Singh et al. (2017) Can J Biotech, Volume 1, Special Issue, Page 212
https://doi.org/10.24870/cjb.2017-a197

Canadian Journal of Biotechnology

ISSN 2560-8304

Poster Presentation OPEN ACCESS

Category: Plant Genomics

Allele-specific physical interactions regulate the heterotic traits in hybrids of *Arabidopsis thaliana* ecotypes

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Abstract

Heterosis is an important phenomenon for the breeding in agricultural crops as it influences yield related traits such as biomass yield, seed number and weight, adaptive and reproductive traits. However, the level of heterosis greatly varies for different traits and different genotypes. The present study focuses on identification of physical interactions between alleles and their role in transcriptional regulation in heterotic plants. Here, we used two Arabidopsis ecotypes; Col-0 and C24 as parent for crosses. We performed crossing between these ecotypes and screened the F1 hybrids on the basis of different SSR markers. Further, we used Hi-C to capture intra- and inter-chromosomal physical interactions between alleles on genome-wide level. Then, we identified allele-specific chromatin interactions and constructed genome-wide allele-specific contact maps at different resolutions for the entire chromosome. We also performed RNA-seq of hybrids and their parents. RNA-seq analysis identified several differentially expressed genes and non-additively expressed genes in hybrids with respect to their parents. Further, to understand the biological significance of these chromatin interactions, we annotated these interactions and correlated with the transcriptome data. Thus, our study provides alleles-specific chromatin interactions in genome-wide fashion which play a crucial role in regulation of different genes that may be important for heterosis.

Citation: Singh, B., Singh, S.K., Kumar, V., Agarwal, N. and Sawant, S.V. Allele-specific physical interactions regulate the heterotic traits in hybrids of *Arabidopsis thaliana* ecotypes [Abstract]. In: Abstracts of the NGBT conference; Oct 02-04, 2017; Bhubaneswar, Odisha, India: Can J biotech, Volume 1, Special Issue, Page 212. https://doi.org/10.24870/cjb.2017-a197