Altering self-incompatibility using *Sli* overcomes reproductive barriers between cultivated diploid potato and wild species of Piurana Series

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Wild *Solanum* species represent under-explored diversity for novel resistance genes useful to keep pace with the dynamics of potato pathogens. However, inter-specific reproductive barriers (IRB) have restricted introgression of genetic diversity from wild to cultivated gene pools, limiting efforts to broaden the crop's genetic base. Intensive screening of tuber-bearing wild potato species at CIP has found large genetic variation and high levels of resistance to potato late blight (*Phytophthora infestans*) within species from the 2x (2EBN) self-incompatible (SI) Series Piurana. Gene transfer from Series Piurana, ranked in GP3, to cultivated potato was not expected to be possible by conventional breeding methods. The combination of mentor pollen and embryo rescue was required for the introgression of putative novel resistance genes to diploid cultivated Series Tuberosa that shares the same EBN. Despite the successful selection of late blight resistant hybrids with appealing tuber type; the procedure was cumbersome and laborious. In vivo examination of Tuberosa × Piurana series crosses found pollen tube growth to stop in the style, such that only very few pollen tubes reached the ovaries. Means to overcome this pre-zygotic barrier would lead to increased fertilization, and improve the efficiency of introgression of genes from this GP to cultivated potato. The S-locus inhibitor (*Sli*) gene from *S. chacoense* provides an opportunity to assess whether changes in SI status affect pre-zygotic IRB. *Sli* gene has a sporophytic behavior hence, *Sli* -derived SC hybrids are able to accept SI pollen. We significantly increased fertilization in crosses between Series Tuberosa and Piurana by generating SC hybrids from 2x (2EBN) Tuberosa species through the introgression of *Sli*, and subsequently using these SC hybrids as females to capture diversity from SI Piurana species. Four incompatible SI × SI combinations (*S. stenotomum* × *S. piurae*, *S. stenotomum* × *S. chiquidenum, S. goniocalyx* × *S. piurae* and *S. goniocalyx* × *S. chiquidenum*) were rendered compatible when converted to SC × SI crosses The respective cross combinations yielded 25 (Crossing efficiency (CE)=2.5), 80 (CE=16), 75 (CE=7.5) and 33 (CE=3.3) viable seeds/fruit. Molecular markers were used to confirm hybridity in a sample of 50 plants per family. The generation of RILs from these inter-specific hybrid crosses will be valuable for mapping and identification of putative novel resistance genes. Culinary and nutritional attributes, adaptation traits, and ability to form unreduced gametes highlight the usefulness of diploids species of Series Tuberosa as female bridging parents to transfer desirable genes from wild diploid species of GP3 into the cultivated tetraploid gene pool.