PERFORMANCE OF PROMISING SUGARCANE VARIETIES IN COMPARISON WITH COMMERCIAL VARIETIES

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ABSTRACT
A field trial was conducted at Quaid-e-Awam Agriculture Research Institute (QAARI), Larkana to examine the performance of seven promising sugarcane varieties as compared to two commercial varieties Gulabi-95 and L-116 during 2006-2007. The results revealed that Larkana-2001 showed excellent performance with cane yield of 218.05 m.t ha\(^{-1}\), followed by varieties Chandka and NIA-98 with cane yield of 142.49 and 124.71 m.t ha\(^{-1}\), respectively against the cane yield of 94.16 and 91.66 m.t ha\(^{-1}\) in case of check varieties i.e. Gulabi-95 and L-116, respectively. The cane yield of varieties Triton and CP-43/33 was also promising i.e. 116.66 and 114.99 m.t ha\(^{-1}\), while lowest cane yield of 88.32 m.t ha\(^{-1}\) was recorded in variety HOND 3-34. It was concluded from the study that both the varieties evolved by QAARI Larkana (Larkana-2001 and Chandka) surpassed all rest of the varieties experimented for cane yield, but the brix content was relatively higher in varieties HOND 3-34 and L-116, however, the differences were not so pronounced.

KEYWORDS: Sugarcane, performance, promising, varieties

INTRODUCTION
Sugarcane, \textit{Saccharum officinarum} L., is a giant perennial grass belonging to the family graminaceae. The plant comprised of 73-76\% water and 24-27\% solids, and the soluble solids consist of 75-92\% sugars, 3-7\% salts and the rest free organic acids and other organic non sugar. Sugarcane is one of the most important cash crops of Pakistan as well as of Sindh province. In Sindh province, 31 sugar mills are in function and province has the potential to produce more raw material for more sugar factories (Nazir et al. 2000).

Sugarcane crop is highly water-intensive and an important crop. Sugar production in the country mostly depends on this crop, though a small quantity of sugar is also produced from sugar beet. Its share in value added agriculture and GDP is 3.5 and 0.7 percent, respectively. For 2006-07, the area under sugarcane crop was targeted at 1005 thousand hectares as against 907 thousand hectares of last year. However, sugarcane has been planted in the area of 1029 thousand hectares, 2.4 percent higher than target and 13.5 percent higher than last year. The sugarcane production in Pakistan followed a declining trend and the cane production of 53413 thousand tons in the year 2003-04 came down to 47244 thousand tons in 2004-05, while in 2005-06 it further decreased to 44666 thousand tons. The reduction in cane production was 11.6\% (2004-05) and 5.5 \% (2005-06) over the preceding year. However, in the year 2006-07 the total cane production showed promising trend 54752 thousand tons cane, with the increase of 22.6 percent over the preceding year. The higher sugarcane production is the result of increase in area, timely rains, judicious application of fertilizer, improvement in cultural practice, better management and attractive prices offered by the millers.
In Sindh province sugarcane was cultivated on an area of 214.9 thousand hectares, producing 11263.8 thousand of cane with an average cane yield of 52.4 tons ha\(^{-1}\). Hence, Sindh province has 23.5 percent share in total area of the country and 26.0 percent share in the total cane production (GOP, 2007).

High yielding varieties have a decisive role in getting self sufficiency in local sugar consumption as well as to make surplus sugar to export. At present Sindh province cannot afford further shifting of area of other main crops towards sugarcane. Hence, it is need of the time to plant high yielding and high sucrose content varieties to obtain maximum cane and sugar yields. In Sindh province, though conditions for development of breeding programme are favourable, especially in the coastal belt, but due to non-availability of basic laboratory facilities i.e. green house, photoperiod chamber etc. development of new sugarcane varieties has become difficult. Thus, introduction or development of varieties through selection from the available germplasm collected within the country and from abroad is continued. Keeping in view the importance of high yielding varieties, the present study was carried out to compare the growth and yield performance of some promising sugarcane varieties with local commercial varieties under the agro-ecological conditions of Quaid-e-Awam Agriculture Research Institute, Larkana.

**MATERIALS AND METHODS**

The experiment was conducted in a three replicated Randomized Complete Block Design, having net sub-plot size of 8 x 3 (24 m\(^2\)). Sugarcane is a deep-rooted crop and keeping this in mind a well-worked friable fully pulverized seedbed was prepared. Well-rotten F.Y.M. at the rate of 40 cart loads ha\(^{-1}\) was incorporated in the soil, one month before planting, so as to increase microbial activity of soil organisms and to increase organic matter for the improvement of soil fertility status. The planting of sets was done by dry method with the end to end arrangement. After land leveling operation, the ridges/ furrows were prepared at the distance of 100 cm. The seed sets were placed in the furrows, after covering, the field was irrigated. The planting was done on 10.10.2006. Forty thousand two-budded sets per acre with end to end arrangement were planted in single row system. The irrigation was applied at 7-10 days interval in summer (April- August) and 10-15 days interval in winter (November-March). There was severe irrigation water shortage during this season, hence mostly tubewell water was applied. Sugarcane is long duration and heavy feeder crop with high dry matter content, NPK requirements are quite higher than all other crops. The NPK fertilizers were applied at the recommended dose for upper Sindh (275N+150P+160K kg ha\(^{-1}\)) as 1 bag urea + 2 bags DAP + 2\(\frac{3}{4}\) bags SOP at planting and 1\(\frac{1}{2}\) bag urea at first earthing and 1\(\frac{1}{2}\) bag urea at second earthing. After every fertilization, the crop was irrigated immediately. Weeds were removed from young crop, until the crop became in such height to shed the weeds. The harvesting of sugarcane crop was done when the 1\(\frac{1}{3}\) leaves of the basal portion of the cane became dry and show the tendency of dropping on the ground. The data so collected were analyzed statistically using analysis of variance, and LSD test was applied to discriminate the superiority of the means of different varieties as suggested by Gomez and Gomez (1984).

**RESULTS AND DISCUSSION**

**Germination percentage**

The plant population per unit area is mainly associated with the germination percentage and it has significant effect on the yield ha\(^{-1}\). This significant variation in germination percentage between varieties might be due to the genetic makeup of the parental material of these varieties. It was noted that the differences in germination percentage between varieties were statistically highly significant and varieties Larkana-2001, Chandka, Triton and NIA-98 produced germination of 92.00, 79.75, 74.00 and 73.75 percent, respectively against the germination provided by L-116 (67.75%) and Gulabi-95 (66.00%). The results of the present investigation are in concurrence with those of Khandagave and Satpute (1995), Goswami and Singh (1996) and Sugimoto et al. (2001), who reported significant variation in germination of different sugarcane varieties, while Keerio et al. (2003) and Kadam et al. (2004) were of the experience that germination may vary within varieties due to their genetic makeup or due to climatic conditions because different varieties can behave differentially even under similar climatic conditions.
Cane length (cm)
Cane length is a major yield component and in variety selection criterion this character possesses vital significance. The significant differences in cane length of varieties were mainly associated with genetic makeup of the parental material of these varieties. The results further revealed that varieties Larkana-2001 and Chandka had significantly longer canes i.e. 3.19 and 3.13 metres, respectively followed by NIA-98 with cane length of 2.75 meters against 2.23 and 2.20 meters cane length in L-116 and Gulabi-95 varieties, respectively. These results are further supported by Das et al. (1996) and Singh and Singh (2000), who reported that varieties behave different under different climatic conditions for cane length; while Keerio et al. (2003) and Kadam et al. (2004) found significantly high variation in cane length of different varieties developed under different climatic conditions.

Cane girth (cm)
Cane girth is also one of the most important and yield influencing parameter and varieties even with better in other characters may not be considered if cane girth is less than the criterion level. Cane girth was significantly maximum (3.34 cm) in variety Gulabi-95, followed by Triton, Chandka and Larkana-2001 with cane girth of 3.33, 3.32 and 3.25 cm, respectively. However, minimum cane girth of 2.12 cm was recorded in commercial variety L-116 (control). The situation suggested that the cane girth in all the varieties under experimentation was satisfactory and further experimentation may be carried out to confirm the results. The results of the present investigation are in line with those of Das et al. (1996) and Singh and Singh (2000), who were of the opinion that varieties of different genetic groups behave different even under similar climatic conditions for cane girth; while Keerio et al. (2003) and Kadam et al. (2004) reported that all the varieties in their experiments behaved quite different for cane girth and other yield components.

Number of internodes per cane
Number of internodes per cane generally does not possess position to affect the yields, but it is obvious that tall varieties possess more number of internodes as compared to short ones, probably the internodes provide required stand to the plant. The variation in number of internodes per cane of different varieties may be due to their genetic characteristics or may have association with cane length. The number of internodes was maximum (28 cane\(^{-1}\)) in variety Larkana-2001, followed by Chandka, CP-43/33 and NIA-98 with 25.3, 24.45 and 22.95 internodes cane\(^{-1}\), respectively. The lowest number of internodes (18/cane) was in Triton. The results further revealed that all varieties differed significantly in number of internodes and probably due to the differences in their genetic makeup, such differences were occurred. These results are further confirmed by the findings of Das et al. (1996) and Keerio et al. (2003), who were of the view that internodes in cane enable the plant to grow taller and Kadam et al. (2004) reported that all the varieties in their experiments behaved quite different for number of internodes per cane.

Number of tillers per stool
Number of tillers per stool has vital position and it affects the cane yields per unit area linearly. There was highly significant (P<0.01) influence on the number of tillers per stool due to different varieties. This variation in number of tillers per stool of different varieties may be due to their genetic variability. It is obvious from the results that varieties under experiment were with different genetic makeup and thus tillering capacity also differed significantly. Variety Larkana-2001 showed its superiority for tillering capacity with 11.16 tillers stool\(^{-1}\), followed by 7.79, 7.74 and 7.67 tillers stool\(^{-1}\) in varieties Triton, Chandka and NIA-98, respectively. However, the lowest tillers stool\(^{-1}\) (5.47) were recorded in variety HOND 3-34. The results of the present investigation for number of tillers stool\(^{-1}\) were in agreement to those of Das et al. (1996), Singh and Singh (2000) and Keerio et al. (2003), who have reported significant differences in the number of tillers stool\(^{-1}\) in varieties of different genetic groups. Moreover, they were of the opinion that climatic conditions and soil texture could also affect tillering capacity of a variety.
Cane yield ha$^{-1}$ (kg)
Yield ha$^{-1}$ is always an ultimate objective behind any research effort. The results showed that variety Larkana-2001 proved its superiority to produce highest cane yields of 218.1 m.t ha$^{-1}$, followed by average cane yield of 142.49, 124.71, 116.66 and 114.99 m.t ha$^{-1}$ in case of varieties Chandka, NIA-98, Triton and CP-43/33, respectively. However, the minimum cane yield of 88.32 m.t ha$^{-1}$ was recorded in variety HOND 3-34. The results of the present study are in accordance with those of Khandagave and Satpute (1995), Dora et al. (1996), Das et al. (1996), Singh and Singh (2000), Keerio et al. (2003) and Kadam et al. (2004), whose consolidated achievements suggested that cane yield was significantly different in various varieties, because these varieties were genetically different and thus variation was natural.

Brix content (%)
Brix content refers to total solids in cane juice and generally determined by means of hand reflectometer and approximately half of its quantities are recoverable as commercial cane sugar. The results further revealed that varieties HOND 3-34 had maximum brix content of 22.00%, followed by 21.50, 21.00 and 21.00 percent brix in varieties L-116, Chandka and Larkana-2001, respectively. However, the lowest brix content (18.70%) was recorded in NIA-98. The results regarding brix content achieved in this investigation are in concurrence to those of Dora et al. (1996), Das et al. (1996), Sugimoto et al. (2001), Arul and Prabagar (2003) and Keerio et al. (2003). Their consolidated conclusions suggested that brix content is purely a genetic characteristic and can also varying due to climatic conditions within varieties.

CONCLUSIONS
It was concluded from the study that both the varieties evolved by QAARI Larkana (Larkana-2001 and Chandka) surpassed all rest of the varieties experimented for cane yield, but the brix content was relatively higher in varieties HOND 3-34 and L-116, however, the differences were not so pronounced.

Table-1: Performance of sugarcane varieties evolved by different Research Institutions in varietal trial at QAARI Larkana during 2006-07

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Varieties</th>
<th>Germination %</th>
<th>Cane length (m)</th>
<th>Cane girth (cm)</th>
<th>No.of Internodes cane$^{-1}$</th>
<th>No.of tillers stool$^{-1}$</th>
<th>Cane yield (m.t ha$^{-1}$)</th>
<th>Brix (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Chandka</td>
<td>79.75</td>
<td>3.13</td>
<td>3.32</td>
<td>25.3</td>
<td>7.74</td>
<td>142.49</td>
<td>21</td>
</tr>
<tr>
<td>2.</td>
<td>Nia-98</td>
<td>73.75</td>
<td>2.75</td>
<td>3.02</td>
<td>22.95</td>
<td>7.67</td>
<td>124.71</td>
<td>18.7</td>
</tr>
<tr>
<td>3.</td>
<td>Gulalbi-95 (Check)</td>
<td>66.00</td>
<td>2.20</td>
<td>3.34</td>
<td>21.17</td>
<td>6.09</td>
<td>94.16</td>
<td>20.25</td>
</tr>
<tr>
<td>4.</td>
<td>CP-43-33</td>
<td>67.00</td>
<td>2.17</td>
<td>2.23</td>
<td>24.45</td>
<td>6.87</td>
<td>114.99</td>
<td>19.25</td>
</tr>
<tr>
<td>5.</td>
<td>LARKANA-2001</td>
<td>92.00</td>
<td>3.19</td>
<td>3.25</td>
<td>28.00</td>
<td>11.16</td>
<td>218.05</td>
<td>21</td>
</tr>
<tr>
<td>6.</td>
<td>TRITON</td>
<td>74.00</td>
<td>2.09</td>
<td>3.33</td>
<td>18.00</td>
<td>7.79</td>
<td>116.66</td>
<td>19.25</td>
</tr>
<tr>
<td>7.</td>
<td>HOND3-34</td>
<td>65.5</td>
<td>2.09</td>
<td>2.17</td>
<td>22.3</td>
<td>5.47</td>
<td>88.32</td>
<td>22</td>
</tr>
<tr>
<td>8.</td>
<td>L-116 (check)</td>
<td>67.75</td>
<td>2.23</td>
<td>2.12</td>
<td>20.9</td>
<td>6.84</td>
<td>91.66</td>
<td>21.5</td>
</tr>
</tbody>
</table>

S.E± 0.5612 | 0.0088 | 0.0065 | 0.2781 | 0.0285 | 1.0365 | 0.0295
LSD 0.05 2.0501 | 0.0370 | 0.0171 | 1.1685 | 0.3838 | 2.6081 | 1.2395
LSD 0.01 2.9852 | 0.0508 | 0.0235 | 1.6013 | 0.5251 | 3.6584 | 1.6982
REFERENCES


