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研究论文

自身基因组原位杂交揭示植物基因组重复DNA沿染色体的分布自身基因组原位杂交揭示植物基因组重复DNA沿染色体的分布

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摘要

重复DNA沿染色体的分布是认识植物基因组的组织和进化的要素之一。本研究采用一种改良的基因组原位杂交程序，对基因组大小和重复DNA数量不同的6种植物进行了自身基因组原位杂交（self-genomic in situ hybridization，self-GISH）。在所有供试物种的染色体都观察到荧光标记探针DNA的不均匀分布。杂交信号图型在物种间有明显的差异，并与基因组的大小相关。小基因组拟南芥的染色体几乎只有近着丝粒区和核仁组织区被标记。基因组相对较小的水稻、高粱、甘蓝的杂交信号分散分布在染色体的全长，但在近着丝粒区或近端区以及某些异染色质臂的分布明显占优势。大基因组的玉米和大麦的所有染色体都被密集地标记，并在染色体全长显示出强标记区与弱标记或不标记区的交替排列。此外，甘蓝染色体的所有近着丝粒区和核仁组织区、大麦染色体的所有近着丝粒区和某些臂中间区还显示了增强的信号带。大麦增强的信号带带型与其N-带带型一致。水稻自身基因组原位杂交图型与水稻Cot-1 DNA在水稻染色体上的荧光原位杂交图型基本一致。研究结果表明，自身基因组原位杂交信号实际上反映了基因组重复DNA序列对染色体的杂交，因而自身基因组原位杂交技术是显示植物基因组中重复DNA聚集区在染色体上的分布以及与重复DNA相关联的染色质分化的有效方法。

关键词 自身基因组原位杂交；植物基因组；重复DNA；染色质分化；基因组组织

分类号

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The Distribution of Repetitive DNAs Along Chromosomes in Plants Revealed by Self-genomic in situ Hybridization

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Abstract

<P> The distribution of repetitive DNAs along chromosomes is one of the crucial elements for understanding the organization and the evolution of plant genomes. Using a modified genomic in situ hybridization (GISH) procedure, fluorescence in situ hybridization (FISH) with genomic DNA to their own chromosomes (called self-genomic in situ hybridization, self-GISH) was carried out in six selected plant species with different genome size and amount of repetitive DNA. Nonuniform distribution of the fluorescent labeled probe DNA was observed on the chromosomes of all the species that were tested. The signal patterns varied among species and were related to the genome size. The chromosomes of the small Arabidopsis genome were labeled almost only in the pericentromeric regions and the nucleolus organizer regions (NORs). The signals in the relatively small genomes, rice, sorghum, and Brassica oleracea var. capitata L., were dispersed along the chromosome lengths, with a predominant distribution in the pericentromeric or proximal regions and some heterochromatic arms. All chromosomes of the large genomes, maize and barley, were densely labeled with strongly labeled regions and weakly labeled or unlabeled regions being arranged alternatively throughout the lengths. In addition, enhanced signal bands were shown in all pericentromeres and the NORs in B. oleracea var. capitata, and in all pericentromeric regions and certain intercalary sites in barley. The enhanced signal band pattern in barley was found consistent with the N-banding pattern of this species. The GISH with self-genomic DNA was compared with FISH with Cot-1 DNA in rice, and their signal patterns are found to be basically consistent. Our results showed that the self-GISH signals actually reflected the hybridization of genomic repetitive DNAs to the chromosomes, thus the self-GISH technique would be useful for revealing the distribution of the regions where repetitive DNAs concentrate along chromosomes and some chromatin differentiation associated with repetitive DNAs in plants.</P>

Key words self-genomic in situ hybridization (self-GISH) plant genome repetitive DNA chromatin differentiation genome organization

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