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REARRANGEMENT IN THE B-GENOME FROM DIPLOID PROGENITOR TO WHEAT ALLOPOLYPOLID

Salina E.A.

Institute of Cytology and Genetics SB RAS, Novosibirsk, Russia

*e-mail: salina@bionet.nsc.ru

Three key periods that were accompanied by considerable rearrangements in the B genome of wheat and its progenitor can be considered. The first period covers the period from the divergence of diploid *Triticum* and *Aegilops* species from their common progenitor (2.5–6 million years ago) to formation of the tetraploid *T. diccocoides* (about 500 thousand years ago). Significant genomic rearrangements in the diploid progenitor of the B genome, *Ae. speltoides* (SS genome), involved a considerable amplification of repeated DNA sequences, which led to an increase in the number of heterochromatin blocks on chromosomes relative to other diploid *Aegilops* and *Triticum* species. Our analysis has demonstrated that during this period the Spelt1 repeats intensively amplified as well as several mobile elements proliferated, in particular, the genome-specific gypsy LTR-retrotransposon Fatima and CACTA DNA-transposon Caspar. The second period in the B-genome evolution was associated with the emergence of tetraploid (BBAA genome) and its subsequent evolution. The third most important event leading to the next rearrangement of the B genome took place relatively recently, 7000–9500 years ago, being associated with the emergence of hexaploid wheat with the genomic formula BBAADD. The evolution of the B/S genome involved intergenomic and intragenomic translocations and chromosome inversions. So far, five rearrangements in the B-genome chromosomes of polyploid wheats has been observed and described; the majority of them took place during the formation and evolution of tetraploid species. The mapping of the S-genome chromosomes and comparison with the B-genome chromosome maps have demonstrated that individual rearrangements pre-existed in *Ae. speltoides*; moreover, *Ae. speltoides* is polymorphic for these rearrangements.

Chromosome 5B is nearly 870 Mbp (5BL = 580 Mbp and 5BS = 290 Mbp) and is known to carry important genes controlling the key aspects of wheat biology, in particular, *Ph1*, critical for correct mitosis and meiosis in the allopolyploid nucleus; *Kr1*, controlling interspecific incompatibility; the genes controlling hybrid necrosis and response to vernalization, *Ne1* and *Vrn-B1*; and genes controlling resistance to various pathogens and bread-making quality. The translocations and inversions of chromosome 5B/5S, which could have taken place in the evolution of *Ae. speltoides* and allopolyploid wheats, yet has not been detected so far. On the other hand, the changes in chromosome 5B that had brought forth the locus *Ph1* took place due to certain yet unknown mechanisms. Construction of the physical map for chromosome 5B and determination of its primary structure are in progress now.