THE EFFECTS OF ANEUPLOIDY ON GENE EXPRESSION
IN A DOSAGE SERIES OF MAIZE CHROMOSOME ARM 1L

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ABSTRACT

Aneuploidy is a class of genetic conditions involving an unbalanced number of chromosomes. Aneuploid conditions necessarily involve a change in the dosage of those genes which are located on the varied chromosome. However, the dosage level of a gene does not automatically correspond to the amount of RNA or protein that will be produced in vivo. Based on previously published studies, the impact of chromosome dosage changes on the transcription of single genes may be direct, inverse, or anywhere in between; and genes may be impacted anywhere in the genome, not just on the varied chromosome.

Using a maize model system, a dosage series of plants was produced in which sibling plants are identical, except for the copy number of chromosome arm 1L. Using RNA sequencing, expression levels for all genes in mature leaf tissue were determined. The results were analyzed in aggregate, allowing for a view of effects on the level of the whole transcriptome.

Results suggest that dosage of genes on the varied chromosome region has some correlation with expression of those genes, though the change compared to a diploid is often partial. Inverse relationships between chromosome dosage and RNA expression of genes elsewhere in the genome are seen to occur. Both direct and inverse reactions were amplified by increased levels of genomic imbalance.