IMPORTANCE OF USING DIVERSE GERMPLASM AND MULTIPLE CONDITIONS TO UNDERSTAND THE EVOLUTIONARY CONSEQUENCES OF CROP-WILD GENE FLOW.

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Due to neutral or adaptive genetic divergence of populations within a species, plant populations can be differentiated in their phenotypes. Divergent environmental conditions and GxE interactions can further alter the phenotypic expression of plant characteristics, including fitness. In each crop-wild gene flow scenario, different wild populations and crop lines hybridize and the resulting hybrids may be found in different environmental conditions. These factors affect fitness and could shape the relative fitness of hybrid and wild individuals, resulting in variable amounts of crop gene introgression across hybrid zones. In our research in sunflower, the use of nine wild populations, three crop lines, and four environments helped to elucidate environmental conditions where crop gene introgression may be more likely for certain genotypes by investigating relative fitness. This perspective is essential to understanding the range of evolutionary outcomes of crop-wild gene flow, including understanding where crop gene introgression may be more or less problematic. Although there are experimental design and resource concerns regarding the use of numerous genotypes and multiple environmental conditions, if studies investigating the biosafety risks of transgenic crops do not integrate this complexity, the resulting policy will be made using erroneously simplistic data. For policy to more closely reflect biological complexity, it must emphasize the quantitative range of possible gene flow outcomes, not only a qualitative description of risk determined from a narrow pool of genotypes and environments.

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