

Phenotype Screening

C O R P O R A T I O N

enabling discovery

Service Description

Field and Greenhouse Harvested Root Analysis

There are applications where plants must be grown in soil, either in Field or Greenhouse. For those situations, we offer a washed root imaging and analysis service. Ship us your washed root systems overnight and we will image and analyze the roots for you. We can give you next day delivery of spreadsheet analysis data, or a full written report in a matter of days.



Example Washed Maize Root Systems as Shipped to PSC

The secret to attaining good root data from field grown and pot grown plants is good experiment planning and good root extraction methods. The present state of root research is one of trade-offs and compromises. This is particularly true in the extraction and analysis of mature root systems. Our application specialists are available to discuss your research goals and share their experience based upon our characterization of thousands of root system images.

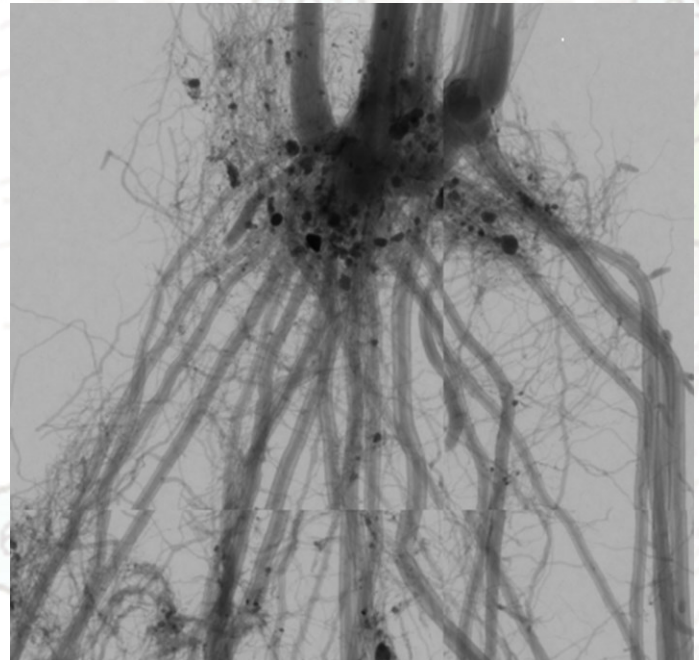
After a root system has been extracted and washed it must then be packaged for safe

shipment to our laboratory. A key consideration is timing. We recommend overnight early morning delivery. This guarantees fresh samples and thus good imaging results.

Once received at our facility we will unpack the samples, inspect them, and develop a labeling convention for keeping track of the samples and their experimental conditions throughout our imaging and analysis pipeline.

After imaging is complete the samples can be destroyed or shipped back to your facility for your further analysis.

Below is an image of a switchgrass root system grown in a greenhouse pot under acid soil conditions. The very dark circular struc-



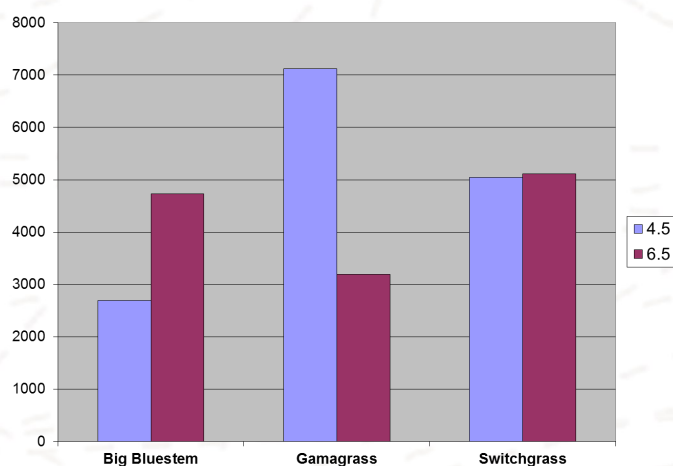
tures represent soil particles that were not completely removed during washing. The fine roots that appear to be growing upward parallel to the tillers are a consequence of

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(continued)

how the roots were packaged for shipping. The below graph shows the mean total root length in millimeters of three prairie grass species grown under two different soil acidity levels (pH 4.5 and pH 6.5.) These measurements were determined from a set of X-ray images similar to the one on the previous page. The data is from six samples of each variety.



Our automated analysis software determines key root traits from X-ray images and generates a tally of the measurements in spread-

sheet format. You can then apply your preferred statistical analysis package to the spreadsheet data.

Our results show that the variety of switchgrass used in this trial had a root system that was insensitive to soil acidity, the gamagrass variety's root system was larger under acidic soil and the big bluestem's variety root system was smaller under acidic soils. This data was used for species selection of an contaminated site's phytoremediation.

Example Pricing

For maize, soybean, cotton, and some grasses the below example pricing for a lot of ten root systems applies. Note that x-ray imaging and analysis through to a spreadsheet of root system properties is included in the \$750 per lot of ten washed root systems price. A Statistical Analysis of the Data and preparation of a summary presentation is an additional \$1000. Contact us for a firm quotation for your plant species of interest and to discuss larger quantity discounts.

Service Activities

Unpack, Inspect and Associate Identification to Each Plant
 Prepare Plants for X-ray Imaging
 Stereo X-ray Image All Plant Root Systems
 Provide Digital Files of All Imaged Root Systems
 Provide Quantified Root Data in Spreadsheet Form
 Provide Summary Statistical Analysis and PowerPoint Report

Level One

Yes
 Yes
 Yes
 Yes
 Yes
 No

Level Two

Yes
 Yes
 Yes
 Yes
 Yes
 Yes

Estimated Price

\$750.00

\$1,750.00

Prices are for a lot of ten harvested and washed root systems