

## DEVELOPMENT OF CYST NEMATODE-RESISTANT SOYBEAN POPULATION S89-3151

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### Abstract

A soybean [*Glycine max* (L.) Merr.] population (S89-3151) has been developed by intermating nine different soybean plant introductions (PIs) using genetic male sterility. The PI lines carried resistance to two or more races of soybean cyst nematode (*Heterodera glycines* Ichinohe). Soybean population S89-3151 is available for distribution for research and developmental purposes.

**F**ORTY-FIVE plant introductions of soybean were identified to be resistant to Race 3 of the soybean cyst nematode (Anand and Gallo, 1984). Of these 45, 13 were also resistant to Race 4, and 10 were also resistant to Race 5. The line PI 437654 was determined to be resistant to Races 1 through 5 of SCN (Anand et al., 1988). In subsequent studies (Anand, 1991), PI 437654 was found to be resistant to all known races of SCN. Analysis of the genetic relationships among the PI lines indicated that some of the resistant soybean lines carried different loci for resistance to Races 3 and 5 (Rao-Arelli and Anand, 1988; Anand and Rao-Arelli, 1989). To combine resistance from multiple sources, a soybean population was developed that provides a broad genetic base of SCN resistance for use in breeding and genetic studies.

### Materials and Methods

Soybean lines that were regarded resistant to Race 4 are now considered resistant to Race 14 based on new classification system (Riggs and Schmitt, 1988). Nine soybean PI lines: 'Peking' (resistant to Races 1, 3, and 5), PI 88788 (Races 3 and 14), PI 90763 (Races 1, 2, 3, and 5), PI 437655 (Races 3 and 14), PI 89778 (Races 3 and 5), PI 404166 (Races 3 and 5), PI 209332 (Races 3 and 14), PI 438503A (Races 3 and 14), and PI 437654 (Races 1, 2, 3, 4, 5, 6, 9, and 14) were selected on the basis of their differences in resistance to SCN races and maturity. These lines were crossed to a genetic male-sterile line developed from 'Ogden' × N69-2774, which was obtained from J.W. Burton of North Carolina State University, Raleigh. Line N69-2774 had the male-sterile gene *ms1* reported from North Carolina (Brim and Young, 1971). The male-sterile line was used as the female parent.

**Abbreviations:** PI, plant introduction; SCN, soybean cyst nematode.

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The  $F_2$  seeds of the nine crosses were composited and planted in isolation at the Delta Center of the University of Missouri at Portageville. Only seed of male sterile plants, which developed from out-crossing, were harvested. The male-sterile plants were recognized at maturity by their poor seed set and retention of leaves. Generations of intermating alternated with generations of selfing, in which  $F_1$  seeds from the male-sterile plants were planted and  $F_2$  seeds from male-sterile plants were harvested. Intermating was practiced to develop new gene combinations. The  $F_2$  population was always planted in isolation and bordered by a mixture of the resistant lines.

Following the third generation of intermating in 1987, the  $F_1$  seeds from male-sterile plants were planted in 1988. Approximately 200 male-fertile plants were harvested and threshed individually. Progeny of each plant were screened for SCN Races 3, 5, and 14, and ≈100 plants resistant to one or more races were selected. In 1989, single-plant progenies were grown and an equal quantity of seeds from each fertile plant was bulked and designated as S89-3151. The  $F_3$  generation is expected to segregate in the ratio of 5 male fertile to 1 male sterile.

### Results and Discussion

Soybean population S89-3151 is variable in several characters. The individual plants range in maturity from Maturity Group III through Maturity Group VI. The seed color may be black, brown, green, yellow, or various shades of these. S89-3151 has both determinate and indeterminate plants, and the height may vary from 50 to 125 cm. S89-3151 should provide a broad spectrum of resistance to SCN for soybean cultivar development.

Approximately 3 kg of seed of S89-3151 is available for distribution. Five hundred seeds of S89-3151 will be given free of charge on request. There will be no restriction imposed by the University of Missouri on the use of the material except to acknowledge the source if the germplasm contributes to the development of a cultivar or a new germplasm.

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