



PROGRESS IN SEED PRODUCTION OF *Phaseolus albicarminus* Debouck & N. Chaves, BY USE OF GRAFTING

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Phaseolus albicarminus is a wild bean species (*Papilionoideae: Phaseoleae*) kept in CIAT genebank (accession G40901) at recently described (Debouck *et al.* 2020) but is unavailable for further research due to lack of seeds for distribution. Originally collected in the county of Tarrazú, province of San José, Costa Rica in 2012 (Araya-Villalobos *et al.* 2014), the material bloomed and set seeds in the CIAT station of Santa Rosa (county of Popayán, Cauca, Colombia; coordinates: lat. N 02° 31' 02.6"; long. W 76° 38' 04.8"; elev. 1,765 masl). To increase the number of original plants for seed production, a grafting technique has been assayed. Grafting has been used successfully in beans, namely, to multiply interspecific crosses (Gurusamy *et al.* 2010), or to understand physiological disorders or reactions (Izquierdo & Hosfield 1982, White & Castillo 1989).

Phaseolus dumosus Macfadyen, a species that is naturally distributed as a weed in the Colombian Andes (Schmit & Debouck 1991) and tolerant to many fungal diseases, as well as anthracnose and angular leaf spot, has been used as rootstock. The accession G35684 (from the county of San Cristobal de las Casas, Chiapas, Mexico; coord.: lat. N 16° 45' 3.92"; long. W 92° 40' 11.63"; elev. 2,113 masl) was selected because of its possible adaptation to the ecological conditions of the station of Tenerife (county of Cerrito, Valle del Cauca, Colombia; coord.: lat. N 03°41'30", long. W 76°04'23", elev. 2,160 masl), into which the cultivation was planned. The seed of *P. dumosus* was planted in June 2, 2020, after rinsing the testa with sodium hypochlorite (2%) for 3 seconds and water. At 7 days the seedling was planted in a 1.6 liter pot filled with a mix 1:1 of humus and coconut fiber; it was placed in a growth chamber with 16 hours day-length, light intensity of 480 μ moles, and 20°C in temperature and 80% relative humidity (light period) and 14°C and 90% humidity (dark period). At 15 days, a shoot of *P. albicarminus* (5 cm long, diameter of 1.2 mm) was cleft grafted on the *P. dumosus* rootstock, using a plastic tube (2.0 cm long, 3.0 mm diameter) to maintain close proximity of both plant parts (Figure 1c). Eight days after grafting, growth of the *P. albicarminus* shoot resumed, while the plant material was kept in the growth chamber.

Five months after grafting, the plant material was planted in the soil at the Tenerife station. Three months later (or eight months after grafting), floral buds were noted, with anthesis occurring nine months after grafting, the pollen was tested for viability resulting in more than 70% (Figure 1f). Thirty-eight days after anthesis, the first pods were formed. Two pods, each with one seed towards the pod beak (Figures 1i, 1j), were harvested, about one year after grafting. Some characteristics were compared (Table 1), with the same material in its site of origin in Costa Rica, reaching the conclusion that the grafting technique of *P. albicarminus* on *P. dumosus* allows a normal development of the plant, demonstrating it is an alternative for regeneration in the germplasm banks. The evolution of the graft is shown in Figure 1.

Table 1. Comparison of traits of *Phaseolus albicarminus* between original collection site and place of regeneration.

Traits	(Tarrazú, province of San José, Costa Rica, elev., 1,837 masl)	(Cerrito, Valle del Cauca, Colombia, elev., 2,160 masl)
terminal leaflet (length & width) mm	76-84 x 45-49	90 x 48
pedicel (long & diameter) mm	10-21 x 1 or less	18 x 0,7
plant size m	4-6	4,2
pod (length & width) mm	47-78 x 12-16	54 x 13
seed (length, width & thick) mm	12-13 x 10 x 3-4	11,57 x 9,39 x 3,29
100-seed weight gr	23	23,5



Figure 1. Evolution of the grafting of *P. albicarminus* over *P. dumosus*: a: Desinfection and sowing of rootstock (seed). b: Germination of rootstock. c: Union of rootstock buds with plastic capillary. d: Transfer and transplanting the graft to the Tenerife station. e: Flower buds and first open flower. f: Viable pollen grain. g: View of vegetative development and abundant flowering. h: Point of union one year after grafting. i: First fruits in formation. j: Fruits in filling and physiological maturity. k: First seed harvested. (Photos Jeison Ypiales, Julio Ramírez and Ramiro Sabogal Carvajal).

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