CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

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Project Number

35714

Project Title

Testing for Predicted Transposable Elements in Citrus sinensis and C. clementina

Abstract

Objectives/Goals

The goal of this project is to characterize DNA transposable elements (TEs) of the citrus species Citrus sinensis and C. clementina. TEs are noncoding segments of DNA, popularly known as #jumping genes,# capable of moving from one location in the genome to another. They have been shown to play a major role in gene regulation of various species. They may hamper the ability of critical genes or play a major role in citrus diseases, some of which are substantially overwhelming the citrus industry. The main objective of this project is to isolate and functionally characterize a TE in citrus.

Methods/Materials

Various methods were used to predict and isolate this TE. First, analysis of the genome sequence of C. sinensis was performed using bioinformatics. Primers were designed for this predicted TE and PCR was conducted on genomic DNA from citrus varieties Nules, Cutter, and Olinda. The amplified TE was cloned into the Zero Blunt TOPO cloning vector. Afterwards, primers were designed for the transposase gene of the TE. The transposase was amplified using the TE clone and was cloned. Partial sequencing of this transposase has been completed and sequencing of the entire TE is in progress. Primers were designed for the mini-hAT of this TE, the sequences surrounding the transposase. The left mini-hAT of this TE has been successfully amplified and cloned. Another mini-element related to this TE was predicted using a bioinformatics program. Primers were designed for this TE and it was amplified from citrus genomic DNA and cloned.

Results

The existence of TEs in citrus has been validated. A TE has been isolated and cloned from C. sinensis. The transposase gene, left mini-hAT, and a related element to this TE have been cloned. Partial sequencing of this transposase has been completed and sequencing of the entire TE is in process.

Conclusions/Discussion

The presence of two predicted TEs in citrus has been verified. Due to the major effects of TEs in gene regulation, their presence in citrus has broad implications for citrus genetics. Their activity and location in the citrus genome, which can be determined by later analyses, may play a role in citrus diseases and influence the functions and abilities of genes. To analyze the activity of citrus TEs, a yeast assay will be used to study the transposition of both TEs with the isolated transposase.

Summary Statement

Testing for the presence and activity of transposable elements in citrus species by a molecular and biochemical approach.

Help Received

I was allowed to conduct research at the Neil A. Campbell Science Learning Laboratory in UCRiverside with the permission of Dr. Susan Wessler, Distinguished Professor of Genetics. Dr. James M. Burnette has been my mentor for this project. Mr. Alejandro Cortex has also assisted me in data analysis.