Abstract

This review describes image analyses for chromosome visible structures, focusing on the chromosome imaging system CHIAS (Chromosome Image Analyzing System). CHIAS is the first comprehensive imaging system for the analysis and characterization of plant chromosomes (Fukui 1985; Fukui 1986) . A simulation method for human vision for capturing band positive regions was developed and used for the image analysis of large plant chromosomes with bands. Applying this method to C-banded *Crepis* chromosomes enabled recognition of band positive regions as seen by human vision. Furthermore, a new image parameter, condensation pattern was developed and successfully applied to identify small plant chromosomes such as rice and brassicas. Condensation profile (CP) derived from condensation pattern was also effective in developing quantitative chromosome maps. The result was quantitative chromosomal maps of several plants with small chromosomes, including *Arabidopsis,* diploid brassicas, rapeseed, rice, spinach, sugarcane, etc. In the final chapter, various applications of imaging techniques to the analysis of pachytene chromosomes, improved visibility of multicolor FISH images, 3D reconstruction of a human chromosome based on cross-section images obtained by FIB/SEM, automatic extraction of chromosomal regions by machine learning, etc. are described.