

Mar 6th, 11:30 AM - 1:30 PM

## Analysis of Cytokinin Response Factors in *Artemisia tridentata*

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### Recommended Citation

Biscoglia, Kelly; Melton, A. E.; and Buerki, S., "Analysis of Cytokinin Response Factors in *Artemisia tridentata*" (2023). *Research in the Capitol*. 14.

<https://scholarworks.uni.edu/rcapitol/2023/all/14>

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# Analysis of Cytokinin Response Factors in *Artemisia tridentata*

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## Background

- Cytokinin response factors (CRFs) belong to a transcription factor protein family within land plants.
- Although being identified across all land plants, CRF proteins have distinct lineages in flowering plants.
- CRFs have been found to potentially be regulators of the developmental processes within vascular tissues, playing an important role in environmental stress response
- The focus of this research is identifying the CRF proteins within the *Artemisia tridentata* species.
- The understanding of these pathways can lead in many directions including developing more sustainable, drought resistant species.

## Hypotheses and Objectives

### Hypothesis

Due to an evolutionary history with whole genome duplications, we hypothesize that we would see a duplication in the cytokinin response factors of *Artemisia tridentata*.

### Objectives

- 1) Identify cytokinin response factor proteins (CRFs) within the *A. tridentata* genomic protein annotation.
- 2) Reconstruct the phylogeny of cytokinin response factors (CRFs) identified in *A. tridentata*



*A. tridentata*

## Methods

- Starting with new reference genome assembly for *A. tridentata*, the assembled protein fasta was searched for CRFs using the CRF domain to do the blast search
- Alignment using MAFT
- Phylogenetic reconstruction using RAxML

## Preliminary Results

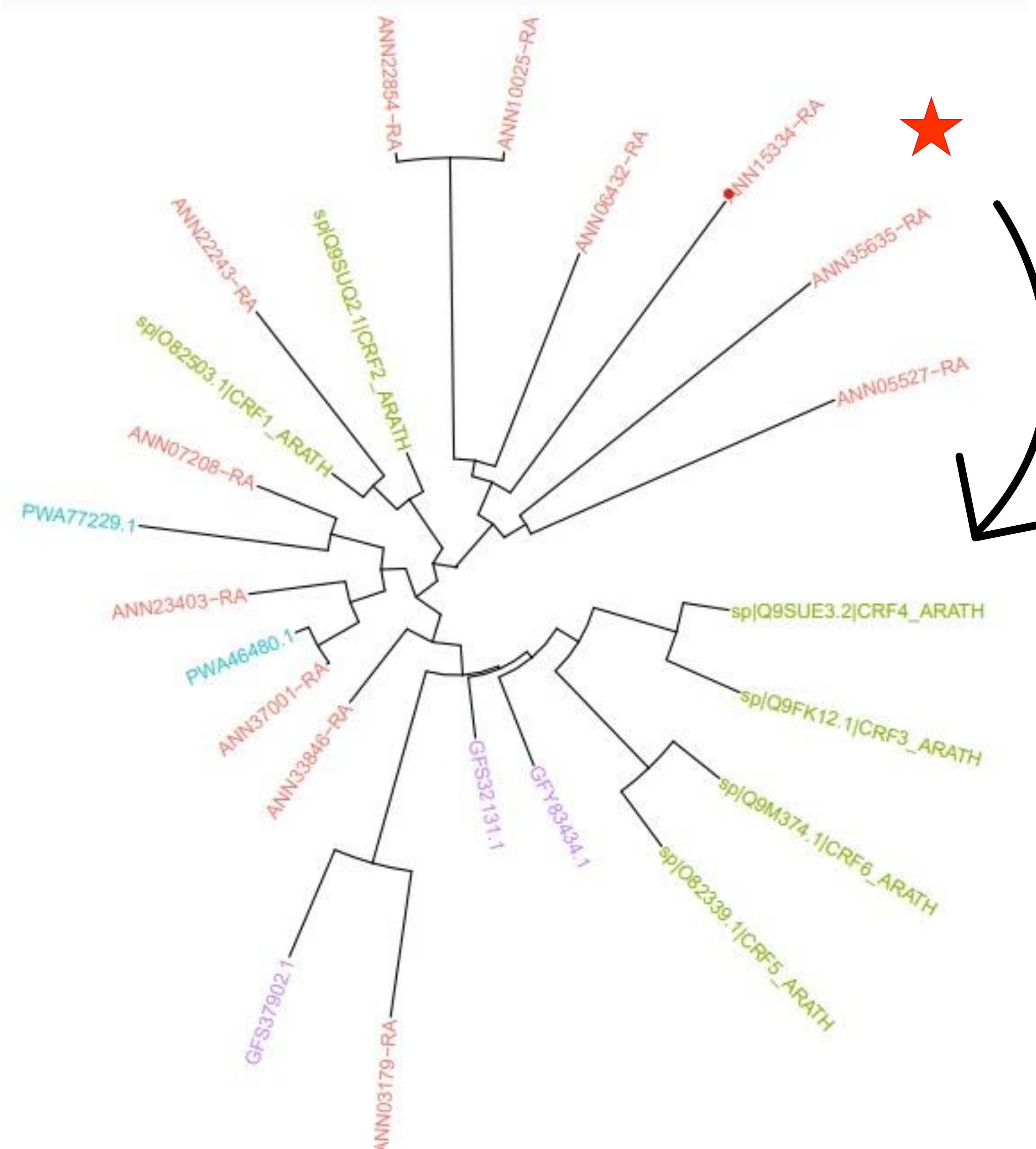


Figure 1. Phylogeny of CRF proteins from *A. tridentata*, *A. annua*, Arabidopsis, *Actinidia* (kiwi). Most *A. tridentata* CRFs resolve where we would expect them to but due to errors in the automated annotation pipeline, some proteins were not properly assembled and thus not able to be properly aligned.

## Preliminary Results

Tip Label	Species
ANN23403-RA	<i>A. tridentata</i>
ANN15334-RA	<i>A. tridentata</i>
ANN06432-RA	<i>A. tridentata</i>
ANN10025-RA	<i>A. tridentata</i>
ANN22854-RA	<i>A. tridentata</i>
ANN05527-RA	<i>A. tridentata</i>
ANN35635-RA	<i>A. tridentata</i>
ANN22243-RA	<i>A. tridentata</i>
ANN03179-RA	<i>A. tridentata</i>
ANN33846-RA	<i>A. tridentata</i>
ANN07208-RA	<i>A. tridentata</i>
ANN37001-RA	<i>A. tridentata</i>
sp O82503.1 CRF1_ARATH	Arabidopsis
sp Q9SUQ2.1 CRF2_ARATH	Arabidopsis
sp O82339.1 CRF5_ARATH	Arabidopsis
sp Q9M374.1 CRF6_ARATH	Arabidopsis
sp Q9FK12.1 CRF3_ARATH	Arabidopsis
sp Q9SUE3.2 CRF4_ARATH	Arabidopsis
GFS37902.1	Actinidia
GFS32131.1	Actinidia
GFY83434.1	Actinidia
PWA77229.1	<i>A. annua</i>
PWA46480.1	<i>A. annua</i>

Table 1. Twenty-three total cytokinin response factor proteins. Twelve of which are from *Artemisia Tridentata*. This matches the number of CRFs in other known species such as Arabidopsis and *Actinidia*.

## Discussion and Future Directions

- There was no evidence of duplication of CRFs in the *A. tridentata* genome.
- The most likely explanation for why the annotation software did not get the proteins correct is because the genes were physically too close on the chromosome for the software to differentiate. This leads to proteins that were too long and including other genes not within the CRF protein - making the alignment more difficult.
- Future directions would be to figuring out where the CRF proteins lie within the chimeric protein sequence and redo the alignment and phylogenetic reconstruction .
- We expect the CRFs placed in the top right clade to be mixed within Arabidopsis CRFs 3-6

## Acknowledgments

I would like to thank the GEM3 research program NSF/Idaho EPSCor.