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Cytogenetic and molecular identification of a wheat-*Leymus mollis* alien multiple substitution line from octoploid *Tritileymus* x *Triticum durum*

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ABSTRACT. *Leymus mollis* (Trin.) Pilger (NsNsXmXm, 2n = 28), a wild relative of common wheat, possesses many traits that are potentially valuable for wheat improvement. In order to exploit and utilize the useful genes of *L. mollis*, we developed a multiple alien substitution line, 10DM50, from the progenies of octoploid *Tritileymus* M842-16 x *Triticum durum* cv. D4286. Genomic *in situ* hybridization analysis of mitosis and meiosis (metaphase I), using labeled total DNA of *Psathyrostachys huashanica* as probe, showed that the substitution line 10DM50 was a cytogenetically stable alien substitution line with 36 chromosomes from wheat and three pairs of Ns genome chromosomes from *L. mollis*. Simple sequence repeat analysis showed that the chromosomes 3D, 6D, and 7D were absent in 10DM50. Expressed sequence tag-sequence tagged sites analysis showed that new chromatin from 3Ns, 6Ns, and 7Ns of *L. mollis* were detected in 10DM50. We deduced that the substitution line 10DM50 was a multiple alien substitution line with the 3D, 6D, and 7D chromosomes replaced by 3Ns, 6Ns, and 7Ns from *L. mollis*. 10DM50 showed high resistance

to leaf rust and significantly improved spike length, spikes per plant, and kernels per spike, which are correlated with higher wheat yield. These results suggest that line 10DM50 could be used as intermediate material for transferring desirable traits from *L. mollis* into common wheat in breeding programs.

Key words: Alien substitution line; Leaf rust; *Leymus mollis*; Molecular cytogenetics; *Triticum aestivum*

