Gene flow events among bean species of section Phaseoli in Colombia and Costa Rica using microsatellites markers

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Introduction

Gene flow events in common bean have been reported in several parts of the Americas where wild and cultivated forms are sympatric, often distant from a few to dozens of meters. After using microsatellite markers to successfully establish gene flow events in weedy forms and to indicate pollen direction from the wild into the cultivated and vice versa (González-Torres et al. 2004), we were interested in testing the hypothesis of participation of alien species into such a flow. Studies (Schmit et al. 1993; Llaca et al. 1994; Delgado-Salinas et al. 1999) using neutral molecular markers have shown that among the dozens of species described (Freytag & Debouck 2002) a small group of species including the common bean - section Phaseolus - share the same lineage. These species are sympatric with wild P. vulgaris in several mountainous areas of tropical America (Debouck 2000): P. albescens in western Mexico (Romírez-Delgadillo & Delgado-Salinas 1999), P. costaricensis in central Costa Rica (Araya-Villalobos et al. 2001), and P. dumosus in several parts of Central America and the northern Andes (Schmit & Debouck 1991).

Materials and Methods

We tested microsatellites screened at 67 loci (Gaitán-Solís et al. 2002) to evaluate the level of participation of nuclear genes in six rare forms possibly resulting from interspecific hybridizations in natural conditions of Colombia (in contact with P. dumosus) and Costa Rica (with P. costaricensis and P. dumosus). The analysis involved these species as well as P. coccineus and P. albescens as controls (Table). The otypical materials were selected because of growth abnormalities often seen in artificial interspecific hybrids (shrivelled seeds, ovule abortion, crippled plants) (Hucl & Scoles 1985).

Results and Discussion

The microsatellites were powerful enough to separate the species though they belong to the same evolutionary phylum (Fig. 2). The characterization of the different bean species through microsatellite loci evaluation according to Gaitán-Solís et al. (2002) is confirmed and extended to P. albescens and P. costaricensis for the first time (Fig. 2, 3).

These molecular markers indicated that the putative natural interspecific hybrids actually were hybrids (Fig. 2, 3). The data indicate that the evaluated hybrids result from gene flow between the common bean and P. dumosus (as pollen donor) in the Central Valley of Costa Rica as well as in Boyacá, Colombia (Fig. 4).

References