

CENTROMERE FUNCTION AND EVOLUTION IN MAIZE

Jonathan Carl Lamb

Dr. James A. Birchler, Dissertation Supervisor

ABSTRACT

A dispensable supernumerary chromosome present in maize, the B chromosome, was the focus of many centromere studies. First, I examine the variation in copy number of centromeric elements and other repeats among different maize lines. Then, I demonstrate that centromeric elements are present away from the centromere on the B chromosome indicating that centromeric elements are not sufficient for centromere function in maize. I demonstrate that the B centromere can be inactivated in dicentric chromosomes to produce stable, functionally monocentric chromosomes. Next, I examine the rate of divergence for centromeric elements in maize and its relatives in relation to other repetitive elements in the genome. I examined the genomic distribution of repetitive elements showing that certain families of retrotransposons are enriched in the heterochromatic regions flanking the centromere. Finally, I describe a novel chromosomal rearrangement, an inversion with a breakpoint in the centromere that splits the tract of centromere repeats creating a chromosome with two distinct sites of centromere elements.