ditions, the interaction between the nucleus and different cytoplasm can be evaluated at the morphological and molecular level. Cytoplasmic organelles (mitochondria and chloroplast) have been implicated in multiple plant-pathogen interaction pathways.

Our project is to measure differential responses of various alien cytoplasms in a specific nuclear background to various pathogens to provide a better understanding on the effect of nuclear-cytoplasmic interactions on biotic stress tolerance. In this study, we analyzed the nuclear donors of 56-1 (tetraploid), and Chris and Selkirk (both hexaploid), alloplasmic lines. Fifty selected alloplasmic lines were tested for their diseases response to *Pyrenophora tritici-repentis* (Ptr) isolates BR15 (produces ToxA, B, and C) and Pti2 (produces ToxA and C), one of the more virulent isolates in our collection. Results indicated that *Aegilops bicornis* cytoplasm provided reduced sensitivity to isolate BR15 as identified in alloplasmic lines of Selkirk and Chris, whereas *Ae. variabilis* cytoplasm provided reduced sensitivity to isolate BR15 as identified in alloplasmic lines 56-1 and Chris. Selkirk alloplasmic lines showed a similar reaction to the euplasmic parent to isolate Pti2. These alloplasmic lines, and others that showed significant increases in resistance or susceptibility, are being screened with additional Ptr isolates. Further investigations determining the mechanism of increased resistance or sensitivity by measuring the changes in the production of reactive oxygen species in those selected alloplasmic lines are underway. In conclusion, cytoplasm variability can improve resistance to plant diseases.

Poster 70. The function of scs, Rf, and vi for proper compatibility of durum wheat nucleus in alien cytoplasms.

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Interactions between alien cytoplasms and particular species cytoplasm specific, *scs*, genes from *Triticum timopheevii* or common wheat (*T. aestivum*) transferred to the nuclear genome of durum wheat (*T. turgidum*) produce male-sterile, A lines that are maintained by crossing to normal counterparts (B lines). Our objective was to study the function of fertility restorer (*Rf*), *scsti*, and *vitality* (*vi*) genes in alloplasmic lines of durum wheat to provide partial (sterile) and full compatibility (fertile) between alien cytoplasm and nucleus. We crossed A lines of durum wheat with cytoplasms from different related species, including *T. timopheevii* (Tt), *T. araraticum* (Ta), and *Aegilops speltoides* (Spt) to the (*Ae. longissima*) double-ditelosomic 1B ((lo) dDt 1B) having *scsti scsti* and *vi vi* and the durum lines having *scsti scsti* or *vi vi*. The crosses of (lo) dDt 1B with the *scsti scsti* and *vi vi* gene pairs produced fertile F_1s, showing that *scsti* and *vi* produce fertile F_1s, whereas crosses to durum lines having a *scsti scsti* or *vi vi* produced male sterile F_1s, showing that *scsti* or *vi* alone do not produce fertility in A lines with alien cytoplasm. Also, crosses of (lo) *scsti*–durum to the R lines having *Rf* genes and cytoplasm of Tt, Ta, spt, or other related species produced plump and viable seeds having *scsti* and *Rf* and fertile F_1s, but seeds having *Rf* genes alone were shriveled and inviable, like those from a cross to control durum. In summary, the (lo) *scsti vi* or (lo) *scsti Rf* produced plump seeds and fertile F_1,whereas (lo) *vi* produced plump seeds with greatly reduced fertility and plant vigor, and *Rf* produced shriveled and inviable seeds.

Poster 71. Homoeoallelic relationship of two speciation genes involved in the evolution of allopolyploid wheat.

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The evolution of wheat is a very complex process involving both nuclear and extranuclear genomes. Here we present work on homoeologous relationship between two speciation genes affecting nuclear-cytoplasmic (NC) interactions, critical in the development of allopolyploid wheat. Disruption of such NC interactions leads to multiple incompatibilities, such as lack of seed viability or low vigor. These incompatibilities create genetic barriers, playing an important role in the speciation process, and preclude the commercial production of hybrid wheat and the full exploitation of the secondary and tertiary gene pools in breeding of *Triticum* ssp. The species-cytoplasm specific (*scs*) genes restore adequate compatibility between durum wheat nucleus and *Aegilops longissima* (S^lS^l; 2n=2x=14) cytoplasm. Classical mapping using