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HYBRID DWARFISM IN *Phaseolus vulgaris* L. AND ITS IMPLICATIONS
IN GENETIC IMPROVEMENT

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Hybrid dwarfism is of rather frequent occurrence in bean (*Phaseolus vulgaris* L.) crossing nurseries at CIAT. This trait has previously been referred to as "crippled" (1,4), sub-lethal (3) or developmental abnormality (2). It is characterized by the reduced and stunted growth of the F₁ hybrids which often do not flower or produce pods. Premature death of such stunted hybrids is very common. Van Rheenen (3) and Shii, *et al.* (2) reported that the sub-lethal or developmental abnormality of the F₁ hybrids was controlled by two dominant genes. The latter also presented evidence which indicated that the expression of the trait was temperature dependent. 192

During the last four years we have encountered hybrid dwarfism in a total of 64 crosses at CIAT-Palmira, Colombia. This encouraged us to undertake a study in 1980 to determine the geographic origin of gene(s) controlling hybrid dwarfism in beans. To study this phenomenon, three groups of *P. vulgaris* accessions were established based on country of origin: 1) Brazil, 2) Turkey, and 3) West Germany. A fourth group was also formed of bred lines developed at CIAT and elsewhere. Group 1 and 4 included lines with small and medium or large seed sizes. All accessions in groups 2 and 3 had medium size seeds.

All possible diallel crosses within each group and crosses of selected lines from each group with a common tester were made for field evaluations at CIAT-Palmira and Popayán farms. Varying levels of hybrid dwarfism, from early seedling death to flowering and production of few pods by stunted plants, were recorded. All the cases of hybrid dwarfism occurred only when a small seeded line (≤ 25 gr/100 seeds), e.g., BAT 332, Carioca, G 7148, etc., was crossed either with a medium (> 35 gr/100 seeds) such as G 5066 or large seeded line, e.g., ICA L 23. However, not all such crosses showed hybrid dwarfism.

Medium and large forms of *Phaseolus vulgaris* are predominant in the highlands of the Andes and small seeded types are more prevalent in coastal areas of México and Central America. The former groups, in general, show adaptive superiority over the latter in cooler climates. In warmer climates small seeded bush bean lines outyield those possessing medium and large seeds. From numerous crosses made between small and medium or large seeded parents, thus far, we have been unable to fully recover the yield potential of small seeded parents in large seeded bush types. This leads us to believe that hybrid dwarfism is a manifestation of a genetic barrier between these two distinct forms of beans which preserves their individual characteristics of adaptive fitness in contrasting environments.

References

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