

Paulo, Brazil, developed Catu. A 442 was developed from a single-cross interracial population: Carioca/Guanajuato 31' (synonym G 2618 and PI 608383). A 442 has medium cream-striped seed, *I* gene resistance to BCMV, resistance to anthracnose, and a Type III growth habit. Higuerrillo (synonym G 811) is a landrace from the highlands of Mexico from the common bean race Durango. Higuerrillo has medium-sized pinto-colored seeds, Type III growth habit, and resistance to ALS and anthracnose, but lacks resistance to BCMV. All parental genotypes were developed at CIAT except Catu and Higuerrillo. Population BZ 5845 was selected at CIAT-Quilichao, which has a 24°C mean growing temperature, 990-m elevation, and 1750-mm rainfall. Soil type was a very fine kaolinitic, isohypothermic, plinthic Kandiodox, with pH of 4.5. MAR 1 originated from a single plant selection in the F<sub>2</sub>, followed by bulk selection in F<sub>3</sub> and F<sub>4</sub>. MAR 1 has medium-sized (28 g 100 seed<sup>-1</sup>) cream-speckled seed, purple flowers, and a Type III growth habit. MAR 1 flowered in 42 d and matured in 80 d in Colombia.

MAR 2 was developed at CIAT-Popayán. MAR 2 was derived from a single-cross population: AR 3782 = A 252/ 'Ecuador 299' (synonym G 5653). A 252, in turn, was selected from an interracial single cross population: Carioca/Guanajuato 31. A 252 has a Type III growth habit, small cream-striped seed, and resistance to anthracnose, BCMV (*I* gene), and some species of root-knot nematode (*Meloidogyne* spp.). Ecuador 299 has a Type IV growth habit, medium-sized light purple seed, and resistance to ALS, anthracnose, and rust, but lacks resistance to BCMV. The population AR 3782 was mass-selected in the F<sub>2</sub>, F<sub>3</sub>, and F<sub>4</sub>, followed by a single plant selection in F<sub>5</sub>. The entire F<sub>6</sub> plant-to-progeny row, without counting number of plants, was bulked to form the initial seed stock for MAR 2. MAR 2 has cream-striped seed, white flowers, and a Type III growth habit. MAR 2 is insensitive to long photoperiod, but, like MAR 1, flowered in 42 d and matured in 80 d in Colombia. The ALS resistance in MAR 2 to race 63.39 of *P. griseola* is controlled by a single dominant gene that is linked in coupling phase with random amplified polymorphic DNA marker OPE-04 at 5.8 cM (Ferreira et al., 2000).

MAR 3 was developed at CIAT-Popayán and selected from a single-cross population: MX 5042 = A 321/Higuerrillo. High-yielding low-soil-fertility-tolerant A 321 was developed from a three-way population: BAT 562//G 7474/Guanajuato 31. A 321 is highly resistant to anthracnose, has *I* gene resistance to BCMV, small cream seed, and a Type III growth habit. Thus, both MAR 1 and MAR 3 have Higuerrillo in their pedigree, and Guanajuato 31 is present in the pedigree of MAR 2 and MAR 3. Population MX 5042 was mass-selected in F<sub>2</sub> and F<sub>3</sub>, followed by single plant selection in F<sub>4</sub>. The F<sub>5</sub> plant-to-progeny row was bulked and seed increased in the subsequent generation to obtain the seed stock for MAR 3. MAR 3 has a Type III growth habit, small pinto-colored seed, and white flowers. MAR 3 is sensitive to long photoperiods (receiving a score of 8 on a 1 to 9 scale, where 1 = insensitive or day-neutral, and 9 = highly sensitive).

All nurseries at CIAT-Popayán were inoculated two to three times during the growing season with a mixture of isolates collected locally in the previous cropping seasons of the pathogens causing ALS and anthracnose. Similarly, mixtures of locally collected isolates in the previous cropping seasons of the ALS pathogen were used to inoculate nurseries at CIAT-Quilichao. Subsequently, the resistance reactions of four genotypes for ALS and anthracnose were verified in the greenhouse. They were also challenged by the NL-3 strain of the bean common mosaic necrosis virus (BCMNV) in the greenhouse at CIAT-Palmira. Soils at CIAT-Popayán and CIAT-Quilichao have high levels of exchangeable Al and Mn,

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#### Registration of Indeterminate Tall Upright Small Black-Seeded Common Bean Germplasm A 55

Small-seeded (<25 g per 100 seed) black common bean (*Phaseolus vulgaris* L.) germplasm A 55 (Reg. no. GP-233, PI 632407) was developed at the Centro Internacional de Agricultura Tropical (CIAT), Cali, Colombia. A 55 was derived from population TC 590 = TTS/77B-ICA 10303. Tallo Tipo Soya (TTS) was selected at CIAT-Palmira [1000 m elevation with a mean growing temperature of 24°C; fine silty, mixed, isohypothermic Aquic Hapludolls soil with pH 7.5; and ~1000 mm annual rainfall] in the late 1970s from a multiple-parent common bean population of unknown pedigree. Tallo Tipo Soya had a Type II growth habit with a very strong main stem and less than two partially developed branches. ICA 10303, developed at the Instituto Colombiano Agropecuario (ICA), Palmira, Colombia, also had a Type II growth habit with small black seeds. The F<sub>2</sub> population was space-planted at CIAT-Palmira. Single-plant selections were made in the F<sub>2</sub>, followed by evaluation in plant-to-progeny rows in the

subsequent generation. This conventional pedigree method of selection was practiced until the F<sub>5</sub> at the same location. Two crops (March to May and September to November) were taken each year to expedite the selection process. Five plants were bulked in the F<sub>5</sub> to form the initial seed multiplication stock for A 55.

A 55 has a Type II indeterminate growth habit (Singh, 1982) with tall (>70 cm plant height), upright stiff stems and branches. It has the *I* gene for bean common mosaic virus (BCMV, a potyvirus) resistance. A 55 has moderate resistance to root rot [caused by *Fusarium solani* (Mart.) Sacc. f. sp. *phaseoli* (Burkholder) W.C. Snyder & H.N. Hans.; *Pythium ultimum* Trow; and *Aphanomyces euteiches* Drechs. f. sp. *phaseoli* W.F. Pfender & D.J. Hagedorn] (Silbernagel and Mills, 1991), and to bacterial brown spot (caused by *Pseudomonas syringae* pv. *syringae* van Hall) (H.F. Schwartz, 2002, personal communication). It has resistance to races 38 and 53 of bean rust [caused by *Uromyces appendiculatus* (Pers.:Pers.) Unger], and to fusarium yellows (caused by *Fusarium oxysporum* Schlechtend.: Fr. f. sp. *phaseoli* J.B. Kendrick & W.C. Snyder) (Pastor-Corrales and Abawi, 1987; Salgado and Schwartz, 1990). A 55 has moderate resistance to race Delta of *Colletotrichum lindemuthianum* (Sacc. & Magn.) Lams.-Scrib., cause of anthracnose, but it is susceptible to race Alpha. In field tests in the USA and Canada, A 55 has reduced disease incidence and severity under a moderate white mold [caused by *Sclerotinia sclerotiorum* (Lib) de Bary] pressure, but is susceptible under heavy disease pressure in field and in greenhouse straw tests (i.e., lacking physiological resistance) (Miklas et al., 2001; Park, 1993a,b). Omwega et al. (1988) found A 55 to be resistant to southern root-knot nematode [*Meloidogyne incognita* (Kofoid & White) Chit.]. A 55 is susceptible to common bacterial blight [caused by *Xanthomonas campestris* pv. *phaseoli* (Smith) Dye] and angular leaf spot [caused by *Phaeoisariopsis griseola* (Sacc.) Ferraris].

In comparative yield trials of 12 common bean genotypes representing growth habit Types I, II, and III across three locations and four plant densities in Colombia, A 55 had the lowest number of nodes per branch (2.1), branches per plant (2.5), and nodes per square meter (272) (Nienhuis and Singh, 1985). Mean seed yield of A 55 was 1490 kg ha<sup>-1</sup> across 16 environments in Colombia. A 55 has purple flowers with large chordate bracteoles and stripes on the outer lower surface of the standard. It possesses other characteristics, such as leaf size and shape and phaseolin seed protein, of the small-seeded lowland tropical common bean race Mesoamerica (Singh et al., 1991).

A 55 flowered in 44 d and matured in 84 d at CIAT-Palmira. Although it was selected near the equator, it is insensitive to long photoperiods, and hence it is fairly well adapted to most common bean growing environments, including the higher latitudes of temperate North America. A 55 is late maturing (100–110 d) at Kimberly and Parma, ID. A 55's expression of growth habit and stiff erect stem characteristics are stable across environments, although plant height may vary depending on the nutrient and moisture availability and growing season temperatures. Relatively warmer temperatures promote maximum plant height expression. Moreover, plants may develop a small vine or guide in some environments.

A small quantity of seed for research purposes is available from the corresponding author or by requesting directly to CIAT, A.A. 6713, Cali, Colombia.

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### Registration of ARS-NLT-SALT and ARS-NLT-SALT/B Saline Tolerant Narrow-Leaf Trefoil Germplasm

ARS-NLT-SALT (Reg. no. GP-9, PI 632397) and ARS-NLT-SALT/B (Reg. no. GP-10, PI 632398) narrow-leaf trefoil (*Lotus glaber* Mill., syn. *L. tenuis* Waldst. & Kit. ex Willd.) germplasm were developed and released in 2002 by the USDA-Agricultural Research Service (ARS). These materials were developed for their phytoremediation and crop rotation value in saline soil reclamation.

ARS-NLT-SALT and ARS-NLT-SALT/B are germplasm lines developed from the broad-based narrow-leaf trefoil germplasm ARS-1207 (PI 608022) using two cycles of saline condition selection during seed germination followed by intercrossing using honey bee (*Apis mellifera* L.) pollinators under isolation cages near Corvallis, OR, in 1996 and 2000, respectively. ARS-NLT-SALT was developed using 10 dS m<sup>-1</sup> and 20 dS m<sup>-1</sup> saline solutions made from a stock solution of 446 mM CaCl<sub>2</sub> (dihydrate), 1.3 M NaCl<sub>2</sub>, and 30 mM Na<sub>2</sub>SO<sub>4</sub> (anhydrous) for the first and second selection cycles, respectively. Equal numbers of seeds were harvested from 14 and 30 plants in the first and second selection cycles, respectively. ARS-NLT-SALT/B was developed as above, except 10 mg L<sup>-1</sup> B was added to 10 and 15 dS m<sup>-1</sup> saline solutions in the first and second selection cycles, respectively. There were 14 and 96 plants used for the two ARS-NLT-SALT/B selection cycles. Seeds were harvested en masse from both isolated increases, tested for saline and fresh water germination percentages, and the results compared with those for the base ARS-1207 population.

The germination percentages for ARS-NLT-SALT, ARS-NLT-SALT/B, and ARS-1207 in the fresh water control were 74, 77, and 80%, respectively. The ARS-1207 base population germinated 11 and 16% in the 20 dS m<sup>-1</sup> and 15 dS m<sup>-1</sup> + 10 mg L<sup>-1</sup> B saline conditions, respectively. ARS-NLT-SALT