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# CANE AND SUGAR YIELD POTENTIAL OF SUGARCANE LINE AEC81-8415

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**Abstract**

Sugarcane line AEC81-8415, generated from the (fuzz) seed of a cross combination of NCo 310 x CP56-614, imported from ARS, USDA, Canal Point, Florida, USA, was primarily selected on the basis of number of stalks per stool, weight per stool and sugar content. This line was significantly ($P \leq 0.05$) superior to check varieties BL4 and L116 in cane and sugar yield.

## Introduction

Sugarcane is an important cash crop of Pakistan (Ahmad *et al.*, 1991; Rahman *et al.*, 1992). The average yield of sugarcane in Pakistan is about 50 t/ha which is the lowest among the sugarcane growing countries of the world (Anon., 1999). Deterioration in the yield potential and resistance to biotic and abiotic stresses of sugarcane cultivar demand their replacement with new improved lines. Selection, hybridization, induced mutation and biotechnological techniques play a vital role in the evolution of improved varieties of crop plants. Sugarcane improvement through hybridization is not feasible in Pakistan because of intricacies in flowering (Malik *et al.*, 1986; Habib *et al.*, 1992). Habib *et al.*, (1991) suggested that introduction and acclimatization form baseline for the cane breeders to develop varieties. The commercial varieties of sugarcane grown in Pakistan are the result of direct introduction of either germplasm from abroad (NCo 310, PR 1000, Triton, CP65-357) or seedlings raised from imported seed (fuzz) (BL4, L116, BF 162, BF 129) by different scientists at various research stations in Pakistan (Malik *et al.*, 1986; Siddiqui *et al.*, 1990; Habib *et al.*, 1991 & 1992). The objective of this study was to evaluate the potential of newly selected sugarcane lines AEC81-8415 for cane and sugar yield in different varietal trials under the agroclimatic conditions of Tando Jam, Sindh, Pakistan.

## Material and Methods

True seed (fuzz) of different crosses of sugarcane was imported from USDA, Canal Point, Florida, USA and grown at Nuclear Institute of Agriculture, Tando Jam. The line AEC81-8415 was selected from the seedlings of the cross NCo 310 x CP56-614. Initially, single row of each seedling was planted and observations were recorded on stalks per stool and sugar content. The yield performance of this line was tested in different yield trials.

Seven sugarcane clones alongwith two checks i.e. BL4 and L116 were evaluated in preliminary yield trial during 1986. The experimental layout was RCBD with 3 replicates. The plot size was 8m x 4m rows one meter apart from each other. Five sugarcane clones alongwith one check i.e., BL4 were evaluated in micro yield trial during 1987. The experimental layout was RCBD with 3 replicates. The plot size was 8m x 6m having 6 rows one meter apart from each other. Six sugarcane clones alongwith two checks i.e., BL4 and L116 were evaluated in major yield trial during 1988 in both the planting seasons i.e., spring as well as autumn plantings. The experimental layout was RCBD with 4 replications. The plot size was 8m x 8m with 8 rows one meter apart in each plot.

Observations on cane yield and sugar content in both the planting seasons were recorded. The cane weight of 10 stalks were the basis of yield for each clones in preliminary yield trial and in micro and major yield trial three rows from each plot for each clone were harvested to record yield data. Three stools were taken at random from each clone. The sugar content in cane juice were determined according to Queensland Lab. Manual (Anon., 1970). Data on cane yield and sugar content were analysed statistically according to Gomez & Gomez (1984). The mean values were compared by using DMR Test at 5% level of significance.

## Results and Discussion

Cane yield: The line AEC81-8415 showed significantly ($P \leq 0.05$) higher cane yield than all the entries in all the yield trials giving 2.09, 24.15, 11.29% increase over BL4 respectively (Table 1, 2, 3 & 4) and 52.88, 56.00 and 57.52% increase over L116 respectively (Table 1, 3 & 4). Yield difference beyond the 10% values reflects its impact on the economic benefit. This line showed 2.09 to 26.23% increase over BL4 and more than 50% increase over L116 in the cane yield. It could suggest that its cultivation will not only increase the cane yield but also increase the sugar yield per unit area in the province of Sindh.

**Table 1. Performance of different sugarcane clones for cane yield and sugar content in preliminary yield trial at NIA, Tando Jam during 1986 (Autumn Planting).**

| Clones | Cane yield (t/ha) | Stalks/stool (nos.) | Weight/ stool (kg) | CCS (%) | CCS (t/ha) |
|---|---|---|---|---|---|
| AEC81-8415 | 136.22a | 6.77bc | 8.69a | 7.07h | 9.63e |
| AEC80-3437 | 116.30c | 7.66b | 8.01ab | 9.50b | 11.05c |
| AEC80-4326 | 108.02e | 7.83ab | 7.44ab | 10.50a | 11.34b |
| AEC80-4725 | 10.06d | 7.66b | 7.49ab | 10.47a | 11.52a |
| AEC81-3029 | 87.89g | 7.27b | 6.05ab | 9.43c | 8.28f |
| AEC81-4411 | 69.11i | 6.97bc | 4.76b | 7.28g | 5.03h |
| AEC81-5206 | 85.02h | 7.77ab | 5.85ab | 7.97e | 6.77g |
| BL4 | 133.42b | 5.30c | 9.19a | 7.52f | 10.03d |
| L116 | 89.10f | 8.38a | 6.13ab | 9.27d | 8.25f |

Different letters showed significant difference at $P \leq 0.05$.

**Table 2. Performance of different sugarcane clones for cane yield and sugar content in micro yield trial at NIA, Tando Jam during 1987 (Autumn Planting).**

| Clones | Cane yield (t/ha) | Stalks/stool (nos.) | Weight/ stool (kg) | CCS (%) | CCS (t/ha) |
|---|---|---|---|---|---|
| AEC81-8415 | 121.05a | 8.33a | 8.94a | 12.13a | 14.68a |
| AEC82-346 | 76.96f | 6.83ab | 4.75cd | 11.53c | 8.87e |
| AEC82-500 | 85.80e | 6.61ab | 4.96cd | 11.99b | 10.28c |
| AEC80-3336 | 69.30g | 6.34b | 3.75d | 10.60e | 7.34g |
| AEC80-3437 | 91.00d | 6.75ab | 5.86bc | 10.17f | 9.25d |
| AEC80-4326 | 103.76b | 6.11b | 6.14b | 8.36f | 8.67f |
| BL4 | 97.50c | 6.28b | 7.39ab | 10.89d | 10.70b |

Different letters showed significant difference at $P \leq 0.05$.

Higher cane yield of AEC81-8415 as compared with the commercial varieties may be due to higher number of stalks per stool (6.77 and 8.33) and weight per stool (8.69 and 8.94 kg) as depicted in Tables 1 and 2, respectively. Singh *et al.*, (1985) reported that number of canes (stalks/stool) were the most important character contributing directly to higher yield. According to Raman *et al.*, (1985), number of stalks was the major contributing factor for cane yield. Quebedeadux & Martin (1986) proposed that both the stalk number and weight should be assessed to have accurate yield potential of the variety.

**Commercial cane sugar: CCS % and CCS t/ha:** Significant ($P \leq 0.05$) differences were recorded for CCS% amongst all the entries under trials. The line AEC81-8415 showed the highest CCS% in micro (12.12%) as well as in major (12.04 %) yield trials (Table 2 and 3). It exhibited 0.52 unit percent increase over BL4 and 0.63 unit percent increase over L116 respectively (Table 3). The data revealed that no entry could compete with AEC81-8415 in sugar yield (CCS t/ha) in micro as well in major yield trial. An increase of 37.19, 16.36 and 22.49% was recorded over BL4 in micro and major yield trial respectively (Table 2, 3 & 4) and 64.69 and 56.17% over L116, respectively (Table 3 & 4).

**Table 3. Performance of different sugarcane clones for cane yield and sugar content in major yield trial at NIA, Tando Jam during 1988 (Spring Planting).**

| Clones | Cane yield (t/ha) | Stalks/stool (nos.) | Weight/ stool (kg) | CCS (%) | CCS (t/ha) |
|---|---|---|---|---|---|
| AEC81-8415 | 182.45a | 9.21a | 10.69a | 12.04a | 21.97a |
| AEC82-5659 | 128.48e | 7.71b | 6.84cd | 10.29f | 13.22f |
| AEC81-2512 | 116.99f | 7.26b | 6.19d | 11.12d | 13.00g |
| AEC81-4516 | 137.50d | 7.83b | 7.44c | 10.72e | 14.74d |
| AEC81-4935 | 145.20c | 7.66b | 7.49c | 10.24f | 14.87c |
| AEC80-3864 | 106.70g | 7.84b | 5.17e | 9.62g | 10.26h |
| BL4 | 163.94b | 5.87c | 8.44b | 11.52b | 18.88b |
| L116 | 116.95f | 7.87b | 5.70e | 11.41c | 13.34e |

Different letters showed significant difference at $P \leq 0.05$.

**Table 4. Performance of different sugarcane clones for cane yield and sugar content in major yield trial at NIA, Tando Jam during 1988 (Autumn planting).**

| Clones | Cane yield (t/ha) | Stalks/stool (nos.) | Weight/ stool (kg) | CCS (%) | CCS (t/ha) |
|---|---|---|---|---|---|
| AEC81-8415 | 165.45a | 7.87b | 8.68a | 10.40d | 17.21a |
| AEC80-2046 | 123.33c | 7.32b | 6.74b | 12.23a | 15.08b |
| AEC80-2826 | 116.95d | 8.11a | 5.66c | 9.20e | 10.75e |
| AEC80-5108 | 85.97f | 7.45b | 5.13c | 9.83d | 8.45f |
| BL4 | 131.07b | 6.42b | 8.65a | 10.68b | 14.05c |
| L116 | 105.03e | 7.87b | 5.88c | 10.50c | 11.02d |

Different letters showed significant difference at $P \leq 0.05$.

Since the increase in cane and sugar yield in our country has been mainly due to an increase in acreage (Hashmi, 1995), therefore evolution of such clones is needed which could increase the cane and sugar yield per unit area (Khan *et al.*, 1997). The AEC81-8415 is a high yielding line and has the potential to enhance the production of cane and sugar per unit area in the province of Sindh.

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