Computational Analysis of Unknown DNA Sequences Using Integrated Bioinformatics Tools

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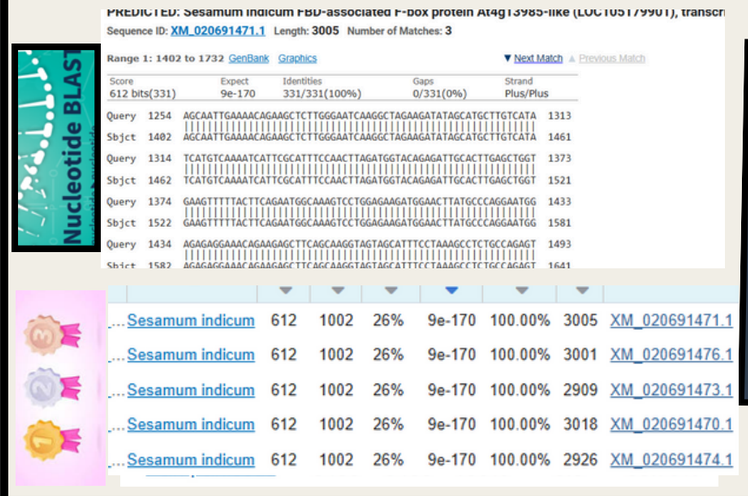
Official name: FBD-associated F-box protein At4g13985-like
Gene type: protein coding
O**rganism:** Sesamum indicum

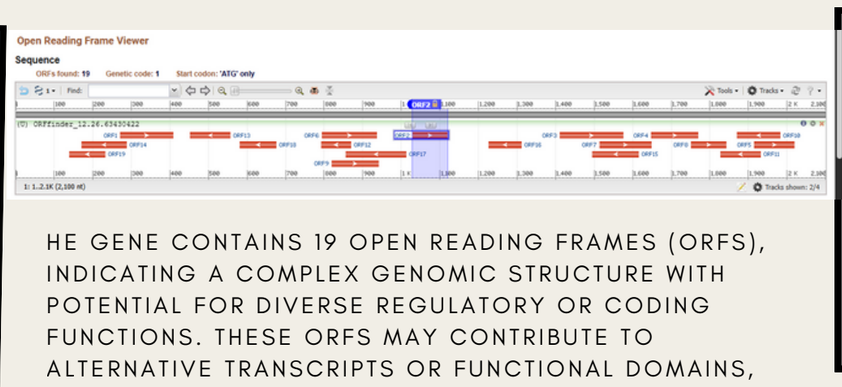
The FBD-associated F-box protein At4g13985-like of Sesamum indicum is a member of the F-box protein family involved in the ubiquitin–proteasome pathway. It likely functions as part of an SCF E3 ubiquitin ligase complex, contributing to regulated protein degradation in plant growth and stress responses.

1 DNA ANALYSIS

1.1 BLAST



1.2 ORF FINDER

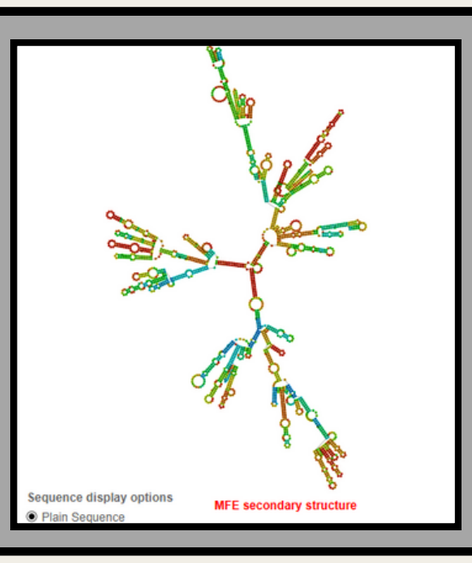


HE GENE CONTAINS 19 OPEN READING FRAMES (ORFS), INDICATING A COMPLEX GENOMIC STRUCTURE WITH POTENTIAL FOR DIVERSE REGULATORY OR CODING FUNCTIONS. THESE ORFS MAY CONTRIBUTE TO ALTERNATIVE TRANSCRIPTS OR FUNCTIONAL DOMAINS, ENHANCING THE PROTEIN'S REGULATORY VERSATILITY.

1.3 DNA TO PROTEIN TRANSLATION

2. RNA Analysis

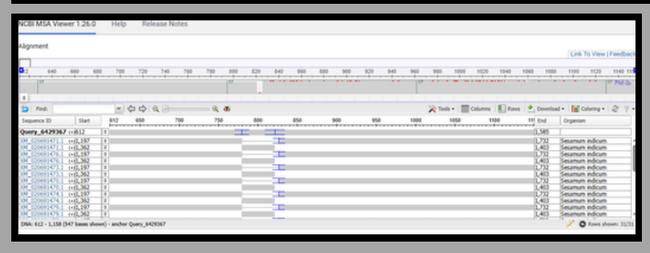
RNAfold WebServer



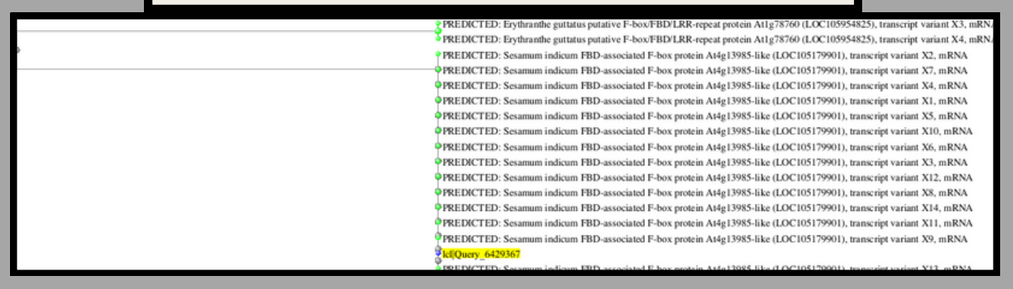
RNAfold analysis indicates a highly stable RNA structure (MFE = −160.19 kcal/mol).

3 PHYLOGENETIC ANALYSIS

3.1 MSA



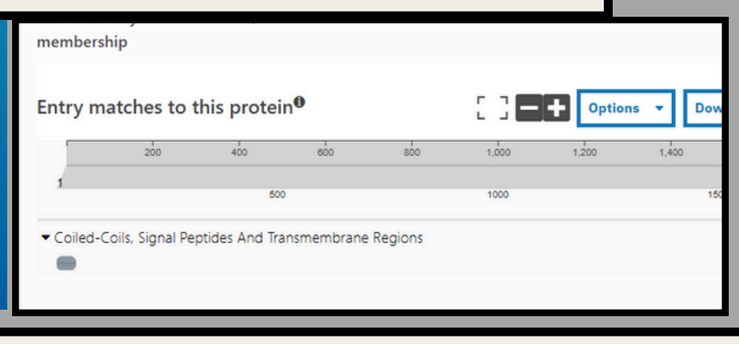
3.2 PHYLOGENETIC TREE



4 Protein Analysis (Structure & Properties)

4.1 DOMAIN AND MOTIFS

InterPro



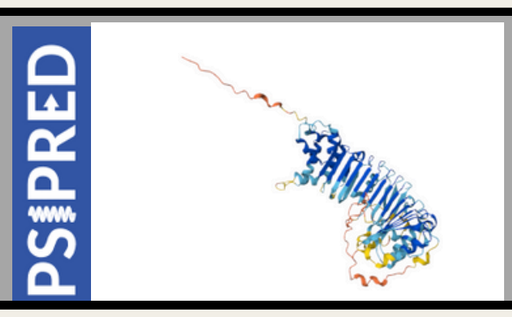
4.2 TABLE OF PROTEIN PROPERTIES

Expasy

Parameter	Value
Number of amino acids	35
Molecular weight (Da)	488.85
Theoretical pI	8.56

4.3PROTEIN SEC. STRUCTURE

PSIPRED



4.4 Summary of predicted function:
It likely functions in selective protein degradation by recognizing specific target proteins for ubiquitination, thereby regulating growth, development, and stress responses in Sesamum indicum.

5 SUBCELLULAR LOCALIZATION

TargetP-2.0

Protein type	Other	Signal peptide	Mitochondrial transfer peptide	Chloroplast transfer peptide	Thylakoid luminal transfer peptide
Likelihood	0.5343	0.3862	0	0.0795	0

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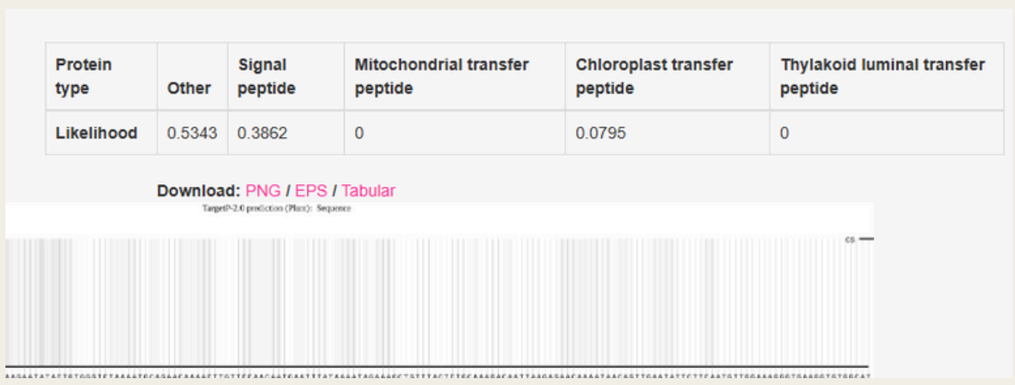
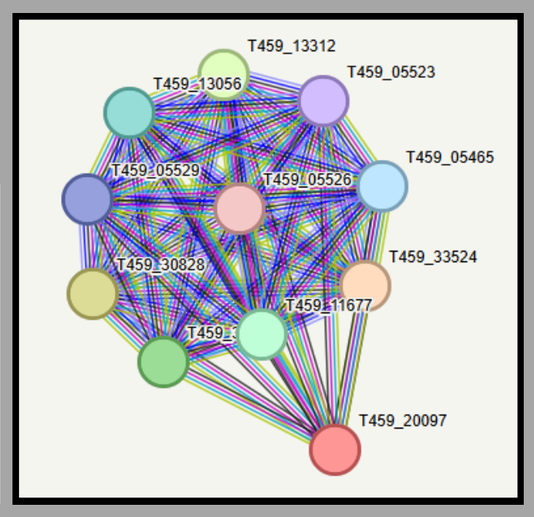


THE FBD-ASSOCIATED F-BOX PROTEIN AT4G13985-LIKE OF SESAMUM INDICUM IS PREDICTED TO BE LOCALIZED PRIMARILY IN THE NUCLEUS AND CYTOPLASM, CONSISTENT WITH ITS ROLE IN PROTEIN REGULATION. THIS LOCALIZATION SUPPORTS ITS INVOLVEMENT IN SCF COMPLEX–MEDIATED UBIQUITINATION OF TARGET PROTEINS WITHIN CELLULAR REGULATORY PATHWAYS.

6 Protein-Protein Interaction

6.1 Biological Significance

The biological significance of the FBD-associated F-box protein At4g13985-like in Sesamum indicum lies in its role in maintaining cellular protein homeostasis through regulated protein degradation. By controlling the stability of key regulatory proteins, it contributes to plant development, adaptation, and responses to environmental stresses.



Conclusion

In this project, we used different bioinformatics tools to study a DNA sequence and its protein with its function. We found the longest coding region, looked for its similar sequences, tried to find its localization and evolutionary relation.

References

- Jain, M., Nijhawan, A., & Tyagi, A. K. (2007). F-Box Proteins in Rice: Genome-Wide Analysis, Classification, Temporal and Spatial Gene Expression during Panicle and Seed Development, and Regulation by Light and Abiotic Stress. Plant Physiology, 143(4), 1467–1481
- National Center for Biotechnology Information. (2023). LOC105178141 F-box protein SKIP23-like [Sesamum indicum (sesame)] [Gene database entry]. NCBI