Survival and fitness potential of cultivated-wild potato hybrids in abandoned fields in the Peruvian Andes

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In the Andes, gene flow between and among potato including wild relatives occurred over a long period of time resulting in numerous diverse domesticated forms. Yet, little is known on the survival of the most advanced domesticated forms, hybrids between cultivated x wild species, and characters that enhance fitness, including those that could be conferred by genetic engineering. We conducted several field experiments to assess establishment, fitness and survival of diverse potato genotypes: (i) a 4-year field trial in a single environment using 94 hybrid genotypes from crosses between 3 different cultivated potato accessions and 9 different wild potato species accessions, (ii) a 1.5-year trial in 3 contrasting environments using 50 diverse genotypes (including 36 hybrids between cultivated x wild species), (iii) a fitness simulation trial with 4 commercial varieties (with / without fungicides), (iv) molecular and morphological characterization of a the feral Araq group. The results indicate that the survival of most hybrids declines regularly over time. No evidence of botanical seed germination and establishment was found despite production of berries and sporadic spontaneous germination. Survival is strongly influenced by the growing environmental conditions and only selected genotypes show positive survival rates. No differences were observed in the survival rate of susceptible varieties made artificially resistant to LB. The feral Araq group was found to be a form of the Group Andigena with particular characteristics that allow them to survive close to cultivated potato fields. Taken together these results demonstrate that fitness and survival of potato in the Andes is highly genotype and environment dependent with only few genotypes being able to survive for prolonged periods when competing with invasive flora.

Keywords: Potato, Survival, Center of origin and diversity, Fitness