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"Filling gaps and removing traps
for sustainable resource management"

Insights into the *Batatas* Complex: A Crossing Study and its Significance for Breeding

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Abstract

Sweetpotato crop wild relatives (*Ipomoea* series *Batatas* (Choisy) D.F. Austin) are an untapped and potentially valuable source of genetic diversity for crop improvement. However, the use of wild relatives in sweetpotato breeding remains largely unexplored as obstacles specific to this group must be overcome to fully unleash the resources provided by the sweetpotato crop wild relatives (SP CWR). These difficulties include, for example, unclear species delimitation, lack of diagnostic characters enabling differentiation among taxa, different ploidy levels and unknown levels of cross compatibility. Thus, the objective of this study was to test the compatibility of SWP CWR through a systematic interspecific and intraspecific crossing study to provide information critical for the design of a pre-breeding approach. The crossing study included 46 accessions from eight out of 14 CWR species of the series Batatas: *I. cordatotriloba, I. cynanchifolia, I. grandifolia, I. leucantha, I. ramosissima, I. splendor-sylvae, I. trifida*, and *I. triloba*. The crossing design was a full diallel with 2,070 possible cross combinations and a target of 20 crosses completed per cross combination. Three crossing groups with high levels of interfertility (>40 %) within the diallel were identified that correspond to three distinct syngameons. Crossing group 1 (CG1, 24 accessions) contained *I. cordatotriloba, I. cynanchifolia, I. grandifolia, I. leucantha* and *I. triloba* while CG2 (12 accessions) included *I. trifida* and one *I. ramosissima* accession. CG3 encompassed four *I. ramosissima* accessions. Crosses between accessions of CG1 and CG3 exhibited zero to low levels (<27 %) of interfertility but no absolute barriers to reproduction. In contrast, accessions from CG2 did not form fertile offsprings with CG3 indicating reproductive isolation. Accessions from CG1 (self-compatible species) as females crossed at zero to low levels with accessions from CG2 (self-incompatible species) as males, but the reverse shows no interfertility. This distinction provides us with a roadmap for future pre-breeding approaches. *I. trifida* accessions from CG2 (as males) may serve as bridge species to introgress desired traits from CG1 (as females) into the sweetpotato genepool.

Keywords: Cross compatibility, crossing barriers, *Ipomoea*, pre-breeding, sweetpotato crop wild relatives

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