

Pattern of variation for seed size traits and molecular markers in Italian germplasm of *Phaseolus coccineus* L.

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Abstract Variation in Italian germplasm of *Phaseolus coccineus* L. was assessed for seed traits and molecular markers. A total of 130 seeds and seedlings, five for each of 21 Italian landraces, an Italian commercial cultivar and four Mesoamerican landraces of *P. coccineus*, were analysed using seven selected PCR markers: three RAPDs, two ISSRs and two ETs. Seed weight of the Mesoamerican landraces was ≤ 1 g, whereas that of the Italian landraces varied from 1 g to 2.5 g and was related to their origin. Oval shape was more frequent, with round shape observed only in Mesoamerican landraces. Three seed coat colours were observed: white, violet mottled or spotted black and buff spotted brown, also this trait was related to the origin. The level of polymorphism detected by molecular markers was low but with significant discriminant power. ISSRs were the most effective markers prone to unravel molecular polymorphism. The within accession component of variation exceeded that among accessions, as expected for an allogamous species. However correct classification of the individuals was achieved performing either discriminant analysis

of the seed phenotypic traits or cluster analysis of seedling similarity measure based on the whole banding patterns obtained by the three marker types. Our data suggest that the Italian farmers, starting with ancestral Mesoamerican runner bean introductions in Europe, bred their own landraces through selection for seed size and seed coat colour, but occasional gene flow maintained variability within landraces bred by different farmers in the same Italian Region. Selection favored molecular and seed trait uniformity within several landraces making them suitable for certification.

Keywords *Phaseolus coccineus* · Runner bean · Germplasm · Landraces · Molecular markers · Polymorphism

Introduction

Phaseolus coccineus L. (the scarlet runner bean) is one of the five cultivated species of the genus *Phaseolus* introduced from Mesoamerica into Europe since the XVI century (Gepts and Debouk 1991). In Mesoamerica it is used particularly for its dry or green seeds, for the medicinal properties of the fleshy roots and for the edible flowers. The green pods are used as vegetables in Western Europe and the dry seeds with white seed coat are included in recipes for preparing

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