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Registration of Twelve Grain Sorghum Genetic Stocks Near-isogenic for the Brown Midrib Genes \textit{bmr}-6 and \textit{bmr}-12

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Registration of Twelve Grain Sorghum Genetic Stocks
Near-isogenic for the Brown Midrib Genes bmr-6
and bmr-12

Twelve grain sorghum [Sorghum bicolor (L.) Moench] genetic stocks, N599 to N610, (Reg. no. GS-128–GS-139, PI 639709–PI 639720) near-isogenic to their wild-type counterparts for the brown midrib genes bmr-6 and bmr-12 were developed jointly by the USDA-ARS, and the Agricultural Research Division, Institute of Agriculture and Natural Resources, University of Nebraska, and were released in May 2005.

The genetic stocks were developed by crossing the recurrent parents Wheatland, Redlan, RTx430, BTx623, BTx630, and BTx631 to the brown midrib sources N121 (bmr-6) and F220 or F324 (bmr-12, donated to our project by the late Robert Kalton). Crossing was facilitated by the use of the nuclear male-sterility gene Ms3 with three to four cycles of backcrossing and selfing to recover the recurrent parent phenotype. Following the final backcross, the lines were selfed and advanced head-to-row for four generations to fix the brown midrib genes in the homozygous recessive condition (bmr-6 bmr-6 or bmr-12 bmr-12) and the male-sterility genes in the male-fertile condition (Ms3 Ms3). The brown midrib near-isolines were selected for similarity to the wild-type phenotype and for male fertility. The near-isolines were crossed to A1 cytoplasmic male-sterile lines to evaluate fertility restoration. Lines that maintained sterility (B-lines) were converted to cytoplasmic male-sterile A-lines by crossing them to their A-line wild-type counterparts and recovering the brown midrib lines in A1 cytoplasm after a minimum of four additional backcross generations. The genetic stocks resemble the recurrent parent with descriptive information shown in Table 1.

Release of these genetic stocks makes brown midrib genes known to reduce activity of two specific enzymes important in lignin synthesis, cinnamyl alcohol dehydrogenase (bmr-6) and O-methyltransferase (bmr-12), available in diverse near-isogenic grain sorghum backgrounds. This will allow direct comparison of gene effects across these backgrounds. They have immediate application for basic research involving lignin synthesis and also may be utilized as germplasm for development of improved brown midrib lines and hybrids.

Since genetic drift may have occurred within the recurrent parent inbred lines during multiple generations of maintenance at Lincoln, NE, seed of the recurrent parents used by this project will be distributed with the genetic stocks to maximize similarity of nuclear genes in each set of lines in the various backgrounds. Seed of these genetic stocks will be maintained and distributed by the USDA-ARS, Wheat, Sorghum, and Forage Research Unit, Department of Agronomy, University of Nebraska, Lincoln, NE 68583-0937, and will be provided without cost to each applicant on written request. Genetic material of this release will be deposited in the U.S. National Plant Germplasm System where it will be available for research purposes, including development and commercialization of new varieties or cultivars. It is requested that appropriate recognition be made if this germplasm contributes to the development of a new breeding line, variety, or cultivar.

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Table 1. Genetic stock designations, recurrent parent, brown midrib gene, and descriptive characteristics of sorghum brown midrib near-isolines averaged over four environments.‡

<table>
<thead>
<tr>
<th>PI</th>
<th>Genetic stock</th>
<th>Recurrent parent</th>
<th>Brown midrib gene</th>
<th>Brown midrib source</th>
<th>Days to anthesis§</th>
<th>Height†</th>
<th>Fertility reaction§</th>
<th>Plant color</th>
<th>Caryopsis color</th>
<th>Endosperm</th>
<th>Testa</th>
<th>Awns</th>
<th>Culm</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1639709</td>
<td>A/BN599</td>
<td>Wheatland</td>
<td>bmr-6</td>
<td>N121</td>
<td>68b</td>
<td>101a</td>
<td>B</td>
<td>purple</td>
<td>red</td>
<td>normal</td>
<td>no</td>
<td>no</td>
<td>juicy</td>
</tr>
<tr>
<td>P1639710</td>
<td>A/BN600</td>
<td>Wheatland</td>
<td>bmr-6</td>
<td>F220</td>
<td>71a</td>
<td>101a</td>
<td>A/B</td>
<td>purple</td>
<td>red</td>
<td>normal</td>
<td>no</td>
<td>no</td>
<td>juicy</td>
</tr>
<tr>
<td>P1639711</td>
<td>A/BN601</td>
<td>Redlan</td>
<td>bmr-6</td>
<td>N121</td>
<td>73b</td>
<td>119c</td>
<td>A/B</td>
<td>purple</td>
<td>red</td>
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<td>no</td>
<td>juicy</td>
</tr>
<tr>
<td>P1639712</td>
<td>A/BN602</td>
<td>Redlan</td>
<td>bmr-6</td>
<td>F324</td>
<td>75a</td>
<td>135a</td>
<td>A/B</td>
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<td>red</td>
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<td>no</td>
<td>juicy</td>
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<td>A/BN603</td>
<td>BTx623</td>
<td>bmr-6</td>
<td>N121</td>
<td>66c</td>
<td>116c</td>
<td>A/B</td>
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<td>no</td>
<td>no</td>
<td>juicy</td>
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<tr>
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<td>bmr-6</td>
<td>F324</td>
<td>75a</td>
<td>119b</td>
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<td>110c</td>
<td>A/B</td>
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<td>129a</td>
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<td>F220</td>
<td>75a</td>
<td>121c</td>
<td>A/B</td>
<td>white</td>
<td>normal</td>
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<td>no</td>
<td>no</td>
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<td>N609</td>
<td>RTx430</td>
<td>wild type</td>
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<td>74b</td>
<td>121c</td>
<td>R</td>
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<td>RTx430</td>
<td>wild type</td>
<td>F220</td>
<td>77a</td>
<td>137a</td>
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<td>purple</td>
<td>yellow</td>
<td>normal</td>
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<td>no</td>
<td>no</td>
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</tbody>
</table>

‡ Environments were Ithaca and Lincoln, NE in 2002 and 2003.
§ Means within recurrent parent set followed by different letters differ at P = 0.05 using an F-protected LSD.
¶ Fertility reaction to A1 cytoplasmic male-sterile cytoplasm: A/B = male-sterile/maintainer pair, R = fertility restorer.
¶¶ The BTx630 recurrent parent seed source used was discovered to be segregating for wild-type and waxy phenotype.
# SE, standard error.