DOES DOMESTICATION HAVE MODIFIED CHLOROPHYLL CONTENT AND CHLOROPLASTS TRAITS IN COMMON BEAN PODS?

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In *Phaseolus vulgaris*, the reproductive organs possess a completely active photosynthetic machinery, and chloroplasts isolated from pod walls are able to carry out the sme photochemical activities as those from the leaves (Peña-Valdivia 1993). Phosphoenolpyruvate carboxylase (PEP carboxylase), which plays a particularly important role in carbon fixation in C_4 and CAM plants, is also active in pood tissue. In this tissues it has been suggested that PEP carboxylase reduces carbon losses by assimilating released CO_2 during its dark fixation (Luthra *et al.* 1983, Singal and Singh 1986).

Also, it is well known that evolution under domestication has produced severe morphological and genetic changes in common bean plant, most of them nearly releated with yield (large seeds and long pods), so it is also possible that those changes are related to biochemical and physiological traits of bean pods, as parte of the same process. Our objetive in this study was to determine chlorophyll content and other traits in common bean pods of wild and domesticated Phaseolus vulgaris L.

MATERIALS AND METHODS

Two wild accesions (one small-seeded and one medium-seeded) from Durango, México, and one Mexican cultivar were used. Immature pods were colected and inmediately processed, at 7, 14, 21 and 28 days after anthesis (DAA), from plants growing in an experimental field in Chapingo, Mexico (latitude, 19° 29'; longitude 98° 53'; altitude 2250 m; and mean annual temperature 15° C, according to García 1973). Chlorophyll content and PEP carboxylase in pod walls were measured by the method described by Arnon (1949) and Singal and Singh (1986), respectively, with lesser modifications. After recording fresh mass, pod wall and seeds samples were kept in an oven at 80° C until constant weight.

RESULTS

Along the growth and development, wet and dry weight accumulation of the pod walls was different between wild and cultivated beans (Fig. 1). The dry pod wall/dry seed rate of wild bean diminished significantly along the growth, from 54.72 to 2.4; while, in domesticated bean that rate diminished from 75.41 to 1.44. So, in addition to the wider range in this rate, domesticated bean shows an absolute higher efficiency of the translocation of temporarily accumulated photosynthates in pod walls to the seed.

Chlorophyll content in the pod wall, expresed on wet weight basis, diminished along the growth and development in the pod wall at the same rate in both wild and domesticated common bean (Fig. 1).

There were significant variations in the PEP carboxylase activity expressed on a per pod basis, throughout development and between wild and domesticated common bean (Fig. 1). Green pods of some legumes are known to be capable of fixing carbon dioxide photosynthetically, and that those products are recycled to the developing seeds. Finally, pods of domesticated bean at 21 and 28 DAA (the most critical grouth fase), contained higher levels of the non-photosynthetic PEP carboxylase than those of the wild beasn pods.

The present study demostrated changes in carboxylase activity during pod growth among wild and domesticated common bean, although chlorophyll content showed minimum differences. Comparison of other biochemical traits of the pods between wild and domesticated common bean, is clearly needed for a better understanding of the domestication process.

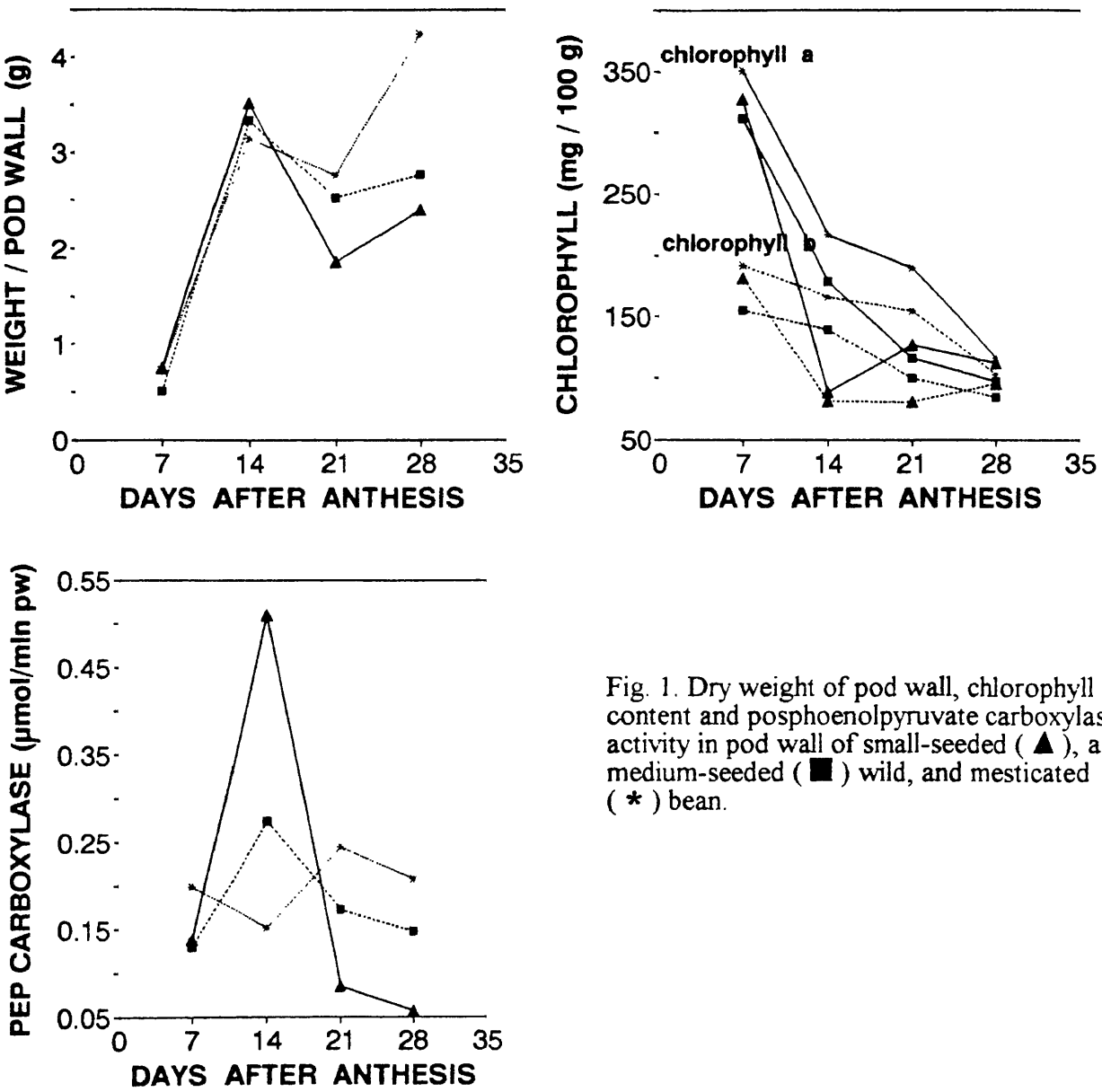

Fig. 1. Dry weight of pod wall, chlorophyll content and posphoenolpyruvate carboxylase activity in pod wall of small-seeded (▲), and medium-seeded (■) wild, and mesticated (*) bean.

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