

Project information

Project title

Cost- and time-effective technology: Biological applications of Near Infra-Red Spectroscopy (NIRS)

Year

2014

Project leader

Kari Anne Bråthen

Participants

Kari Anne Bråthen and Francisco Javier Ancin Murguzur /The Arctic University of Norway

Jørgen Mølmann /BioForsk

Flagship

Terrestrial

Funding Source

450 000 NOK

Summary of Results

Within this project we want to assess ecological applications of NIRS (Near Infrared Reflectance Spectroscopy) as a potentially cost effective methodology for:

1 - Determination of inorganic constituents of plant material and soils (C, N, P, Si) essential to stoichiometric relationships and hence basic biological processes of ecosystems:

We have successfully established NIRS as an application for N, P, C and Si.

2 - Transferability of calibration models between different ecological systems and species:

We have tested transferability of calibration models between phenological stages (early, middle and late season), species (approx. 30 plant species) and community types (meadows and heaths) for N, P and C and Si, and in two countries (Norway and France) for N, P and C. Results show that transferability is high, and represent a first step towards the development of global calibration models.

3 - Transferability of calibration models from dried to fresh material:

When applying NIRS we have so far developed calibrations based on dried material because of interference of water. However, the ability to apply NIRS to fresh plant material open avenues to make measures of live organisms. Preliminary results indicate NIRS can be applied to live leaves for N assessment.

The applications of NIRS developed in this project has facilitated a range of student projects; Katarina Inga (MS project), Freja Fagerholm (MS project), Adriaan Smiis (published paper for his PhD), Maria Tuomi (paper in progress for her PhD), Marjorie Bison (paper in progress for her PhD), Matteo Petit Bon (PhD project).

For the Management

Cost- and time-effective technology for the measurement of plant nitrogen, phosphorus, carbon and silicon have been established at UiT-The Arctic University of Norway.

Published Results/Planned Publications

Smis, A., Murguzur, F.J.A., Struyf, E., Soininen, E.M., Justado, J.G.H., Meire, P. & Bråthen, K.A. (2014) Determination of plant silicon content with near infrared reflectance spectroscopy. *Frontiers in Plant Science* 5:496

To be submitted shortly to *Frontiers in Plant Science*:

Transferability of NIRS calibrations for N, P and C between plants of northern and southern Europe

Planned publication:

Applicability of NIRS for live estimation of plant N

Communicated Results

Talks presented at seminar for the research group of Northern Populations and Ecosystems October 2014: "NIRS where are we now, and where are we heading?". Talk at FRAM February 2015 (part of seminar series at the Polar Institute) "Shedding Infra-Red light in science: is it the time for you to test it out?"

Budget in accordance to results

The budget was used as planned.

Could results from the project be subject for any commercial utilization

No

Conclusions

New applications of NIRS have successfully been developed. Measures of nitrogen, phosphorus, carbon and silicon are achieved in one NIRS scan of plant leaves.