According to [1, 2] a small volume of tissue and a single root primordium adhering to the bud are enough to ensure germination in sugarcane. He also stated that, where growing conditions are favorable, cutting with only one bud did well as seed material. Indian sugarcane experts, [3, 4] indicated the feasibility of eliminating the internode part of the seed piece and using only buds for commercial planting. Extensive work has been done using different types of seed cane materials such as single bud settings, bud chip raised seedlings, 1-3 bud setts for crop establishment and then determining the effect of the planting material on growth and yield of sugarcane in India. It was observed that, due to saving in seed material, the maximum net returns were obtained with bud chips raised seedlings [5]. Normally, eight tons of sugarcane is required to plant a hectare of land, if 30 000 three budded setts are used. Instead, if bud chips are used only two to three quintals (200-300 Kg) of material is sufficient which results in a saving of about 96% of cane by weight. This is most economical in the cost of cultivation of the crop and incidentally saves a few million tons of raw material that can be used for extracting sugar rather than been buried in the soil as seed in India as reported by [6]. Earlier studies established that about 80% by weight of the sett-planting seed material could be saved by planting bud chips. [1, 3, 6-10].

This work aims to study the possibility of growing sugarcane from buds chips instead of using whole lengths of cane (setts) under Egyptian conditions.
MATERIALS AND METHODS

The present study was carried out at El-Mattana Research Station, Luxor governorate, Agricultural Research Center, Egypt. The work was conducted during March and April 2015 to examine possibility of planting sugarcane from bud chips instead of using whole lengths of cane setts. A randomized complete block design with five replications was used for the experiment. Means of significant variance were compared using LSD at 5% probability level.

Methods of raising bud chip settlings

Selected fresh harvested stalks (G.T.54-9 variety) free from disease and pests were topped. Leaves were removed and bud chips were excised manually using Bud Chipping Machine following [2, 4] [Figure−1].

Fig: 1. Bud chipper and cutting single budded chips

The average weight of a bud chip was nearly 9g [Figure−2]. Bud chips were then planted either in trays filled with peat moss blended with vermiculite and placed close to the permanent field. Another method was tested by planting the chips in mini-plot nursery near the experimental field. Bud chips were planted in an upright position [Figure−3].

Fig: 2. Left, bud chips; right cane stalks after scooping bud chips
Fig 3. Placing bud chips in upright position: In trays (left) and in mini plot (right)

Fig 4. Covering of mini plots and trays wrapping with polythene sheet

Fig 5. Sprouted bud chips
Bud chips planted in trays filled with peat moss and vermiculite mixture. For mini-plots, a thin soil layer was applied on top. Both planting methods were tightly covered with polythene sheets and keep it for 7-8 days in the same position to protect from cool temperature and maintain suitable humidity [Figure 4]. Within seven days, the polythene sheet cover was removed. The trays with sprouted buds were aligned side by side in beds on the ground to facilitate watering and other nursery management practices [Figures 5, 6]. Fertilizer was applied at the rate of 1g Urea 46% per bud on 15th and 25th day after planting. Healthy seedlings were transplanted in well prepared field after 35 day with row spacing of 100 cm and 30 cm between seedlings [Figure 7, 8].

Fig: 6. Regular watering

Fig: 7. Healthy settling at 35 DAP

Fig: 8. Planting of bud chips raised settling in main field
Direct set planting (conventional method) was carried out using three budded cane sets planted directly in the main field at the same date of nursery preparation.

**RESULTS AND DISCUSSION**

**Bud sprouting and germination percentage in nursery:**

Data in table (1) showed that the treatments effects on sprouting or germination at 35 days was highly significant effect on sprouting and germination percentage.

Bud chips planted in trays along with chips planted in mini-plots were statistically higher than conventional method. The sprouting of bud chip ranged from 19.02-17.55 percent after 15 days and were statistically similar. In addition, the germination percentage reached values of 93.66 and 92.66 % at 35 days for chips planted in mini-plots and trays, respectively [Table– 2 and Figure– 9]. [14] reported such improvement in sprouting and germination of chips. The means of bud chips method was higher than conventional method with an excess amount of 8.43 and 27.66% on sprouting and germination percentage, respectively.

**Table: 1. Mean squares for sprouting and germination% affected by treatments**

<table>
<thead>
<tr>
<th>Source</th>
<th>D.F</th>
<th>Sprouting % At 15 DAP</th>
<th>Germination % At 35 DAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>14</td>
<td>23.46</td>
<td>192.57</td>
</tr>
<tr>
<td>Treatments</td>
<td>2</td>
<td>121.30**</td>
<td>1277.04**</td>
</tr>
<tr>
<td>Replicates</td>
<td>4</td>
<td>6.07</td>
<td>5.00</td>
</tr>
<tr>
<td>Error</td>
<td>8</td>
<td>7.69</td>
<td>15.23</td>
</tr>
</tbody>
</table>

**Table: 2. Average sprouting and germination % affected by treatments**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Sprouting % At 15 DAP</th>
<th>Germination % At 35 DAP</th>
<th>Survival %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mini-plot</td>
<td>19.02</td>
<td>93.66</td>
<td>82.5</td>
</tr>
<tr>
<td>Trays</td>
<td>17.55</td>
<td>92.66</td>
<td>95*</td>
</tr>
<tr>
<td>L.S.D</td>
<td>Ns</td>
<td>Ns</td>
<td>0.97</td>
</tr>
</tbody>
</table>

**Fig: 9. Germination % affected by treatments.**
Table: 3. Mean squares for Survival % affected by treatments

<table>
<thead>
<tr>
<th>Source</th>
<th>D.F</th>
<th>Survival %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>9</td>
<td>46.18</td>
</tr>
<tr>
<td>Treatments</td>
<td>1</td>
<td>390.62**</td>
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<tr>
<td>Replicates</td>
<td>4</td>
<td>4.68 Ns</td>
</tr>
<tr>
<td>Error</td>
<td>4</td>
<td>1.56**</td>
</tr>
</tbody>
</table>

**significant and highly significant at 0.05 and 0.01 probability level. Ns  not significant

Table: 4. Average Survival % affected by treatments

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Survival %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mini-plot</td>
<td>82.5</td>
</tr>
<tr>
<td>Trays</td>
<td>95*</td>
</tr>
<tr>
<td>L.S.D</td>
<td>0.97</td>
</tr>
</tbody>
</table>

Seedling survival in permanent field

In permanent field, survival percentage of tray-raised seedlings significantly surpassed that of mini-plots seedlings (tables 3 and 4). This may be due to possible damage of roots during the extraction of seedlings from the mini-plots. As compared to the ease of removing seedlings from trays. The survival percentage matches or exceeds the value reported by [4] who showed the survival of bud chips raised settling were about 80%. [14] reported that seed cost can be reduced up to 85%. Earlier studies established that about 80% by weight of the sett-planting seed material can be saved by planting bud chips [1-12].

CONCLUSION

The data of this study shows that bud chip technology could a viable and economical alternative in reducing the cost of sugarcane production, if necessary precautions are taken in handling and storage of bud chip seed material and their subsequent multiplication in the field. Normally, 5 to 6 tons of sugarcane is required to plant a feddan of land if 16800 three budded setts are used. However, if bud chips are used only 140-150 Kg of material is sufficient which results in a saving of about 97% of cane by weight. This is economical in terms of the crop cultivation costs. It also saves several thousand tons of raw material that could be used for extracting sugar. This technique would immensely help sugarcane breeders to handle their valuable cane genotypes with less risk, assured survival, and good establishment. Additionally, transporting the bud chips instead of whole stalks from one location to other would greatly reduce its cost and help in propagation of new and improved cane varieties. Seedlings raised in trays is recommended due to their higher survival percentage (95%) in the field.
These initial studies have shown that bud chip technology could be one of the most viable and economical alternatives in reducing the cost of sugarcane production, provided necessary precautions are taken in handling and storage of bud chip seed material and their subsequent multiplication in the field. This technique would immensely help sugarcane development workers to exchange their valuable cane seed with less risk, assured survival, and good establishment. Additionally, transporting the treated bud chips instead of whole stalks from one location to other would greatly reduce the chances of transmission of sett-borne diseases and help in seed multiplication of new and improved cane varieties. Seedlings raised in the nursery by using seedlings arising on trays gave higher survival% (95%) in the field.

CONFLICT OF INTEREST
There is no any form of conflict of interest.

ACKNOWLEDGEMENT
None.

FINANCIAL DISCLOSURE
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REFERENCES