Studies on the behavior of alien chromosomes in common wheat
パンコムギにおける外来染色体の挙動についての研究

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【Introduction】Common wheat (*Triticum aestivum*, 2n=6x=AABBDD) can interbreed with relative species, and many alien chromosome addition lines of wheat have been established. These lines are useful in analyzing individual alien chromosomes in the common wheat genetic background. In the present study, I analyzed (1) the transmission stability of barley chromosome 3HL to the progeny in common wheat, (2) nondisjunction mechanism of supernumerary rye B chromosomes (increase its number by nondisjunction) in common wheat, and (3) the effect of a rye B chromosome and its segments on homoeologous pairing in hybrids between common wheat and *Aegilops variabilis*, the related species of common wheat.

【Materials and Methods】(1) Using a common wheat line carrying two 3HL, I studied the transmission stability of barley chromosome 3HL by checking the chromosome constitution of the progeny by fluorescence in situ hybridization (FISH) and genomic in situ hybridization (GISH). To confirm the presence of 3HL in the aerial part of the plants, I conducted PCR amplification using markers specific to 3HL and wheat and meiotic observation. (2) With the progenies obtained from reciprocal hybridization between wheat lines carrying rye B chromosome or its segments and common wheat, I confirmed their chromosome constitutions by FISH and GISH. (3) I crossed common wheat lines possessing rye B chromosome or its segments and *Ae. variabilis*. Using hybrid plants composed of those with or without wheat chromosome 5B (a gene for suppressing homoeologous pairing is located) and those with and without ryeB or its segments, I performed meiotic observation and compared the mean chiasma frequencies by Student’s t-test or Welch’s t-test between the hybrids examined.

【Results and Discussion】(1) I found that the transmission rate of 3HL was different from plant to plant and that the low transmission of 3HL was not due to low pairing in meiosis but to its loss during mitosis. Therefore, it is needed to consider the instability of 3HL in maintaining this line. (2) It was revealed that rye B chromosome did not increase in number when the distal region in the long arm of rye B chromosome was not present in meiocyte even though it was present in somatic cells. This indicates that the presence of distal region in the long arm in the same meiocyte is essential for nondisjunction followed by its increase. (3) It was found that rye B chromosome and its segments suppressed homoeologous pairing when wheat chromosome 5B was absent and promoted homoeologous pairing when 5B was present. This result implies that rye B is useful for inducing crossing over by homoeologous pairing between common wheat and alien chromosomes.