

also the seed parent of several private sector hybrids, including at least one dwarf hybrid, produced and marked by private seed companies in India. From 1993 to 1998, ICRISAT supplied 358 kg of 842A breeder seed and 135 kg of 842B breeder seed to public- and private-sector seed producing agencies in India. Seed stocks of 842A and 842B will continue to be maintained and distributed in germplasm amounts by ICRISAT, under the terms and conditions of the relevant ICRISAT Breeding Material Transfer Agreement.

## Reference

**Burton, G.W. 1969.** Registration of pearl millet inbreds Tift 23B<sub>1</sub>, Tift 23A<sub>1</sub>, Tift 23DA<sub>1</sub> and Tift 23DB<sub>1</sub> (Reg. Nos. PL 1, PL 2, PL 3, and PL 4). *Crop Science* 9:397.

## Pearl Millet Parental Lines 843A and 843B

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Pearl millet (*Pennisetum glaucum* (L.) R. Br.) parental line 843B is the inbred maintainer of cytoplasmic-nuclear male-sterile line 843A. Original seed stocks of these two lines, initially developed and designated as BKM 2068 and AKM 2068 by WD Stegmeier at the Fort Hays Branch Experiment Station, Kansas State University, USA, were introduced to ICRISAT-Patancheru in 1980 by D J Andrews. Their reselected versions, named at ICRISAT as ICMB 2 and ICMA 2, have been widely disseminated by ICRISAT since 1984 as 843 B and 843A, respectively.

BKM 2068 was developed by nine generations of pedigree selection in a population derived from the first backcross of Tift 23D<sub>2</sub>B<sub>1</sub> to PI 185642. Tift-23D<sub>2</sub>B<sub>1</sub> is a maintainer line of Tift 23D<sub>2</sub>A<sub>1</sub>, developed at Coastal Plain Experiment Station, Georgia, USA (Burton 1969), PI 185642, collected in 1949 from a market in Kumasi,

Ghana, was supplied by the Southern Region, Plant Introduction Experiment Station, Georgia, in 1971. The BC<sub>1</sub>-derived line was crossed onto Tift 23D<sub>2</sub>A<sub>1</sub>, and during the course of developing BKM 2068 seven successive generations were concurrently backcrossed into the sterile cytoplasm of Tift 23D<sub>2</sub>A<sub>1</sub> to develop AKM 2068. At this stage, AKM 2068 and BKM 2068 were introduced to India by ICRISAT-Patancheru. When grown in a pearl millet downy mildew [caused by *Sclerospora graminicola* (Sacc.) J Schrot.] disease nursery at Patancheru, seed stocks of these lines displayed variability for reaction to this most devastating disease of pearl millet in India. Two generations of pedigree selection for downy mildew resistance in BKM 2068 and concurrent plant x plant backcrossing onto disease-free plants of AKM 2068 produced 843A and 843B, which had 2% disease incidence compared to 10% in AKM 2068 and BKM 2068 (and 55% in susceptible control NHB 3). While 843A and 843B had improved levels of pearl millet downy mildew resistance, their other phenotypic characteristics remained similar to those of AKM 2068 and BKM 2068.

Male-sterile line 843 A has stable male sterility across seasons and sites, and is otherwise phenotypically similar to 843B. Both lines have fairly good open-pollinated seedset, but this is seldom complete. Maintainer line 843B is a prolific pollen producer and has average-to-good seedset under selfing. Panicles of both 843A and 843B have small female-sterile sectors but this trait is not expressed in their hybrids. These short-statured *d*<sub>2</sub> dwarf lines are the earliest commercial seed parents of pearl millet hybrids produced so far anywhere in the world, averaging plant heights of 95 cm and 42 days to reach 50% flowering across locations in India during the rainy season. They have a semispreading growth habit, produce 12 cm long candle-shaped panicles with naked pinkish tips, and have excellent panicle exertion. Plants generally produce 3-4 panicles plant<sup>-1</sup>, with large grains (11-12 g 1000<sup>-1</sup>) of globular shape and light grey color. Further, these lines have dominantly inherited nonhairy leaf sheaths and leaf blades; dominantly inherited light reddish plant base and node (when it is exposed to sunlight) pigmentation; and recessively inherited nonhairy leaf margins and nodes.

Male-sterile line 843 A is the seed parent of the earliest maturing (65-70 days to maturity) public-sector hybrid (HHB 67) released to date in India (Kapoor et al. 1989). HHB 67 was developed by CCS Haryana Agricultural University and released in 1990 for cultivation in all pearl millet growing zones of India. This hybrid is especially popular in the arid to semi-arid margins of the

2. In memoriam of Dr W D Stegmeier, deceased 25 July 1998.

pearl millet tract in northwestern India. 843A is also the seed parent of released hybrid RHB 30, developed by Rajasthan Agricultural University, and at least three additional hybrids produced and marketed by private seed companies in India. During 1991 to 1997, ICRISAT supplied 780 kg of breeder seed of 843 A and 396 kg of breeder seed of 843B to both public- and private-sector seed agencies in India. Since 1998, ICRISAT has turned over responsibility for breeder seed production and supply of 843A and 843B to the Andhra Pradesh State Seeds Development Corporation Ltd. (Registered Office: 5-10-193 2nd Floor, HACA Bhavan, Opp. Public Gardens, Hyderabad 500 004, Andhra Pradesh, India). Nucleus seed stocks of 843A and 843B continue to be maintained and distributed by ICRISAT, in germplasm amounts, under the terms and conditions of the relevant ICRISAT Breeding Material Transfer Agreement.

Maintainer line 843B has been extensively used as a promising elite germplasm for seed parents breeding in India. For instance, of the 49 promising seed parents produced by ICRISAT-Patancheru during 1981 to 1998 and disseminated to pearl millet hybrid breeding programs in India, 37 involve 843B as one of the parents in their pedigrees.

Finally, because of its relatively photoperiod-insensitive early flowering, high tillering capacity, compact plant size, and prolific pollen production, 843B is the pearl millet genotype of choice for use in wheat dihaploid production (Inagaki and Hash 1998).

## References

- Burton, G.W. 1969.** Registration of pearl millet inbreds Tift 23B<sub>1</sub>, Tift 23A<sub>1</sub>, Tift 23DA<sub>1</sub> and Tift 23DB<sub>1</sub> (Reg. Nos. PL 1, PL 2, PL 3, and PL 4). *Crop Science* 9:397.
- Inagaki, M.L., and Hash, C.T. 1998.** Production of haploids in bread wheat, durum wheat and hexaploid triticale crossed with pearl millet. *Plant Breeding* 117:485-487.
- Kapoor, R.L., Kakkur, P.S., Khairwal, I.S., Baniwal, C.R., Nijhawan, D.C., and Yadav, H.P. 1989.** Bajra hybrid HHB 67—a major breakthrough. *Haryana Farming* XVIII(6)M 7, 21.

## Release of NM-1 and NM-2, Two Sets of Dwarf Grain Pearl Millet A<sub>1</sub> and A<sub>4</sub> Cytoplasm Seed Parents and their B-lines

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The pearl millet breeding program in the Department of Agronomy, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln, in May 1998 released two sets, NM-1A<sub>1</sub>/NM-1A<sub>4</sub>/NM-1B and NM-2A<sub>1</sub>/NM-2A<sub>4</sub>/NM-2B, of pearl millet (*Pennisetum glaucum* (L.) R. Br.) cytoplasmic-nuclear male-sterile (cms) dwarf grain-type seed parents (A-lines) and their maintainer (B-line) counterparts.

NM-1B (90PV0293B) and NM-2B (92M59022B) were both derived from 1984 F<sub>2</sub> selections at the Department of Agronomy Farm at the University of Nebraska's Agricultural Research and Development Center (ARDC), Mead, from a cross between ICMB 1 - 81B (a downy mildew resistant dwarf B-line from ICRISAT) and KS 79-2068B (a dwarf B-line developed by W D Stegmeier, Kansas State University, Hays). Pedigree selection was continued to F<sub>15</sub> for both lines. NM-1 B, when testcrossed as a F<sub>6</sub> selection with Tift 23DA<sub>1</sub>E<sub>1</sub> (an A<sub>1</sub> cytoplasm early dwarf A-line from USDA-ARS and University of Georgia, Tifton) in the 1988 winter nursery near Puerto Vallarta, Mexico, gave a male-sterile reaction. Backcrossing was continued to the BC<sub>9</sub> generation to obtain complete uniformity between the male-sterile A<sub>1</sub> cytoplasm A-line and the maintainer B-line. NM-2B was testcrossed as a F<sub>7</sub> selection with Tift 23DA<sub>1</sub>E<sub>1</sub> in the 1989 Puerto Vallarta winter nursery, and backcrossing to develop the A<sub>1</sub> cytoplasm A-line was continued to the BC<sub>10</sub> generation. Both NM-1B and NM-2B were also crossed to Tift 23DA<sub>4</sub>E<sub>1</sub> in 1992 and backcrossed five generations to obtain an A<sub>4</sub> cytoplasm version of each line.

NM-1B is an early, dwarf, synchronous tillering inbred that averages 76-95 cm in height at maturity and flowers 56-64 days after early to mid-June sowings. NM-1B has ovate-shaped, dull gray seeds (11 g 1000<sup>-1</sup>) and yellow anthers. NM-2B is an early, dwarf, synchronous tillering inbred that averages 66-78 cm in height at maturity and flowers 58-65 days after early to mid-June sowings. NM-2B has ovate-shaped, bright gray seeds (10 g 1000<sup>-1</sup>) and yellow anthers. Pest and disease reactions of these lines have not been determined.