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Genetic, phytochemical and biochemical analyses as tools for biodiversity evaluation of wild accessions of *Solanum commersonii*

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Abstract

Genetic fingerprint profiles, the type and content of glycoalkaloids (GAs) and hemagglutination (HAG) activity against red cells were analysed in accessions of *Solanum commersonii*, collected from different locations in the south of Uruguay. Thirty-nine accessions from 21 geographically distinct areas were studied. Random Amplified Polymorphic DNA (RAPD) analysis revealed a high degree of genetic diversity among the accessions used in the study and effectively discriminated among all of the accessions analysed. There was a very high diversity in the type as well as the concentration of GAs in the samples. Strong HAG activity against rabbit red cells was detected in all the *S. commersonii* tuber extracts analysed. Such activity was specifically inhibited by *N*,*N*′-diacetylchitobiose and *N*,*N*′,*N*″-triacetylchitotriose. Differences in the levels of specific HAG activities were found in the different extracts, which might indicate different levels of the lectin specific for *N*-acetylglucosamine (Glc-NAc) and its oligomers, in the tubers. It is shown that the three different approaches used in this

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work successfully discriminate between the accessions of this species and thus, they constitute interesting tools to analyse biodiversity within one species. In addition, they allow selection of those accessions with potential to be used in crop programs.

Keywords: *Solanum commersonii*; Wild *Solanum*; RAPD; Glycoalkaloids; Hemagglutination; Lectins; Biodiversity

1. Introduction

Wild *Solanum* plants have been shown to be valuable sources of germplasm to be used in potato breeding. They have been found to be well adapted to the local climate and ecological conditions and are rarely affected by epidemic diseases, possibly due to their heterogeneity, their discontinuous and dispersed growth and natural biological control. These wild plants could be used to introduce desirable characteristics such as resistance towards certain diseases, insects and stress, into the cultivated potato. More than 15 species of the subsection *Potatoe* (G. Don) D'Arcy have been already successfully used as sources of resistant genes (Petersen et al., 1993). Among the *Solanum* species native to Uruguay, *Solanum commersonii* Dun. Ex Poir (one of the two tuber-bearing native species) has good resistance to cold and to some common pests (Hawkes, 1992) and may be a valuable source of genetic material for potato breeding. No studies related to the biodiversity of *S. commersonii* have been reported to date, although this knowledge is a pre-requisite to attempt any potato breeding programs.

Several different PCR techniques for DNA fingerprinting have been developed during the last decade, each one with specific advantages and disadvantages. The Random Amplified Polymorphic DNA (RAPD) marker technique (Welsh and McClelland, 1990; Williams et al., 1990) is quick, easy and requires no prior sequence information. A single random 10-mer primer is used to specify the sequence that is to be amplified. Polymorphism is then observed and scored as the presence or absence of a fragment and relates to sequence variation due to nucleotide insertion, deletion or substitution. The technique has been used for identification purposes in many crops including potato (Milbourne et al., 1997; McGregor et al., 2000) and one mentioned disadvantage of the technique is the lack of reproducibility of the RAPD banding patterns (Penner et al., 1993).

A detailed phytochemical analysis of the glycoalkaloids (GAs) produced by wild *Solanum* specimens in Uruguay has been reported (Vázquez et al., 1997) and the results indicated the presence of demissine, Δ^5-demissine, commersonine, Δ^5-commersonine and tomatine, this is in contrast to other reports. In Schreiber's early work (Schreiber, 1963) only solanine was found. In the work reported by Osman et al. (1976), which was carried out on herbarium samples, as well as in Deahl's work (Deahl et al., 1993), only commersonine and demissine were found.

These phytochemical analyses are valuable tools for taxonomic differentiation within species or for evaluating the effect of environmental factors (Hawkes, 1992).