

## Near Infrared Transmission Data Key

### *New and non-destructive method for testing and sorting seeds by quality*

Aarhus University

June 2009

#### Technical Field

- Near infrared spectroscopy based seed sorting equipment
- Seed quality testing and seed sorting
- Seedling plant production

#### Business opportunity

Research collaboration  
Licensing opportunity

#### Current state of technology

A proof of concept project is currently carried out in order to improve and validate the method in different commercially important Abies species and test the method on other selected species. In addition the project will develop the optimal shape of a single seed carrier for capturing and presenting single seeds to NIT scanning in a reproducible manor.

The overall aim is to ensure a very high degree of correct identification of quality of single seeds.

#### Applications

The NIT Data Key contain mathematical algorithms that may be used in NIRS based equipment for quality testing or seed sorting of single seeds of the Abies genus, thus adding value to:

- Producers of seed sorting equipment
- Tree seed companies
- Christmas trees producers
- Seed testing laboratories

#### Commercial Value

Seed lot quality of Abies seeds is often variable containing both empty and dead seeds that are extremely difficult to separate from good seeds. Low seed germination inhibits the development of economic sustainable plug production in green houses and precision cultivation of bare root seedlings in the field.

The NIT Data Key will together with NIRS based sorting equipment ensure much more efficient seed sorting and provide seeds that can germinate between 90-100% in plug production making this method economical sustainable.

#### The Technology

A new fast and non-destructive method of identifying seed quality of Abies seeds has been developed and allows separation of seeds into a germinable or non germinable fraction.

The method apply Near Infrared Transmission (NIT) scanning of single seeds, thereby obtaining spectroscopic data sets that have unique features depending on the quality of the single seed. A prediction model is developed based on spectra from thousands of single seeds from a number of seed lots with variable seed quality and water content. Final quality and destiny of seeds has been determined by detailed vigour germination test, biochemical vitality test or cut-testing of seeds.

Comparison of individual new spectra against a classification Data Key model allows prediction of the quality of scanned seeds into seed quality classes, for example empty, dead, viable or germinable seeds.

When this NIT Data Key is used together with NIRS based seed sorting equipment, it will be possible to sort seeds of Abies gena into categories with very high percentage of germination, that will be of tremendous economical benefit for plug production.

In a slightly different setup the NIT DATA Key combined with analysis equipment may be used to provide fast and detailed predictions of seed quality in a population of single seeds, thus replacing or supplementing traditional seed testing methods.

#### Intellectual Property Rights

A European patent application has been filed on 4th of July 2008 and has received the patent number 08012157.7-1260. Universities of Aarhus & Copenhagen, Denmark, are co-owners of the rights.

## Inventors

### Martin Jensen

**Senior scientist, Department of Horticulture, Aarhus University**



*Originally educated within nursery business, Martin Jensen holds a master in Horticulture and a Ph.D. in seed biology.*

*Main research is on seed biology and seed technology for forestry, horticulture and agriculture.*

*Specific focus is on:*

*Understanding of and methods for quantifying and improving biological seed quality by for example seed vigour testing, non-destructive x-ray analysis, NIT scanning (near infrared transmission) of seeds combined with advanced 'physiological seed sorting'*

*Understanding seed dormancy and germination inhibiting mechanisms in seeds and how it develops, efficient methods to break dormancy using for example controlled moisture content and production of seeds without dormancy that tolerate desiccation and storage.*

*Another main research area is development and selection of trees and shrubs for gardens and landscape use - both clonally and on seed propagated basis. This includes a.o. investigations of genetic, phenotypic and disease resistance variation.*

*Have for more than 10 years studied aspects of medicinal plants (for example American ginseng and the anti-malarian species *Artemisia annua*) including cultivation, selection of superior genetics, identification of and variation in bioactive compounds and their health effects).*

### Birthe Møller Jespersen

**Associate professor, KU Life**



*Birthe Møller Jespersen is associate professor in Plant Food Post Harvest Processing and Bioactive Compounds at Quality and Technology.*

*Birthe is agronomist and has her MSc and PhD from University of Copenhagen, Faculty of Life Sciences. The title of the PhD thesis is "Screening analyses for quality criteria in barley – Predicting germinative and physical-chemical properties by spectroscopy evaluated by multivariate dataanalysis".*

*Birthe has experience of more than 10 years of research at University of Copenhagen, Faculty of Life Sciences where the primary research areas have been vigour and germination, physical-chemical characterisation of cereals, data breeding as well as spectroscopic and functional characterisation of betaglucan.*

## References

- Jensen, M. & Jespersen, B.M.P. 2009. NIR spectroscopy for potential quality assessment of tree seeds. Conference: NJF seminar, Agricultural applications of NIRS and NIT, No. 413, April 27- 28, 2009.
- Jensen, M. 2009. Nordmannsgran – langtidslagring af frø i hvile eller korttidslagring af frø uden hvile. 21 p. Conference: Danseed Symposium, Kobæk Strand. , February 24- 25, 2009.
- Jensen, M. 2009 Frø af nordmannsgran skal lagres ved meget lave temperaturer og vandindhold. Nåledrys, 68, 11-13.
- Nielsen, U. B. ; Rasmussen, H. N. ; Jensen, M. 2009 Rooting Nordmann fir cuttings for Christmas trees?. Finnish Forest Research Institute, 2009. 114 ed p. 48-52 Proceedings Conference: Vegetative propagation of conifers for enhancing landscaping and tree breeding, Punkaharju, Finland, September 10-11, 2008.
- Christensen, L.P. & Jensen, M. 2008. Biomass and content of ginsenosides and polyacetylenes in American ginseng roots can be increased without affecting the profile of bioactive compounds. Journal of Natural Medicines. 2008, Vol. 63, No. 2, p. 159-168.
- Jensen, Martin 2008 Desiccation, freezing and storage tolerance of pretreated non-dormant *Abies nordmanniana* seeds. In: Book of Abstracts from International Workshop on Forest Seed Storage, Kostrzyca Forest Gene Bank, Poland. 2008. p. 7.
- Jensen, M. 2008. NIR/NIT analyse af træfrø, Præsentation på Danseed Symposium, Skelskør, 26-27. februar 2008, <http://www.danseed.dk/Nyheder/2008/999-Danseedsymposium.aspx>
- Jensen, M. 2008. Nedtørring, frysning og lagring af forbehandlet nordmannsgranfrø. Nåledrys, 65, 9-14.



AARHUS UNIVERSITET

Contactperson:

**Kristine Kjer Hansen**

University of Aarhus

Phone: + 45 8942 6864

E-mail: [kkh@adm.au.dk](mailto:kkh@adm.au.dk)