





**Figure S3.** Mapping of stem rust resistance minor QTL: *QSr.ace-1A* to race TPMKC and *QSr.ace-2B* to racesJRCQC and TTKSK) in the population Rusty × PI 192051-1. *QSr.ace-1A* was identified using composite interval mapping while *QSr.ace-2B* was mapped using multiple interval mapping (MIM) and MIM-based on a general linearized framework (MIM-GLZ) for race TTKSK and JRCQC, respectively. The QTL analysis LOD threshold is shown with the blue horizontal line. Co-segregating markers were excluded from these maps. SNPs and their co-segregating markers are presented in Figure S2.