Development and Evaluation of Back Cross Hybrids Involving *Erianthus Spp*

Dr. K. Mohanraj
ICAR-Sugarcane Breeding Institute
Coimbatore, TN
Tropical plant- Cultivated between 30º N and S latitudes

Cultivated in more than 100 countries

80% sugar is from sugarcane

Major countries: Brazil, India, China, Australia

World average productivity of sugarcane is 61 t cane per ha

**India**

<table>
<thead>
<tr>
<th>Year</th>
<th>Area Mha</th>
<th>Yield t/ha</th>
<th>Prod mt</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012-13</td>
<td>5.01</td>
<td>66.20</td>
<td>336.00</td>
</tr>
</tbody>
</table>

**Sugar Production:**
- 526 sugar mills
- 2012-13: 25.14 mt of sugar

Maharashtra, Uttar Pradesh, Karnataka, Tamilnadu
Trends in Area and Productivity of Sugarcane in India

Area '000 ha
Yield t/ha

Year
1990-91
1994-95
1998-99
2002-03
2006-07
2010-11
2014-15
2018-19

Area and yield values are shown in the graph.
Modern sugarcane cultivars are derived from interspecific hybridisation between the domesticated cane *Saccharum officinarum* and the wild species *S. spontaneum*.

Provided major improvements in terms of yield, sugarcane varieties currently under cultivation have a narrow genetic base tracing back to less than 20 *S. officinarum*, two *S. spontaneum* and a couple of *S. barberi* clones.

Imposed serious limitations in making a significant improvement in sugarcane productivity in recent years.
Attempts are being made at all cane breeding stations to broaden and diversify the genetic base of sugarcane through the introgression of wild relatives

Traditionally *S. spontaneum* had been used as a source for imparting high productivity and tolerance to biotic and abiotic stresses in sugarcane varieties

In recent years considerable attention is given to use *Erianthus* spp. which has

- High biomass
- Vigor
- Ratoonability
- Tolerance to drought and water logging
- Resistance to pests and disease
Erianthus arundinaceus
At Sugarcane Breeding Institute, Coimbatore, introgression of *Erianthus* spp. is in progress since 1980’s and a number of intergeneric hybrids had been produced over the years.

**Drawbacks**

- Identification of true hybrids based on morphology
- Sterility in the hybrids
- The hybrids though had more productivity lacked some of the agronomic traits including sugar
Intergeneric hybrids involving *Erianthus*

During flowering season 2004, 85 crosses were made using different *Erianthus arundinaceus* clones (Eri 2385, IK 76-93, IK 76-91, IMP 1547) and improved *officinarum, robustum* and commercial canes) with various combinations

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Cross (2004 series)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PIO 96-441 x ERI-2385</td>
</tr>
<tr>
<td>2</td>
<td>PIO-96-443 x ERI-2385</td>
</tr>
<tr>
<td>3</td>
<td>CoC 671 x IK 76-91</td>
</tr>
<tr>
<td>4</td>
<td>PIR 00-1188 x IK 76-91</td>
</tr>
<tr>
<td>5</td>
<td>CoC-671 x IMP-1547</td>
</tr>
<tr>
<td>6</td>
<td>Co 7201 X IK 76-91</td>
</tr>
<tr>
<td>7</td>
<td>PIO 98-297 X IK 76-91</td>
</tr>
<tr>
<td>8</td>
<td>PIO 98-1115 X IK 76-93</td>
</tr>
<tr>
<td>9</td>
<td>PIO 96-436 X IK 76-91</td>
</tr>
<tr>
<td>10</td>
<td>IND 90-776 x PIO 96-435</td>
</tr>
</tbody>
</table>

27 confirmed intergeneric hybrids involving *Erianthus*
Intergeneric hybrids involving *Erianthus*
Intergeneric hybrids involving *Erianthus*
Gu 04(28)EO-2

Improved *S. officinarum*
2n=104

*E. arundinaceus*
2n=60

Gu 04(28)EO-2
2n=80

PIO 96-435
Mean NMC in intergeneric hybrids

- Erianthus: 145
- OE: 60.53
- RE: 75.29
- EO: 72.00
- CoE: 56.80
- Officinarum: 18
Mean single cane weight in intergeneric hybrids

- Erianthus: 0.35
- OE: 0.33
- RE: 0.42
- EO: 0.35
- CoE: 0.45
- Officinarum: 0.93
Mean brix% in intergeneric hybrids

- Erianthus: 8.42
- OE: 14.16
- RE: 12.26
- EO: 13.92
- CoE: 14.41
- Officinarum: 17.72
Backcrossing

In 2009, 87 crosses were made using the intergeneric hybrids as one of the parents with commercial canes.

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Cross</th>
<th>No. of progenies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(R x E) x Commercials</td>
<td>465</td>
</tr>
<tr>
<td>2</td>
<td>(O x E) x commercials</td>
<td>132</td>
</tr>
<tr>
<td>3</td>
<td>(E x O) x commercials</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>642</td>
</tr>
</tbody>
</table>

188 back cross progenies of intergeneric hybrids involving *Erianthus* were evaluated clonally for juice quality and cane yield traits at 300 and 360 days during 2010.
Mean NMC in Backcrosses of intergeneric hybrids

- RExCo: 82.46
- OExCo: 59.44
- EOxCo: 70.95
- Variety: 50.00
Mean Scwt in Backcrosses of intergeneric hybrids

0.73 0.82 0.78

RExCo OExCo EOxCo Variety

0.33 to 0.45 kgs in F1 hybrids
Mean juice brix % in Backcrosses of intergeneric hybrids

12.26 to 14.41% in F1 hybrids
Variability in backcross hybrids involving *Erianthus*
Yield and juice quality of BC1 hybrids

<table>
<thead>
<tr>
<th>Clone</th>
<th>Stalk ht (cm)</th>
<th>S.girth (cm)</th>
<th>SCW (kg)</th>
<th>Yield t/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC1 mean</td>
<td>190.50</td>
<td>2.17</td>
<td>0.73</td>
<td>91.65</td>
</tr>
<tr>
<td>Co 86032</td>
<td>180.00</td>
<td>2.70</td>
<td>1.20</td>
<td>108.02</td>
</tr>
</tbody>
</table>

53 hybrids had shown better yield than the standard Co 86032.

Only one clone GU 07-5403 had both higher yield and juice quality.

Seven clones viz., GU 07-5403, GU 07-127, GU 07-5512, GU 07-5585, GU 07-5388, GU 07-5536 and GU 07-1740 recorded more than 19% Sucrose @ 360 days.
Further backcrossing/intercrossing with the commercial canes is required to develop agronomically superior sugarcane varieties with *Erianthus* genetic base.
Thank You