PATTERNS OF GENETIC DIVERSITY IN IMPROVED DRY BEAN GERMPLASM FROM MEXICO

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Dry bean (*Phaseolus vulgaris* L.) germplasm from Mexico has been a source of genetic variation for different traits and it has been used in breeding programs around the world. In Mexico, from 1943 onwards 120 bred bean cultivars were developed, mainly based on improved disease resistance, broad adaptation and yield stability. The aim of this research was to enhance our knowledge on the patterns of germplasm utilization for the development of bred bean cultivars in Mexico and identify elite cultivars for use in future improvement of common bean.

One hundred and twenty bred cultivars were planted in Santa Lucia, state of Mexico, during 1999 and 2000. The experimental site is located near Mexico City and its climatic characteristics are typical of the subhumid-temperate Mexican highlands (2240 masl, 640 mm and 15°C yearly average rainfall and temperature, respectively). Experimental plots were of one row 6m in length and 0.7 m apart, with two replications. Sowing was done after the rainy season started in July 6th in 1999 and May 23th in 2000. Diverse morpho-agronomic traits were recorded during the growing season. Data were analyzed by PCA (Systat®) using 72 traits to identify those important in explaining the observed phenotypic variation. Also, a cluster analysis (NTSYS®) was performed using 59 relatively unrelated traits. In this note we report on the agronomic variation displayed by the cultivars in the field and on the known pedigree data.

Since the cultivars were developed in different regions of Mexico, they showed different agronomic and commercial seed traits. More cultivars belonged to the following commercial classes: black seeded (opaque and shiny), cream (bayo) and pinto. This is in part due to the fact that those classes are popular in different regions of México, blacks being one of the most consumed classes (Castellanos *et al.*, 1995). In the field, variation was observed for most of the intra and inter seed class traits. PCA showed that a combination of 14 traits explained 60 % of the total observed phenotypic variation. Main traits were pod width, 100 seed weight, pod size, days to flowering, inflorescence position, central leaflet size, growth habit, standard and wing color, hypocotyl anthocyanin coloration, seed prominence and plant height. Similar results were obtained in studies performed for the evaluation of bean descriptors and morphological traits in 1000 bean entries (Hidalgo, 1991).

A dendogram constructed with data from 57 phenotypic traits displayed three main groups: one included the black seeded cultivars (shiny and opaque); a second group included the light solid colors, large seeded such as cream, yellow, white (alubias), azufrados and canarios; and a third group with cultivars of medium seed size with more than one color on the seed coat such as pinto and flor de mayo, etc. Sub-divisions were observed in each group, which were less apparent in the opaque black group in which recurrent and similar parents were used to maintain the seed traits and specific adaptation to the lowland tropics. The shiny black seeded subgroup showed large variability, probably due to the utilization of diverse parents in their development. In the light colored seeds different subgroups were observed, although some of them showed narrow variation due to the utilization of common parents. Large variation was observed in the cream subgroup where inter gene pool crosses have been important. In the third large group, a high level of diversity was observed, diversity due to extensive utilization of introduced germplasm and inter gene pool crossing. In Mexico, diversity in consumer preferences has also enhanced the genetic diversity observed in dry beans.

From the results several points are worth to mention: 1) most of the released cultivars during the first years of breeding were directly derived from outstanding landraces from the Jalisco and Nueva Granada races, such as Amarillo 155 and Canario 101, respectively. 2). Since the 50's, many of the cultivars developed for the Mexican highlands were derived from inter gene pool crosses, Jalisco and Durango races combined with Nueva Granada race cultivars, those used as sources of anthracnose and rust resistance, i.e. Flor de Mayo RMC, Bayo Zacatecas, Pinto Villa, etc. 3) Opaque seeded cultivars from the tropical lowlands have been relatively isolated with crossing mainly within the Mesoamerican race. 4) None breeding effort have been made to improve the climber beans from the Jaliso race. 5) Elite cultivars in the development of bred cultivars for the highlands and the dry tropics of the west coast had been the canario cultivars from the Nueva Granada race, mainly Canario 101 and Bayomex.

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