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COMBINING ABILITY IN SYNTHETIC HEXAPLOID WHEAT × RYE CROSSES

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Synthetic hexaploid wheats (SHW) were derived from artificial synthesis of hexaploid wheat for the exploring the new genes of *T. turgidum* and *Ae. tauschii* and using mainly in common wheat (*T. aestivum*) improvement. Numerous synthetic hexaploid wheat lines have been produced through crosses of the tetraploid cultivar Langdon (Ldn) with *Ae. tauschii* accessions [1,2,3]. Another artificially created form is triticale (× *Triticosecale*) that is an important forage crop and a promising energy plant usually developed by crossing *Triticum turgidum* L. with rye, with secondary forms obtained by crossing primary hexaploid triticale and/or hexaploid wheat with octoploid triticale. As reviewed by Ma and Gustafson [5], wheat hybrids with rye have higher rates of genomic changes than wheat hybrids with other related species and the novel alleles can be induced in wheat-rye hybrids [4]. Hao et al. [2] recently developed an effective method for production of hexaploid triticale via hybridization of synthetic hexaploid wheat with rye.

In our study, we used this method for production of triticale via hybridization of synthetic hexaploid wheat produced in Kyoto University-Japan with the different rye genotypes (*S. segetale*) stored in the cereal collection of Molecular Cytogenetics Laboratory. The six employed SHW lines derived from hybridization of *T. durum cv.* Langdon with *Aegilops tauschii* originated from Western (WPI) and Eastern Precaspian Iran (EPI), and from Georgia (G) (LANGDON/KU-2098 (WPI), LANGDON/KU-2159 (WPI), LANGDON/KU-2829A (G), LANGDON/KU-20-10 (WPI), LANGDON/KU-2079 (EPI) and LANGDON/KU-2093 (WPI)) were used as female plants in the sexual hybridization with rye. The emasculation and pollination in the field were carried out during the months of April-May 2016. No embryo rescue or hormone treatment was applied for the production of F_0 seeds. The seeds were collected from mature spikes in the month of June-July and the crossability of the used genotypes in each hybrid cross was calculated as the percentage of F_0 seeds obtained relative to the number of florets pollinated for that cross. Seeds (shriveled, weak and smaller in size) were obtained from all hybrid combinations, with the average seed set 43, 05%, ranged from a maximum of 72, 34% (for the combination of LANGDON/KU-2079 (EPI) × (#225) *S. segetale*) to a minimum of a 2, 88% (for the combination of LANGDON/KU-2098 (WPI) × (#225) *S. segetale*). The seed set was high also for the combinations LANGDON/KU-2093(WPI) × (#225) *S.segetale* (61,11%), LANGDON/KU-2829A (G) × (#223) *S.segetale* (54,82%) and LANGDON/KU-2159 (WPI) × (#223) *S.segetale* (20, 21%). All of the derived hybrid seeds were germinated in Petri dishes for the revealing of germination rate, which was in average equal to 13, 89% and ranged from highest degree of 22,73% for the combination of highest seed set LANGDON/KU-2079 (EPI) × (#225)*S. segetale* to 5,55% for the combination of LANGDON/KU-2159 (WPI) × (#223)*S.segetale*. The hybrid seeds from five combinations (LANGDON/KU-2098 (WPI) × (#223) (*S.segetale*), LANGDON/KU-2098 (WPI) × (#225) (*S.segetale*), LANGDON/KU-2159 (WPI) x (#225)*S. segetale*), LANGDON/KU-2829A (G) × (#223) *S.segetale* and LANGDON/KU-20-10 (WPI) × (#225) *S. segetale*) failed to germinate. Among these combinations that failed germination were combinations with lowest (2,88% and 2,94%), near to average (11% and 14,42%) and relatively higher (54,82%) seed set data, while the combinations with the highest seed set mainly are not failed to germinate. Moreover, in the combinations of LANGDON/KU-2098 (WPI) and LANGDON/KU-2159 (WPI) with the rye accessions of #223 and #225, the seed set was higher to the accession #223 than #225, and germination is also

observed only with the accession #223 and failed with the #225. So, both rye and SHWs genotypes are influenced the seed set and germination in the combinations and among the used genotypes the rye #223 and SHW genotype LANGDON/KU-2079 (EPI) showed highest combining ability.The obtained seedlings from above mentioned crosses were not uniform by morphology (rosette-like and erect-like structure) and color (with green and red leaves) and currently transplanted into an experimental field for further investigations.

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