REGISTRATION OF KP6BR SORGHUM GERMPLASM
(Reg. No. GP 21)

H. L. Hackerott, T. L. Harvey, and W. M. Ross

THE Kansas Agric. Exp. Stn. and the ARS-USDA released in 1974 a grain sorghum, Sorghum bicolor (L.) Moench, random-mating population, KP6BR homozygous resistant to greenbugs, Schizaphis graminum (Rondani). It is a broad-based synthetic using the genetic male-sterile factor antherless (al), and the greenbug resistance in Sorghum virgatum (Hack.) Stapf. (T.S. 1636). This same resistant source was used in developing KS30 and KS41 to KS44, earlier greenbug-resistant Kansas germplasm releases.\(^1\)\(^2\) Greenbug resistance from this source is simply inherited and appears to be dominant when seedling survival is the evaluation criterion. However, homozygous plants are more resistant to greenbug injury than are heterozygous plants. Tolerance is the main component of resistance, with antibiosis and/or nonpreference also present.

The development of KP6BR began in 1969, the year after the C-biotype greenbug was recognized as a sorghum pest in the USA. Greenbug-resistant, cytoplasmic-genetic male-sterile BC\(_2\)F\(_4\) plants with 'Combine Kafir-60' as the recurrent parent were crossed with males from KP1BR. The recipient population (KP1BR), then in its first generation of random mating, is a limited backcross composite of 217 grain and forage sorghum cultivars and breeding lines commonly used in the USA. Antherless had been introduced into KP1BR from Combine Kafir-60 and 'Martin' genetic backgrounds. Antherless plants from KP1BR, in its second generation of random mating, were crossed with the F\(_1\) plants derived from crossing donor plants with KP1BR. The resulting greenbug-resistant F\(_2\) segregates were mated to antherless plants in KP1BR, then in its third generation of random mating.

The double-heterozygotes from the third random mating generated an F\(_2\) population from which dwarf (combine height), fertile plants were selected. In 1973, 100 F\(_3\)'s, homozygous for greenbug resistance but segregating for antherless, were identified and randomly mated in isolation. Tall plants were rogued before they shed pollen. Plants showing disease symptoms indicated by maize dwarf mosaic virus were eliminated before harvest.

Seed was composited in equal amounts from 1,000 fertile plants and 1,000 antherless plants. Seeds from the fertile and antherless composites were then blended in the ratio of 3 fertile to 1 antherless. These formulated the homozygous greenbug-resistant, random-mating population (KP6BR) with a gene frequency of 0.5 for the al gene. The antherless male-sterile plants are easily recognized at harvest. The low seed set on antherless plants may be a disadvantage in evaluating grain yields of progeny in random mating schemes. Both B and R fertility types can be extracted from this population with a gene frequency of 0.6 for the B fertility type.

A composite of 100 homozygous greenbug resistant F\(_3\)'s were isolated from random fertility F\(_2\) plants in the third generation. Their mean grain yields were compared with hybrid control cultivars at two locations.\(^3\) The results are as follows:

<table>
<thead>
<tr>
<th>Hybrid or population</th>
<th>Hays, Kan.</th>
<th>Mead, Neb.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS 626</td>
<td>6,018 (100)</td>
<td></td>
</tr>
<tr>
<td>RS 671</td>
<td>5,536 (92)</td>
<td></td>
</tr>
<tr>
<td>KP6BR (resistant bulk)</td>
<td>4,204 (70)</td>
<td></td>
</tr>
<tr>
<td>KP6BR (susceptible bulk)</td>
<td>4,200 (70)</td>
<td></td>
</tr>
</tbody>
</table>

These data show that the yield of KP6BR is about 75% as productive as the hybrid controls. Moreover, the resistant and nonhybrid populations did not differ in performance. The performance of component lines of the two populations differ significantly, showing wide variability within each population for agronomic performance. Grain yields and other traits of entries within populations differed significantly, showing genetic variability for unselected characters, enhancing genetic recombination, and permit superior germplasm to be isolated. Other greenbug resistant sources and elite breeding lines can be introgressed into KP6BR. It is the first greenbug-resistant, random-mating sorghum population to be registered.

The random-mating approach will lead to new gene combinations that may protect sorghum more effectively from greenbugs. Greenbug resistance has been improved lines by back-crossing. However, modification to either the recurrent or nonrecurrent can limit the expression of resistance or of a desired trait. Random-mating sorghum populations conserve genetic variability for unselected characters, permit superior germplasm to be obtained, and elite sources can be introgressed into KP6BR. It is the first greenbug-resistant, random-mating sorghum population to be registered. Small seed lots of KP6BR may be obtained from the Kansas Agric. Exp. Stn., Hays, KS 67601.

Registered by the Crop Sci. Soc. of America and the Kansas Agric. Exp. Stn. at Fort Hays Branch Stn., Hays, KS 67601.


\(1\) Unpublished data. M. S. Thesis, Univ. of Nebraska, Lincoln.