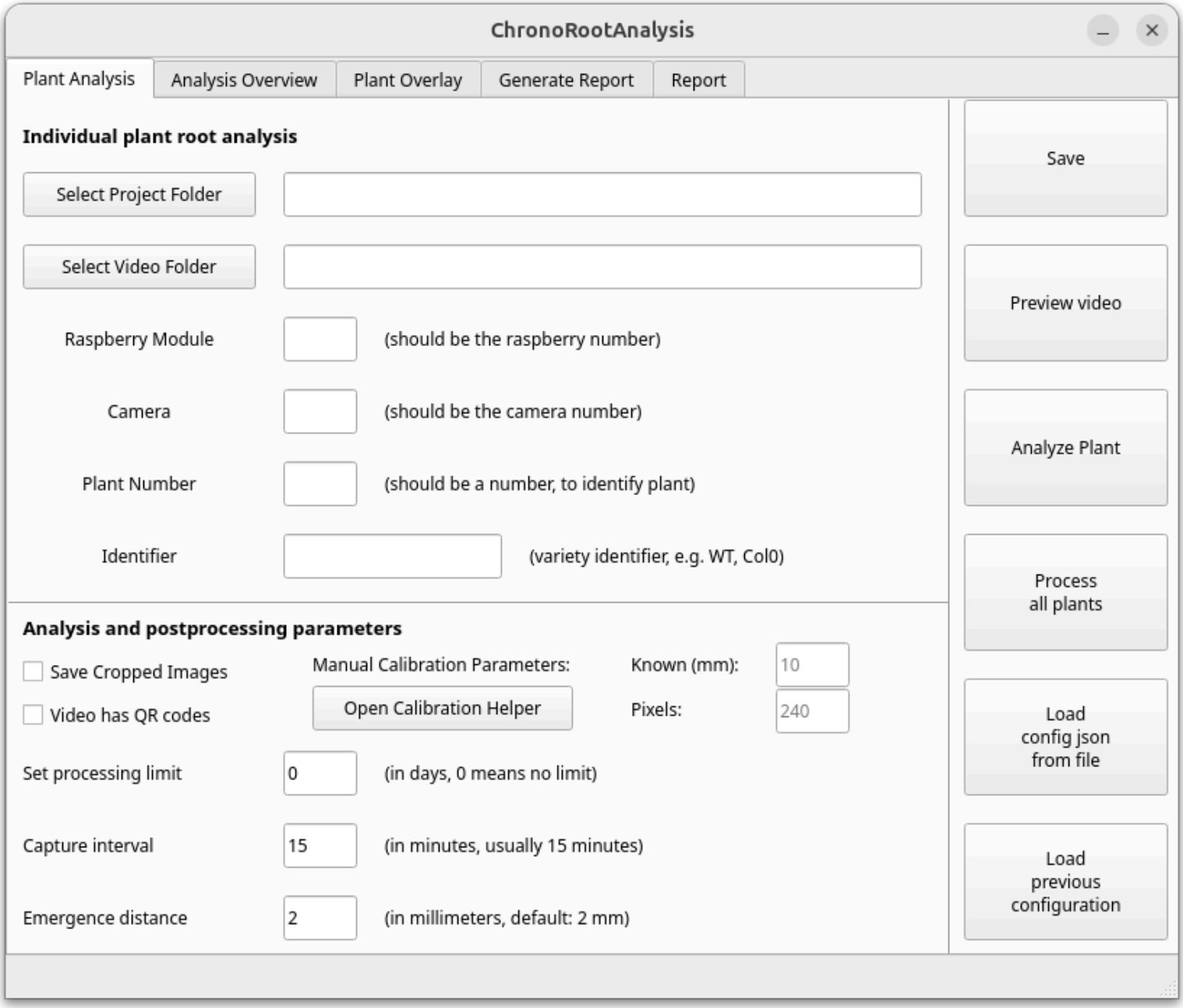
Plant Root Phenotyping Pipeline.



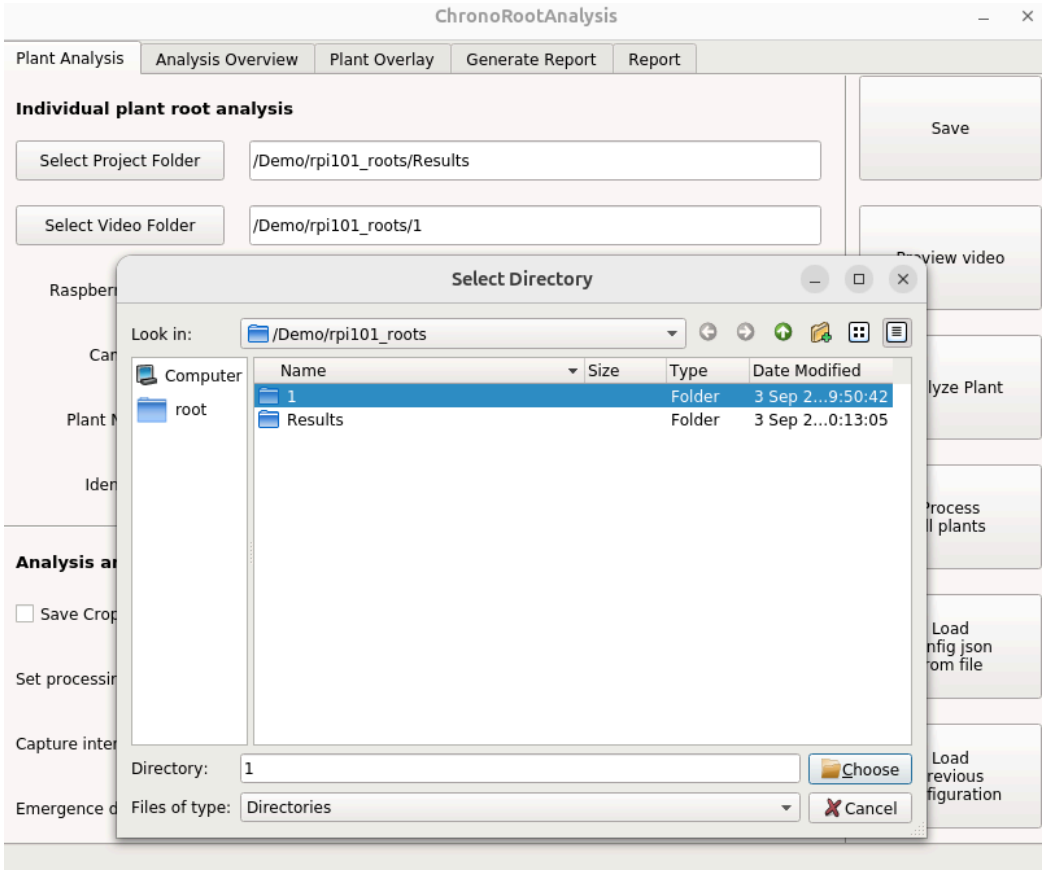
To begin the plant analysis process, launch the interface by entering "chronoroot" in the command line. This will open the main analysis window.

Interface Components:

- **Select Project Folder:** Specifies the storage location for your analysis results. A project encompasses a complete experimental setup involving one or more Raspberry Pi modules.
- **Select Video Folder:** Identifies the video file for current processing. Videos must be processed sequentially, one at a time.
- **Plant Identification Fields:** The Raspberry Pi Module, Camera, Plant Number, and Identifier fields allow you to tag each plant according to its origin (camera and module), position on the plate, and biological variety.
- **Manual Calibration Parameters:** If your video does not have a 1-cm QR code, measure a known distance and write the pixels from the calibration helper.

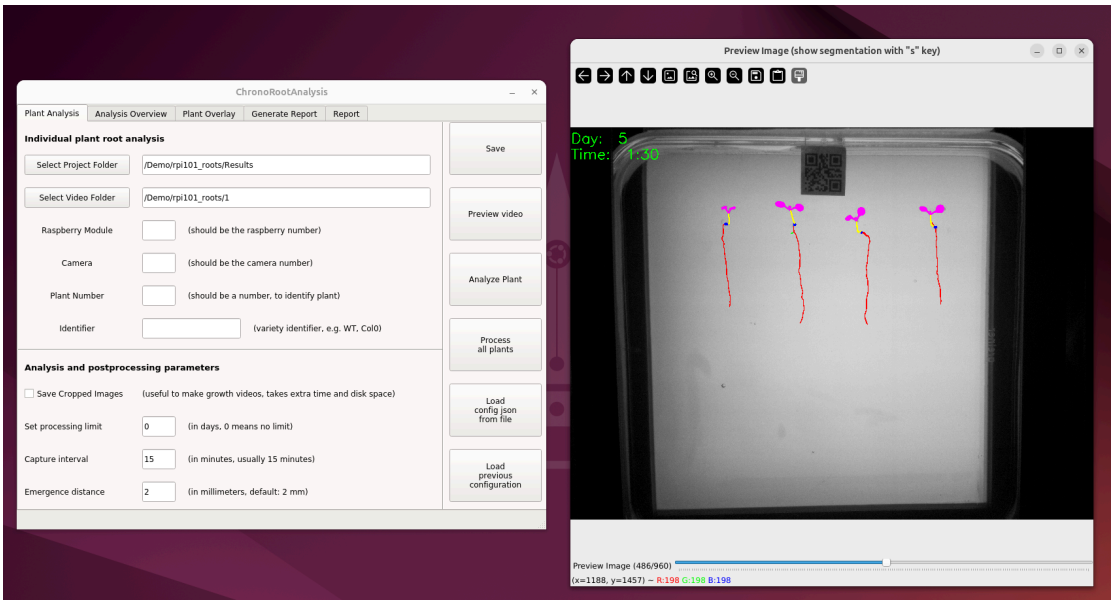
Getting Started:

Begin by creating a dedicated folder for storing results, then select the first video from the Demo dataset. A popup window will prompt you to choose the appropriate folders.

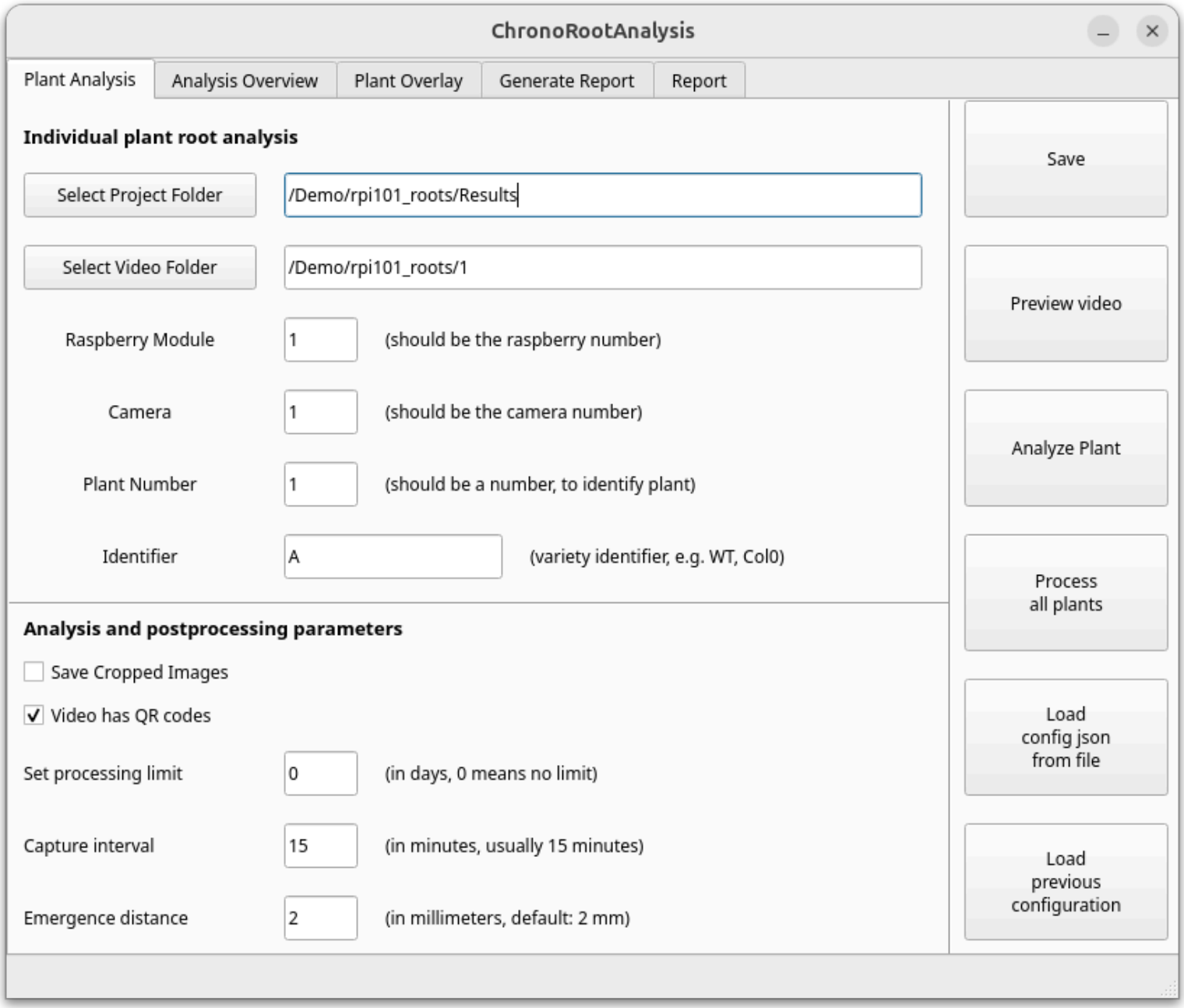


Video Preview and Setup:

Click the "Preview Video" button to view your selected video. Use the scrollbar to navigate between frames and press the "S" button to toggle the segmentation overlay for visual inspection. In this case, we can see that the video contains a QR code.

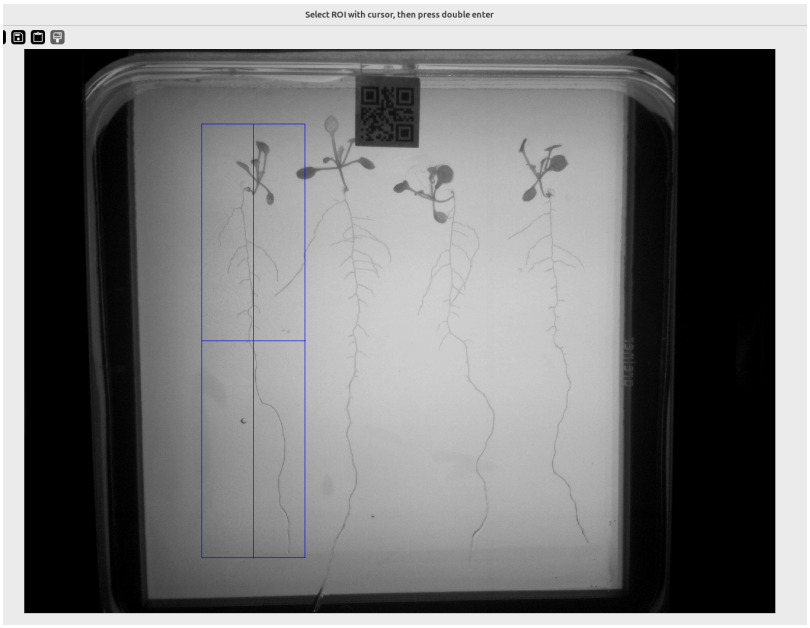


Complete the plant identification details for the first plant you wish to analyze.



Plant Analysis Workflow:

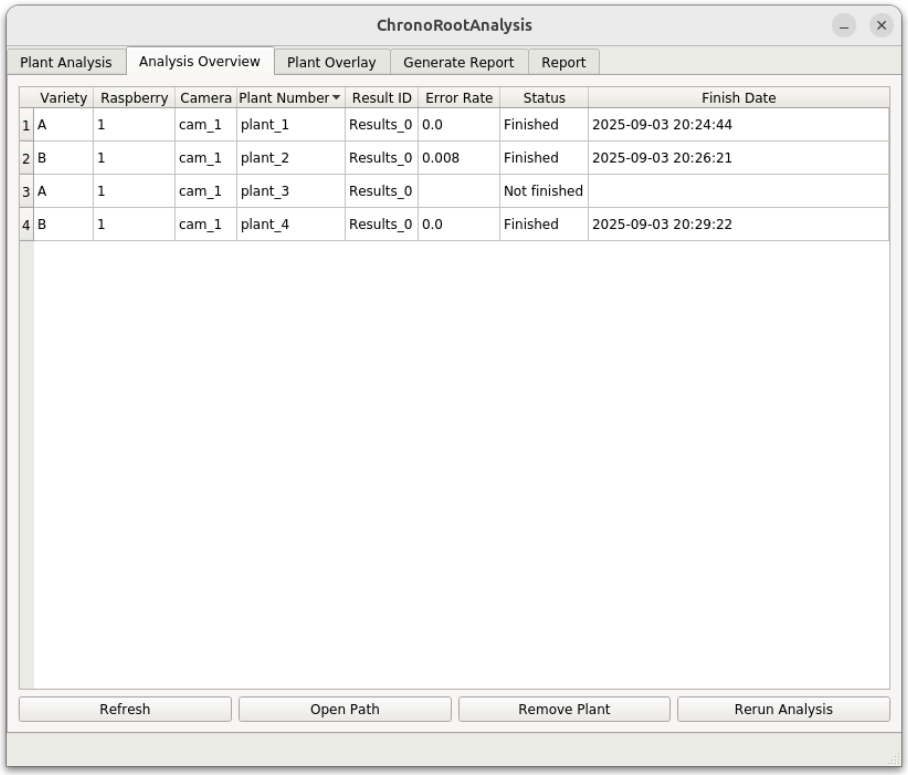
1. **ROI Selection:** Click "Analyze Plant" to open the ROI (Region of Interest) selector. Manually define the analysis area and press double-enter to confirm your selection.
2. **Seed Point Selection:** Choose the seed point carefully, as this will remove any segmentation above it and establish the starting point for graph construction. This serves as a manual validation and cleaning step.
3. **Validation:** Review the complete sequence using the scrollbar and visualize the segmentation by pressing "S". Press Enter when satisfied with the results.
4. **Repeat Process:** Complete this workflow for all 4 plants in the demo. Feel free to compare varieties using patterns like A-B-A-B or A-B-C-D to observe behavioral differences.


Select ROI with cursor, then press double enter


Select seed with cursor
Day: 9
Time: 7:15
Overlap segmentation with "s" (893/960)
(x=434, y=409) ~ R:189 G:189 B:189

Quality Control and Batch Processing:

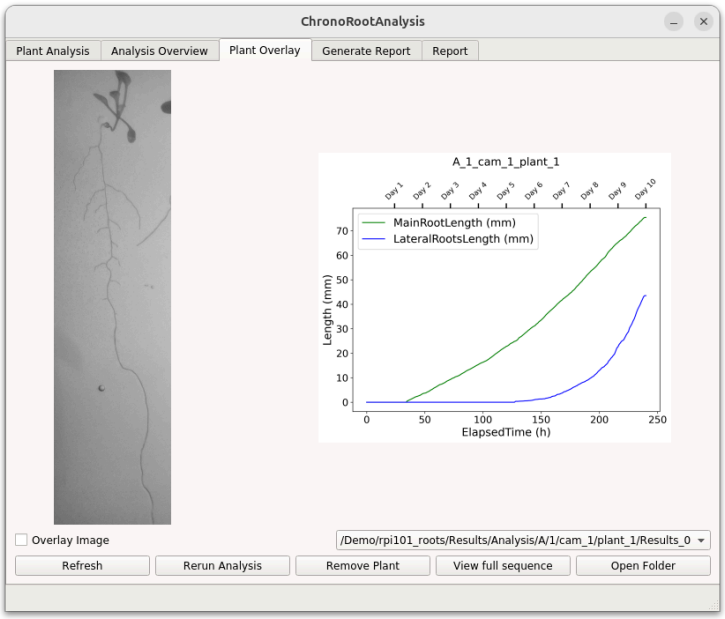
Navigate to the "Analysis Overview" tab to monitor experiment progress and error rates. Poor ROI selection or incorrect seed point positioning may cause errors in graph creation. Once individual plant processing is complete, return to the "Plant Analysis" tab and select "Process All Plants."

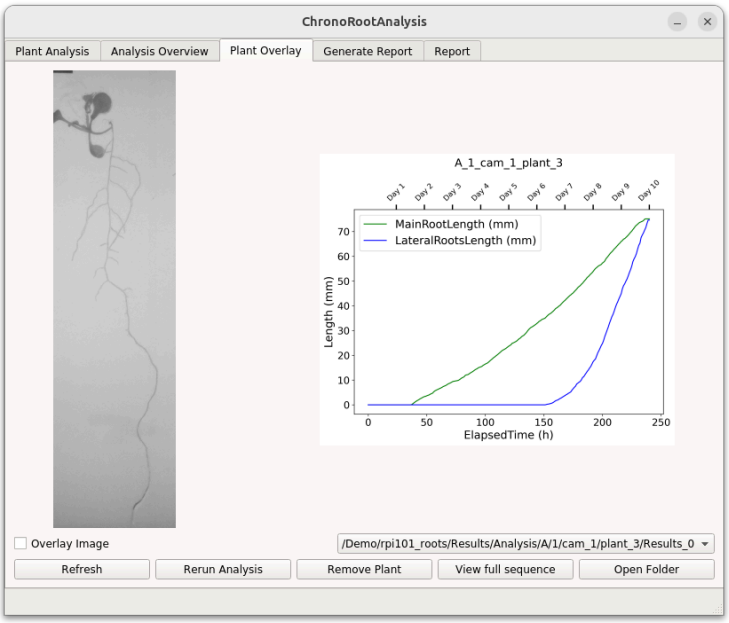


	Variety	Raspberry	Camera	Plant Number	Result ID	Error Rate	Status	Finish Date
1	A	1	cam_1	plant_1	Results_0	0.0	Finished	2025-09-03 20:24:44
2	B	1	cam_1	plant_2	Results_0	0.008	Finished	2025-09-03 20:26:21
3	A	1	cam_1	plant_3	Results_0		Not finished	
4	B	1	cam_1	plant_4	Results_0	0.0	Finished	2025-09-03 20:29:22

Visual Inspection:

The "Plant Overlay" tab provides visual inspection capabilities for both segmentation results and plant root performance analysis. This interface allows you to discard problematic plants or restart the entire process if needed.

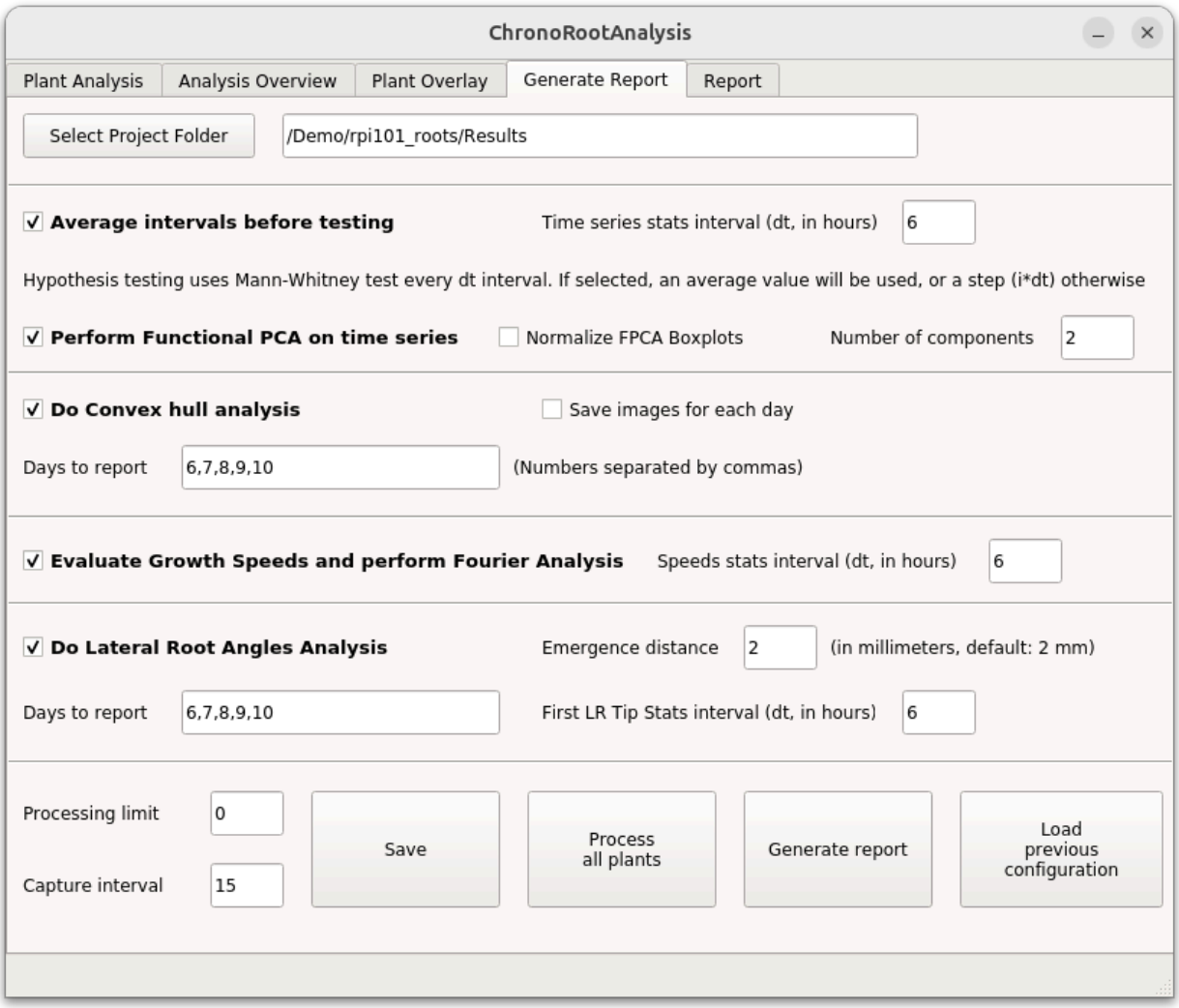




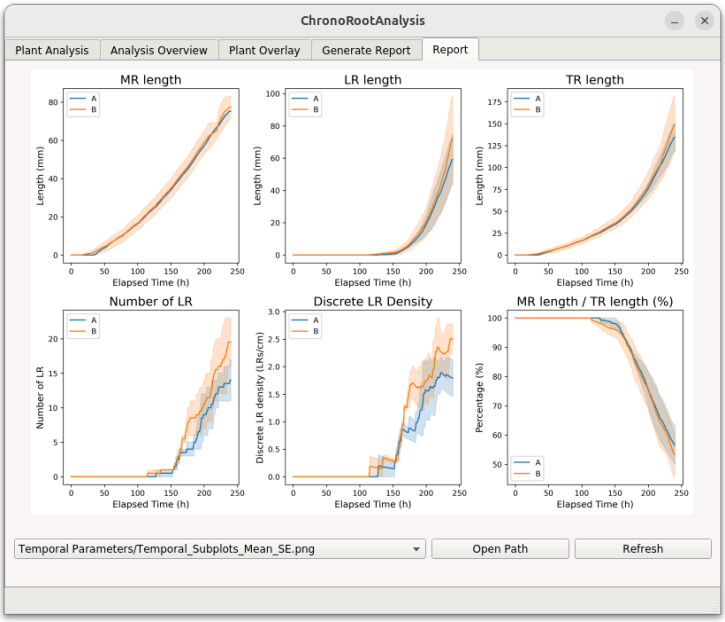
Report Generation:

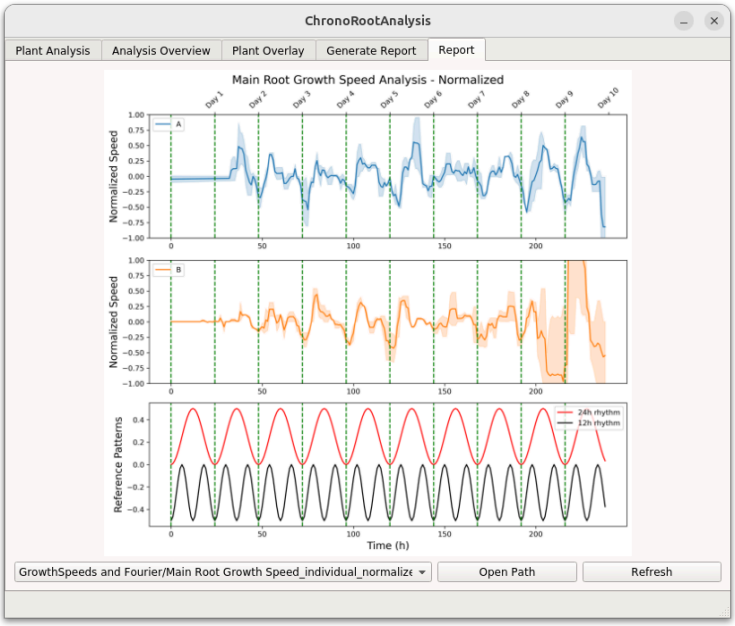
After completing individual plant analyses, you can generate comprehensive reports. The demo dataset includes 10 complete days of plant growth data—feel free to experiment with different report types. The system can perform interval testing (for example, every 6 hours) to compare different varieties using statistical methods such as the Mann-Whitney U test to determine if varieties show statistically significant differences.

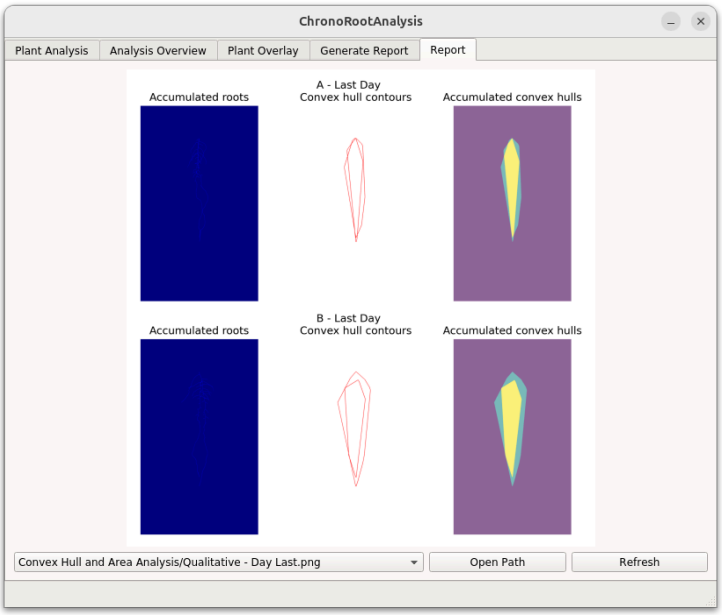
PS: If working with longer datasets and wanting to limit processing time, set the processing limit to your desired number of analysis days.

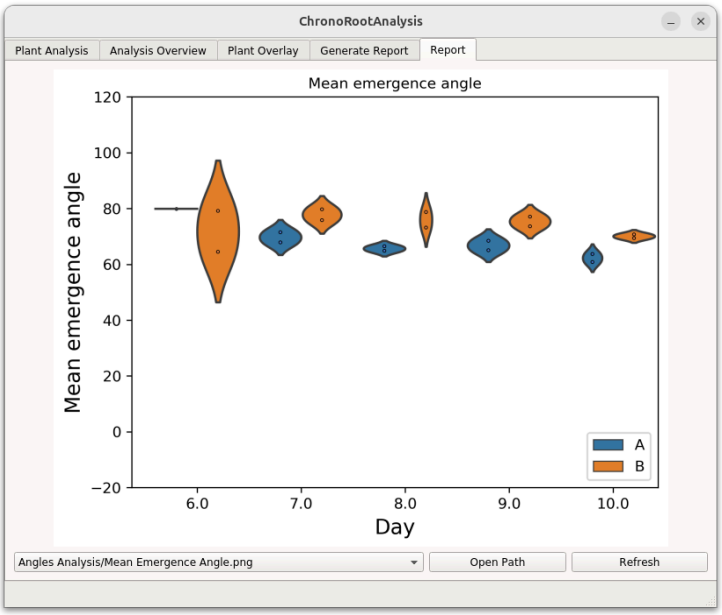


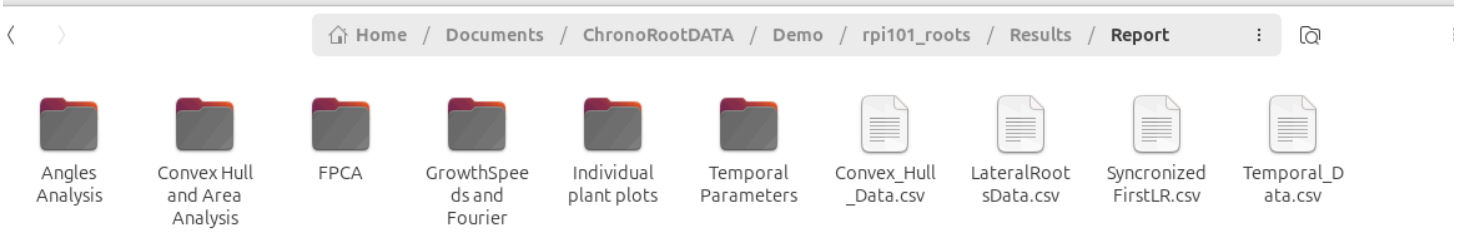
The system automatically generates comprehensive reports containing various figure types. All raw figures and images are saved within the report directory for detailed analysis and further investigation.


ChronoRootAnalysis
Plant Analysis
Analysis Overview
Plant Overlay
Generate Report
Report
MR length
LR length
TR length
Number of LR
Discrete LR Density
MR length / TR length (%)
Elapsed Time (h)
Temporal Parameters/Temporal_Subplots_Mean_SE.png
Open Path
Refresh


ChronoRootAnalysis
Plant Analysis
Analysis Overview
Plant Overlay
Generate Report
Report
Main Root Growth Speed Analysis - Normalized
Normalized Speed
Reference Patterns
24h rhythm
12h rhythm
Time (h)
GrowthSpeeds and Fourier/Main Root Growth Speed_individual_normalize
Open Path
Refresh


ChronoRootAnalysis
Plant Analysis
Analysis Overview
Plant Overlay
Generate Report
Report
Accumulated roots
A - Last Day
Convex hull contours
Accumulated convex hulls
B - Last Day
Convex hull contours
Accumulated convex hulls
Convex Hull and Area Analysis/Qualitative - Day Last.png
Open Path
Refresh


ChronoRootAnalysis
Plant Analysis
Analysis Overview
Plant Overlay
Generate Report
Report
Mean emergence angle
Mean emergence angle
Day
A
B
Angles Analysis/Mean Emergence Angle.png
Open Path
Refresh


Home / Documents / ChronoRootDATA / Demo / rpi101_roots / Results / Report
Angles Analysis
Convex Hull and Area Analysis
FPCA
GrowthSpeeds and Fourier
Individual plant plots
Temporal Parameters
Convex_Hull_Data.csv
LateralRootsData.csv
SyncronizedFirstLR.csv
Temporal_Data.csv