

# In-situ Root Imaging – Redefining Below Ground Research

Understanding root dynamics has always been a challenge — until now. NuTech introduces a state-of-the-art, non-destructive root observation system capable of visualizing *in-situ* root growth and monitoring the movement of even the finest root hairs. This advanced platform combines high-resolution imaging, automated data capture, and precision environmental control, providing researchers with unprecedented insights into root-soil-water interactions and plant physiological responses. A new era in below-ground phenotyping begins with NuTech.



The RZ-141 consists of a control unit, a high-definition imaging module, high-definition cables, a positioning ruler, and a positioning handle. This system captures high-resolution images of roots and rhizosphere microorganisms across different seasons. It is robust, durable, lightweight, and portable, equipped with a "Smucker" positioning handle for precise positioning. The system is suitable for micro-rhizotrons installed horizontally, vertically, or at an inclined angle. The accompanying professional

image acquisition software facilitates rapid setup, image capture, and ICAP naming. The software adjusts the imaging area based on the diameter of the micro-rhizotron and includes nonlinear calibration functionality to eliminate the curved effect of the micro-rhizotron.

## System Features

- **In-situ Monitoring:** Continuously monitors individual fine roots from birth to death without disturbing their growth process.
- **Multispectral Imaging:** Enables detailed imaging of roots under varying lighting conditions.
- **High-precision Analysis:** Quantifies various root indicators in conjunction with professional root analysis software.
- **Real-time Imaging:** Provides real-time imaging of living roots, fulfilling qualitative screening and quantitative research objectives. It achieves fast imaging without the need for white balancing, efficiently capturing images. **Durable and Portable:** The instrument is sturdy, lightweight, and portable, equipped with a "Smucker" positioning handle for precise positioning and suitable for various installation angles.

- **Wide Applicability:** Suitable for research and teaching in disciplines such as agronomy, biology, ecology, cultivation science, and horticulture, as well as in field or greenhouse environments. Parameters such as length, weighted average width, maximum width, minimum width, standard deviation of width, weighted average angle, maximum length, minimum length, standard deviation of angle, surface area, projected area, etc.



### Technical Specifications

- **Imaging Area:** 360° panoramic imaging, with software automatically cropping images to a standard 27mm × 20mm area.
- **Micro-rhizotron Specifications:** Outer diameter 70mm, inner diameter 64mm, wall thickness 3mm; lengths available in 100cm or 200cm (customizable).
- **Micro-rhizotron Material:** Imported PMMA with 92% light transmittance (within the visible light range, <0.05% absorption at 3mm thickness), refractive index 1.491; tensile strength of 110 MPa (-40°C) and 72 MPa (30°C).
- **Scanning Resolution:** 1200 dpi.
- **Image Resolution and Format:** 12 million pixels; JPG format.
- **Imaging Speed:** <1 second per image; efficient image capture without the need for white balancing.
- **Image Naming:** Follows ICAP naming conventions, including file name, rhizotron number, location, date, time, image set number, and collector.
- **Light Source:** Red light 620-625nm, green light 521-524nm, blue light 467-470nm, white light 6000-7000k, and UV 395nm, with a power of 2W.
- **Control Unit:** Tablet PC; Windows 10 operating system; 8GB RAM; software-controlled operation for experiments and image acquisition, including date and location tracking, with ICAP naming scheme.
- **Control Tablet computer:** Ruggedized tablet computer with a high-brightness screen for outdoor use, waterproof and shockproof. Equipped with a 10,000mAh removable lithium battery, it can work continuously for 6 hours.
- **Positioning ruler:** Made of aluminium, with a standard distance of 20mm between positioning holes; a maximum of 3 positioning rulers can be connected continuously.
- **Positioning handle:** Classic "Smucker" positioning handle, enabling precise and rapid circular positioning.

### Supplied with

Control Tablet computer; HD imaging module, 1.8-meter data cable, positioning ruler, positioning handle, power cord, 10 micro-root tubes made of imported materials; root image analysis software.

