Registration of Two Mid-Altitude Climbing Bean Germplasm Lines with Yellow Grain Color, MAC56 and MAC57

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Two common bean (*Phaseolus vulgaris* L.) germplasm lines with climbing growth habit and yellow seed type, MAC56 (Reg. No. GP-271, PI 644088) and MAC57 (Reg. No. GP-272, PI 644089) were released by the International Center for Tropical Agriculture (CIAT) for tropical mid-altitude growing conditions (1200 to 1800 masl). These novel mid-altitude climbing beans (MAC series) with type IVa growth habit are tolerant of higher temperatures (up to 24°C seasonal average) compared to traditional, type IVb growth habit, climbing beans from the Andean gene pool which are generally found at cooler temperatures (16–20°C seasonal average) (Evans, 1973; Woolley et al., 1991). The new germplasms have fast growth rates, maturing much earlier than traditional climbing beans. They also have good climbing ability but without the aggressive growth of the IVb types (Checa et al., 2004). Both MAC56 and MAC57 belong to the “Canario” commercial seed class that is native to Peru, Mexico, and some other countries of Latin America and Africa (Voysest et al., 1994; Voysest, 2000; Pallottini et al., 2004).

MAC56 and MAC57 are advanced generation F5-derived breeding lines from the cross Doré de Kirundo/LAS399 where Doré de Kirundo (G21715 from the CIAT germplasm bank) is a large seeded, type III growth habit landrace from Burundi that produces yellow grain; and LAS399 is an improved breeding line from Colombia produced by joint research between ICA (Instituto Colombiano de Agricultura) and CIAT at the “La Selva” Agricultural Research Station in Rionegro, Antioquia. LAS399 has type IVb growth habit, flowers and matures at 67 and 140 d, respectively, is resistant to anthracnose [caused by the pathogen *Colletotrichum lindemuthianum* (Sacc. & Magnus) Lams.-Scrib.], and produces large red grain of the Radical commercial seed class (up to 60 g per 100 seed weight). LAS399 was developed from the cross of two landraces (G12670/G12666) and was tested under the VEF-EP (Vivero Equipo Frijol– Ensayo Preliminar) multi-locational nursery in the 1990s. The hybridization required to develop the MAC56 and MAC57 was done at CIAT headquarters (Palmira, Colombia) using pedigree and mass selection. Individual plant selections were made for seed color and type IVa climbing bean growth habit in the F5 with mass selection performed on intervening and subsequent generations to the F8 when harvests were bulked. The MAC56 and MAC57 were tested from 2002 to 2006, in yield trials planted at different elevation sites in Colombia (Darién, Palmira).

The mean seed yield of MAC56 from 2002 to 2006 at the moderate-elevation/rainfall site (Darién, 1450 masl, 20°C seasonal average temperature, 1288-mm average yearly rainfall) was 2000 kg ha−1 with a range from 1264 to 2765 kg ha−1 over six growing seasons. The mean seed yield of MAC57 was 2106 kg ha−1 with a range from 1264 to 2765 kg ha−1 over six growing seasons (given bimodal yearly rainfall at this site, the line was tested in 2 yr over both the March–June and September–January seasons). The mean seed yield of MAC56 at the lower elevation site (Popayán, 1800 masl, 18°C seasonal average temperature, 2477-mm average yearly rainfall) was 1658 kg ha−1 with a range from 1264 to 2765 kg ha−1 over six growing seasons. Meanwhile, the average yield of MAC57 was 2000 kg ha−1 with a range of 1193 to 2765 kg ha−1 over four seasons. In comparison, control genotypes used as comparison for yield from the VEF-EP program included MAC56 with a mean seed yield of 1207 kg ha−1over three seasons with a range of 970- to 1658 kg ha−1; MAC57 was not tested at this lower elevation site. Seed yields in Palmira were due to susceptibility to aphid infestation (*Epinotia opposita* Heinrich) that was controlled by spraying one season so as to observe differences in tolerance and adaptability.