Fluorescence microscopy is essential for the study of genes, chromosomes and genomes. The method called fluorescence in situ hybridization (FISH) is used here to map repetitive DNA sequences on chromosomes of plants species in the tribe Hordeae, family Poaceae, that have the Ns-genome in its genomic constitution. Two types of Ns-specific repetitive DNA sequences from Leymus Hochst. and Psathyrostachys Nevski have been isolated in my group: (A) dispersed retroelement-like repeats isolated from tetraploid northern North American and amphi-Pacific species L. mollis (Trin.) Pilger and octoploid European species L. arenarius Hochst. (Figure 1A, Bödvarsdóttir & Anamthawat-Jónsson 2003, Genome 46: 673-682); and (B) sub-telomeric satellite repeats isolated from tetraploid western North American species L. triticoides (Buckley) Pilger (Figure 1B, Anamthawat-Jónsson et al. 2009, Genome 54: 381-390) and two diploid Psathyrostachys species (unpublished results). These sequences have been analysed molecularly and mapped on chromosomes. The sequences, particularly the dispersed repeats, have been used to confirm the presence of Ns-genome in a wide range of species in Triticeae genera including Leymus, Psathyrostachys, Hordelymus (Jessen) Harz and Hystrix Moench. The results consistently show that all genomes in the polyploid Leymus species examined are Ns. The Ns-specific dispersed repeats may have spread predominantly and rapidly across genomes following allopolyploidisation, thus homogenising the nuclear genomes. The Ns-genome may have been evolutionarily diverged into a variable array of Ns-karyotypes, the variation which can be identified using satellite repeats. Furthermore, polymorphisms in Ns-genome specific sequences can be used to reveal relationships among taxonomically related species and to differentiate closely related species having different geographical distributions.

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Fig. 1: Fluorescence in situ hybridization (FISH) mapping of red-fluorescing pLm44 dispersed retroelement-like repeat (A) and green-fluorescing sub-telomeric satellite repeat Lt1-1 (B) on chromosomes of Leymus triticoides. The double FISH in both images represents localization of the 18S-25S ribosomal loci. The scale bar represents 5 µm.