2011 Annual Report of the GEM Project

GEM-Raleigh Highlights

Germplasm releases:

- Four GEM lines from the Raleigh program are recommended for release to GEM Cooperators for the 2012 planting year. Yield data can be found on the CD and in the handout for 2011 recommended lines (EXL7). Releases include two lines derived from CIMMYT inbreds (CML413 and CML329), and two from Caribbean accessions (St Croix Group and Cuba 164). The Cuba 164 release (CUBA164:D27-B-017-001) performed equally well on both Stiff-Stalk and non-Stiff Stalk testers.

<table>
<thead>
<tr>
<th>Pedigree</th>
<th>Race</th>
<th>Type</th>
<th>Heterotic Gr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CML413:N18-001-036-002</td>
<td>Mixed (Tropical inbred)</td>
<td>50% Tropical</td>
<td>NSSS</td>
</tr>
<tr>
<td>CUBA164:D27-B-017-001</td>
<td>Mixed (Creole)</td>
<td>50% Tropical</td>
<td>Other</td>
</tr>
<tr>
<td>SCR_Gp3:N14-028-003-B-002</td>
<td>Tusón</td>
<td>50% Tropical</td>
<td>NSSS</td>
</tr>
<tr>
<td>CML329:N18-001-020-001</td>
<td>Mixed (Subtropical inbred)</td>
<td>50% Tropical</td>
<td>NSSS</td>
</tr>
</tbody>
</table>

Germplasm development:

- Overall, there were about 4000 GEM nursery plots and 1100 GEM isolation plots in Raleigh, with additional GEM-related nursery managed by Major Goodman.
- S1 families were developed from two new breeding crosses, BR106:S42 and BR106:N42 and families from twenty-five GEM breeding crosses were advanced from S1 to S3.
- Twenty-three GEM x GEM F1 combinations were produced based on 2010 yield trial data, and S1 bulk seed will be produced in winter nursery.
- Forty-four new breeding crosses were developed between seven tropical inbreds (89291, CML343, CML373, CML423, Ki43, NC296 and TZI8) and ex-PVP inbreds (LH132, NK740, NKH8431, PHV78 and PHW65) and CH732-12, a Canadian inbred. Both groups of inbreds were selected based on performance in yield trials in North Carolina.

Germplasm Evaluation in 2011:

- Overall, approximately 11,000 yield plots were coordinated from Raleigh, with approximately 6000 planted in NC and the rest planted by eight cooperators at various locations throughout the Southeast and Midwest.
- Twenty-four entries were evaluated at thirteen locations in a third-year trial (EXL7), of which four will be recommended for release.
- Seventy-four entries were evaluated in second-year trials, twenty-eight of which will be evaluated in third-year trials in 2012.
- 220 entries were evaluated in first-year trials, sixty-four of which will be evaluated again in 2012.  
- EX25 evaluated the potential of different combinations of ex-PVPs for use as testers in 2010 and 2011, though no combinations outperformed the testers we are currently using (LH132xFR1064 and LH283xLH287).
- Evaluations of GEM releases from Raleigh and Ames were conducted in four experiments in 2010 and 2011 (EX26, EX27, EX28 and EX29) to identify those with the best potential for use in GEM x GEM crosses. EX26 (NSSS releases from Raleigh) and EX27 (SSS...
releases from Raleigh) were planted at locations in the southern Corn Belt and southeast, while EX28 (NSSS releases from Ames) and EX29 (SSS releases from Ames) were planted in North Carolina and the Corn Belt. A subset of the best performing GEM lines from 2010 was planted in the 2011 trials.

- Breeding crosses were crossed on to testers and evaluated for yield potential in two trials, EX54 and EX55. EX54 consists of 50% tropical breeding crosses, while EX55 consists of mostly 25% tropical breeding crosses. Breeding crosses were also evaluated per se in the Raleigh nursery.

**Allelic Diversity:**

- There were over 800 nursery rows dedicated to the development of F1s and BC1s for the Allelic Diversity project and a related PhD project (Ott), along with 300 and 200 rows devoted to those projects in the winter 2010 and 2011 nurseries, respectively.
- Approximately sixty new BC1 families were developed this summer in Raleigh.

**Other GEM-Raleigh recommendations:**

- Based on one year evaluations of breeding crosses in EX54 and EX55, some of the most promising are BR105:GEMN-0097, BR106:GEMN-0097, BR51501:N11a, CML287:GEMN-0155, DKXL380:S08b, CL-G1607:N11, NEI9004:S2817a, and BR105:N1643. CHIS775:S02, a white breeding cross, also performed well.
- Four of the best entries in EX26 were GEMN-0043, GEMN-0104, GEMN-0108, and GEMN-0169, all four of which were not significantly different from the check mean for yield. GEMN-0169 is derived from GEMN-0108. GEMN-0104, GEMN-0108, and GEMN-0169 all performed well in 2011 GLS evaluations at three locations in North Carolina.
- Four of the best entries from EX27 were GEMS-0006, GEMS-0018, GEMS-0027, and GEMS-0032, the last of which was not significantly different from the check mean for yield.
- Four of the best entries from EX28 were GEMN-0095, GEMN-0097, GEMN-0158, and GEMN-0193. GEMN-0097 was particularly good for Y/M.
- Four of the best entries from EX29 were GEMS-0049, GEMS-0052, GEMS-0091 and GEMS-0113, with the latter also performing well in 2011 GLS evaluations at three locations in North Carolina.