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CHANGES IN THE CHROMOSOME STRUCTURE INFLUENCE MEIOTIC RECOMBINATION IN ARABIDOPSIS

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Meiotic crossover (CO) recombination guarantees the genetic variation and the accurate chromosome segregation. CO distribution is tightly regulated: homolog pairs have at least one CO (obligate CO), CO spacing is nonrandom, and COs occur preferentially in genomic intervals called hotspots. So far, it was showed that CO number and distribution are controlled on a chromosome-wide basis. To acquire knowledge about the factors that determine CO positioning is highly desired by plant breeders for the generation of new allelic combinations.

In our work, we examined the effect of chromosome rearrangements on recombination in male and female meiosis. To address this question, we analyzed chromosome-wide recombination frequency through SNP genotyping in reciprocal translocation heterozygotes. In particular, we used a T-DNA mutant of Arabidopsis (*Atmcc1*) carrying a reciprocal translocation involving chromosomes 3 and 4 (T3-4). We generated two F1 populations by crossing *Atmcc1* as male and female parent with Ler genotype as well as two F1 control populations. Afterwards, four heterozygous BC1 populations were genotyped with 143 SNPs homogenously distributed on the whole genome with a mean interval length of 800 kb. Genotyping was performed using the patented KASP SNP genotyping system that uses Fluorescent Resonance Energy Transfer (FRET) probes on an arrayed 96 well plate resulting in high throughput and very efficient SNPs detection. Our analysis revealed that a global redistribution of crossovers along chromosomes occurred as a consequence of chromosome rearrangements. Significant differences were observed in CO rates between the control and T3-4 derived populations despite the total number of COs per cell was not affected. In particular, chromosome-wide recombination frequency was reduced by 70% and 44% in chromosome 3 in male and female meiosis, respectively. On the other hand, CO rates increased across the other chromosomes, thereby suggesting that crossover homeostasis regulation occurs at cell level.