

ADDITIONAL EVIDENCE ABOUT WILD-WEED-CROP COMPLEXES OF COMMON BEAN IN DIFFERENT PARTS OF COLOMBIA

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Extensive wild-weedy-cultivated complexes were observed in common bean during collection expeditions in regions of Colombia where wild and cultivated beans are sympatric. Such interbreeding complexes may be important mechanisms for the generation of genetic variability in landraces (Beebe et al. 1997).

Here, we report the finding of new complexes (wild-weedy-cultivated) of common bean in Colombian regions where these have not been reported previously. Additionally, we analyzed these complexes from a biochemical (phaseolin and isozyme markers) and morphological viewpoint to estimate the variability as a contribution to their conservation and use.

Materials and Methods. Ten wild-weedy-crop complexes were selected after a geographic sampling in Colombia (Table 1). For the biochemical analysis, we only took the multiplied and conserved seed in the *Phaseolus* germplasm bank held in CIAT. In addition three accessions were chosen as controls: two cultivated *P. vulgaris* from the Andes and Mesoamerica (G4494 and G5773, respectively) and a Colombian wild (G24408). For the seed morphological analysis, we study seed size, color and pattern. The seed storage proteins were analyzed as "selfed materials" of phaseolin type found for each analyzed seed. This variation was first analyzed in ID-SDS-PAGE (Brown et al. 1981) and confirmed later in 2D-IEF-SDS-PAGE (O'Farrel, 1975). For the isozyme analysis only a complex was selected (G50849), being used for it thirty "selfed materials" of phaseolin type. We used only two polymorphic enzymatic complexes: peroxidase (PRX; 1.11.1.7) and diaphorase (DIA; 1.6.4.1). The selected isozyme loci carry alleles from both Mesoamerican and Andean gene pools: the Dia-1⁹⁵, PRX⁹⁸ alleles are considered to be Mesoamerican and the Dia-1¹⁰⁰, PRX¹⁰⁰ alleles are of Andean origin (Koenig and Gepts, 1989; Debouck et al. 1993). The methodology for isozyme analysis was the one reported by Ramirez et al. (1987).

Results and Discussion. The original seed of these populations was collected and classified as cultivated materials. However, during the initial seed increase, we observed segregation for seed size and colors indicating possible wild-weedy-crop complexes.

The materials (1,182 in total) were classified as cultivated [642 (54%)], intermediate [432 (37 %)] and wild [108 (9 %)] (Table 1). These segregating populations were considered to be complexes, since they involve wild and weedy stabilized forms. These complexes showed a great diversity in seed size (from small to large) and color. Additionally, a great diversity for phaseolin types was found within these complexes. The patterns were: five Andean and six Mesoamerican, with a frequency of 55% and 45%, respectively. In these complexes, the "S", "B", "C", "T", "C", and "Mu" phaseolins form a continuum across the full range of biological status (Table 1). For the isozyme analysis, both allozymes (Mesoamerican and Andean) are found in the analyzed complex (G50849). Nevertheless, only two allozymes were found in all phases of the complex: a "crossed" allozyme (PRX^{98, 100}) and an Andean allozyme (Dia-1^{100, 100}) (Table 2). The variability at the phaseolin and isozyme levels suggests an important genetic interchange in the study area in Colombia between Mesoamerican and Andean materials. These results are concordant with those obtained by Debouck et al. (1993); Paredes and Gepts (1995) and Beebe et al. (1997), using morphological and biochemical markers, and those obtained by Tohme et al. (1996), Chacón et al. (2002), and Ocampo et al. (2002), using molecular markers. However, we are reporting a extensive distribution of these introgressed complexes in Colombia, much more of the reported by Beebe et al. (1997). This distribution includes some departments where wild and cultivated beans are sympatric (Cundinamarca and Boyaca) or in departments where the common bean is an important crop (Antioquia, Caldas, Tolima and Cauca).

These results suggest a new map in Colombia for the distribution of these biological complexes of common bean and confirm that a considerable amount of natural hybridization occurs in the areas where these populations were collected.

Table 1. Description of the wild-weed-crop complexes from domesticated Colombian populations of common bean.

CIAT No.	Department	Generación Go (seed original)		Generation advanced (increased seed)	
		S. W. ¹	Gene pool	B. S. ²	Phaseolin types (frequency in parenthesis)
G50711	Antioquia	64.2 g.	Andean	Cultivated Weedy Wild	S (1), B (2), C (4), CAR (2) S (6), B (2), C (5), H ₁ (1) S (5), C (3)
G50849	Antioquia	31.0 g.	Andean introgressed with M. P ³	Cultivated Weedy Wild	S (37), C (41), H ₁ (6), H ₂ (3), T (4) S (15), C (6), H ₁ (2), H ₂ (1) S (6), C (3)
G50632	Antioquia	50.5 g.	Andean	Cultivated Weedy Wild	S (36), CH (5), C (41), T (55), L (1) S (3), B (17), C (3), T (1) B (6), T (1)
G50646	Antioquia	64.8 g.	Andean	Cultivated Weedy Wild	S (14), B (2), CH (1), T (37), C (24), H ₁ (1), H ₂ (1) S (13), T (9), C (5) T (1), C (6)
G50785	Antioquia	60.6 g.	Andean	Cultivated Weedy Wild	S (16), B (3), CH (1), C (41), T (67), H ₁ (8) S (19), B (12), CH (10), T (30), C (45), H ₁ (2) S (4), B (4), CH (3), T (5), C (13)
G50879	Caldas	62.5 g.	Andean	Cultivated Weedy Wild	B (13), C (49), T (2), H ₁ (22), H ₂ (1) B (16), C (4), H ₁ (4) B (2), C (1), H ₁ (1)
G50983	Cundinamarca	21.0 g.	Andean introgressed with M. P ³	Cultivated Weedy Wild	S (6), C (2), Mu (1) S (24), B (48), CH (13), C (9), H ₂ (1), Mu (34) S (3), B (2), Mu (1)
G50988	Boyaca	35.4 g.	Andean introgressed with M. P ³	Cultivated Weedy Wild	S (3), T (2), C (10), H ₁ (5) S (10), C (4), H ₁ (2) S (5), C (6), H ₁ (1)
G50797	Tolima	61.0 g.	Andean	Cultivated Weedy Wild	S (1) S (6), C (3), H ₁ (4) S (9), C (2), H ₁ (4)
G50859	Cauca	33.0 g.	Andean introgressed with M. P ³	Cultivated Weedy Wild	S(5),B (24),T(10),C(18),Ca ₁ (4),H ₁ (2),H ₂ (1),Car (7) B (36), C (6), H ₁ (1) B (11)

S. W. : Is the seed weight derived from 100 seeds

²B. S. : Biological Status;³M. P.: Mesoamerican Phenotype**Table 2.** Allozyme constitution and seed size of the wild-weedy-crop complex G50849.

Biological material	Analyzed "selfed materials"	100 seed weight (g)	Isozyme loci	
			Prx	Dia-1
G50849 Cultivated	23	23.4-47.8	100 (5) 98 (14) 100/98 (4)	100 (17) 95 (6)
G50849 Weedy	4	10.0-24.0	100 (0) 98 (3) 100/98 (1)	100 (4) 95 (0)
G50849 Wild	3	5.3-7.2	100 (1) 98 (0) 100/98 (2)	100 (3) 95 (0)

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