

ISTA
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Multispectral cameras and imaging in seed quality parameters

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OUTLINE

- › Constraints to meet a high seed quality during seed production
- › Multispectral imaging
- › Seed health
- › Purity
- › Germination

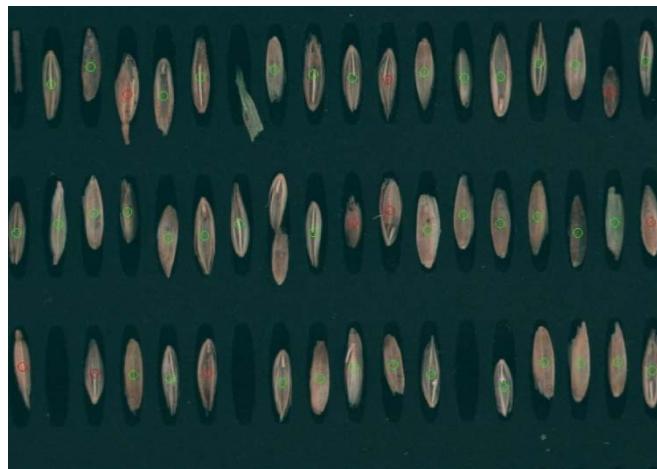


ADVERSE CONDITIONS



Summer 2010 and 2011 in Denmark

ACTIVITIES BEGAN IN 1997



Distinguish between
Poa pratensis/ *Poa annua*?



Identify spores of fungal
pathogens?

WHAT TO BE MEASURED?

- › Colour (or Gray level)
- › Topographical texture
- › Spectral texture
- › Gloss
- › Shape
- › Size
- › Position and orientation
- › Count

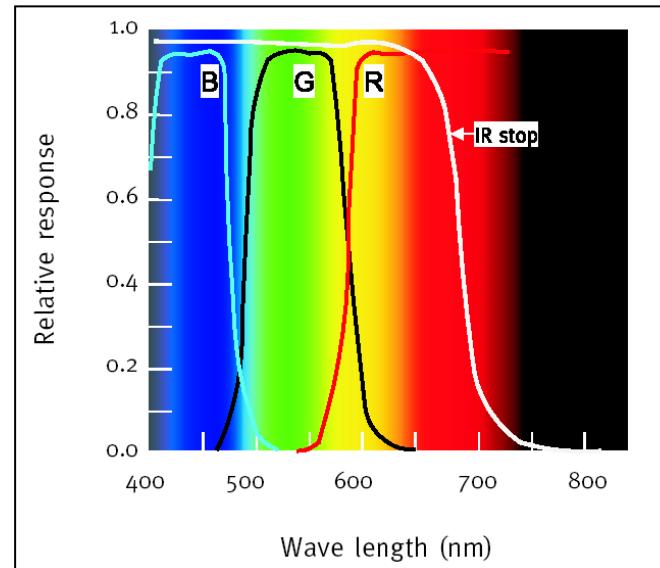


WHY USE IMAGING?

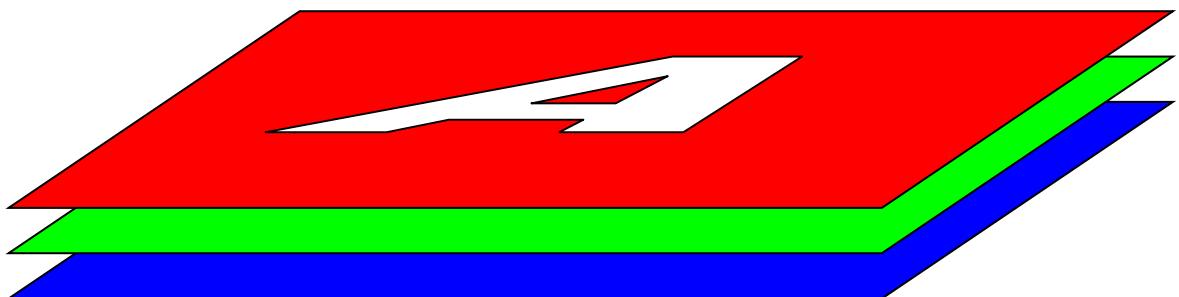
- › Mimic human vision
- › Eliminate subjective assessment
- › Non-homogeneous samples
- › Focusing on certain areas of a sample
- › When the shape, size and texture of the object is of special interest
- › Documentation

TRADITIONAL COLOUR IMAGE

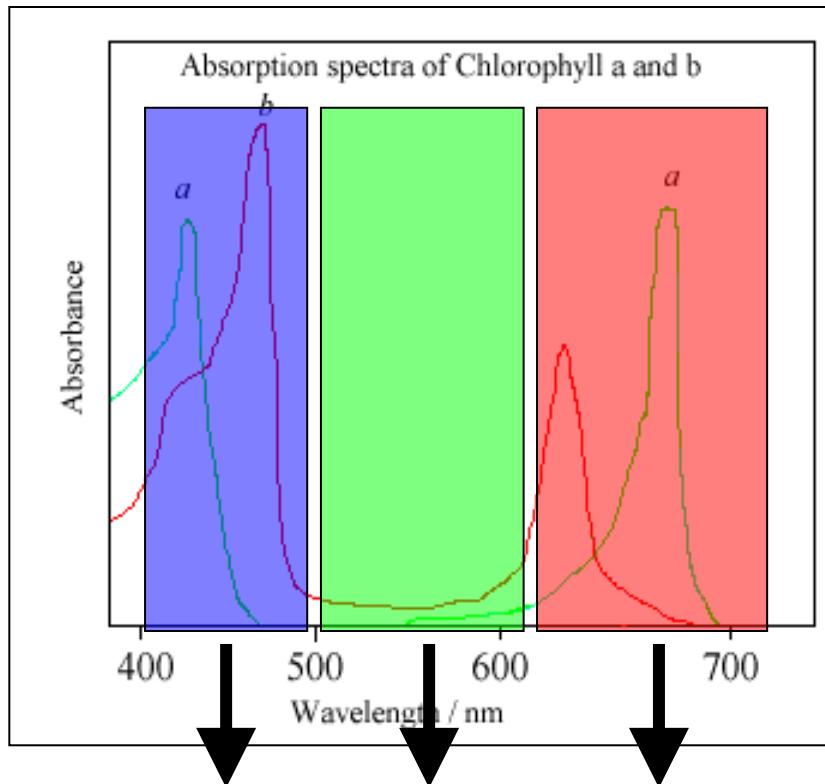
Uses 3 broadband filters for **Red**, **Green** and **Blue**



RGB Image



TRADITIONAL COLOUR IMAGING

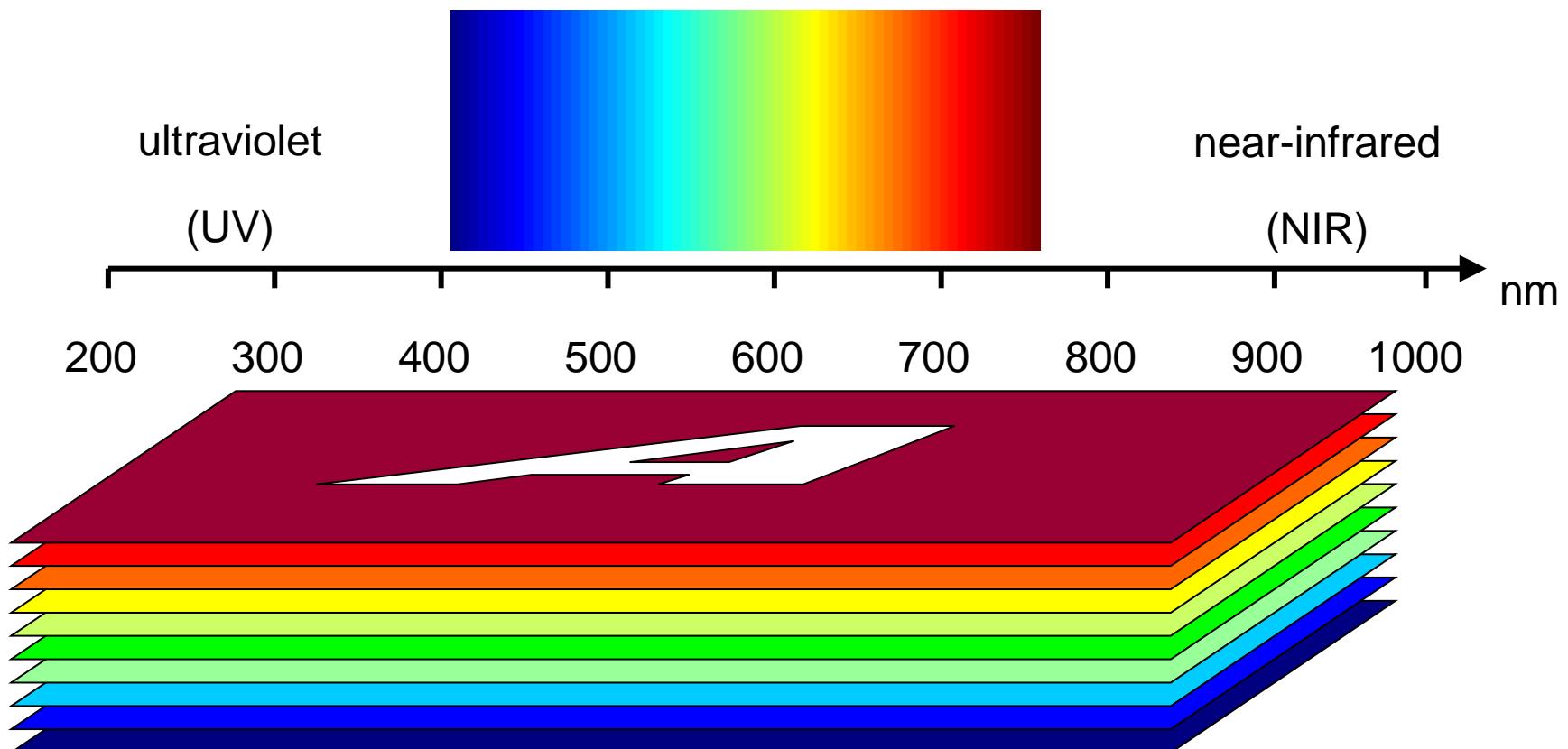


B low G high R low

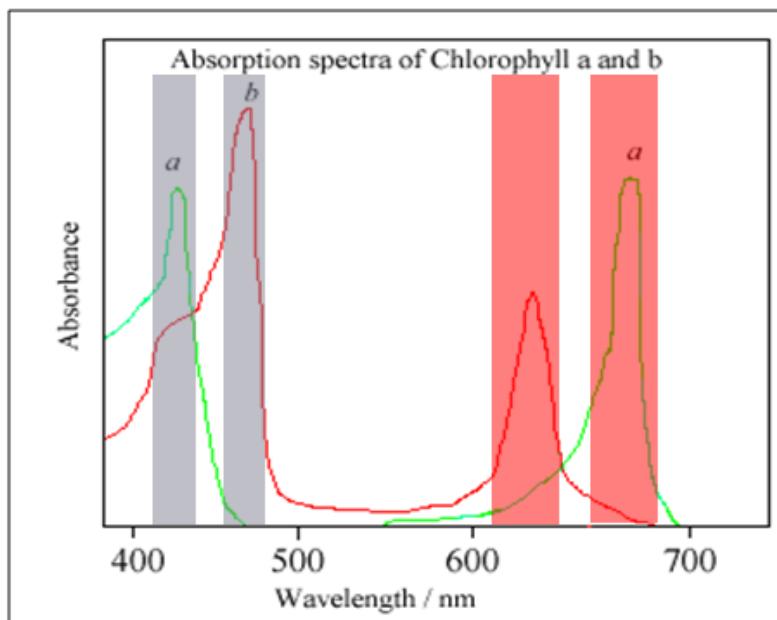
Chlorophyll a and b give almost the same RGB signals



MULTISPECTRAL IMAGING



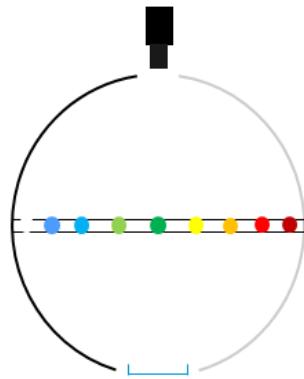
BY SPECIFIC WAVELENGTHS CHLOROPHYLL A AND B CAN BE DISTINGUISHED



Chl.A	low	high	high	low
Chl.B	high	low	low	high



VIDEOMETER SPECTRAL IMAGING



- LEDs: Stable, durable, large selection, rapidly developing technology
- Up to 20 different high-resolution bands acquired sequentially in 0.5-1.5 seconds depending on camera
- May be combined with emission filters and backlight

SPINACH SEED QUALITY

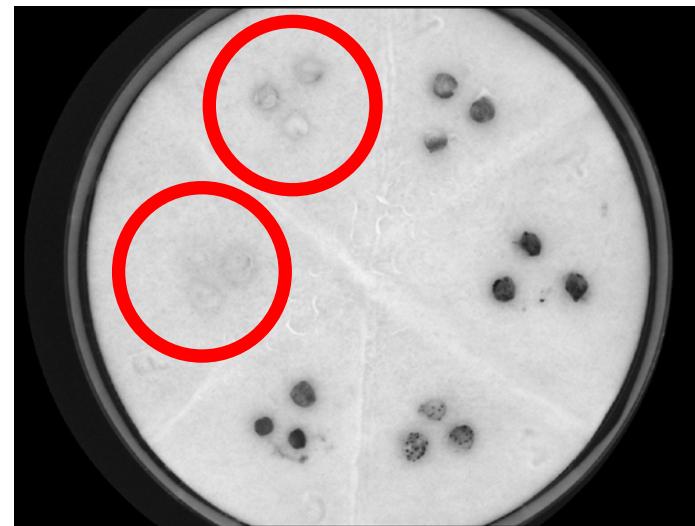


SEED HEALTH

Six groups of 3 seeds (un-infected control, Fusarium, Verticillium, Alternaria, Stemphylium, Cladosporium) analysed in visual and near infrared light.



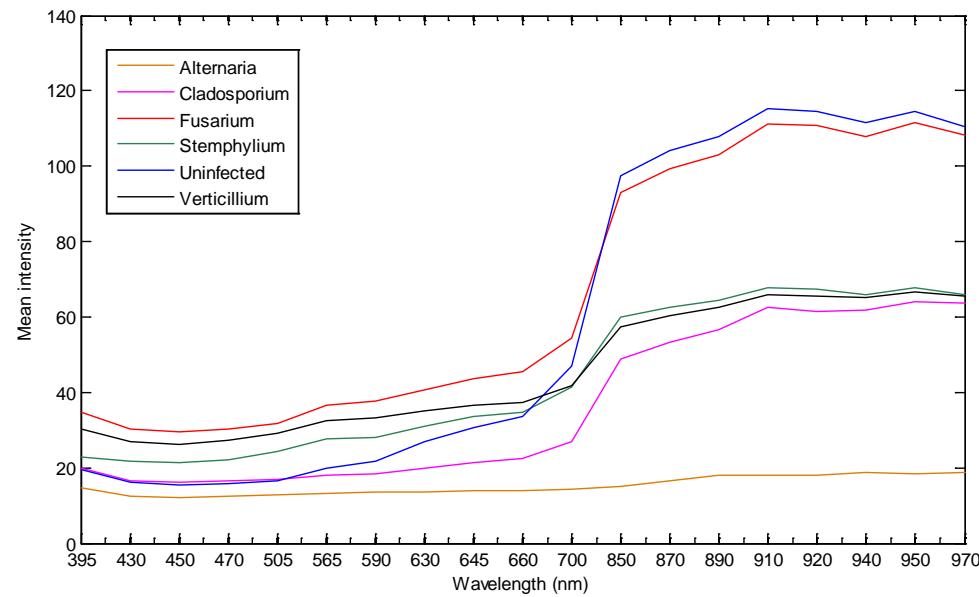
VIS 450nm



NIR 870nm



SEED HEALTH



Stemphylium



Alternaria



Fusarium



Cladosporium

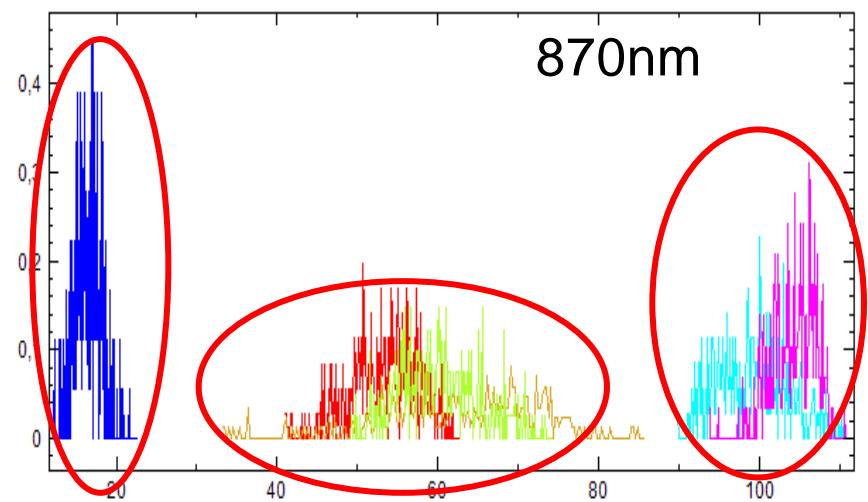
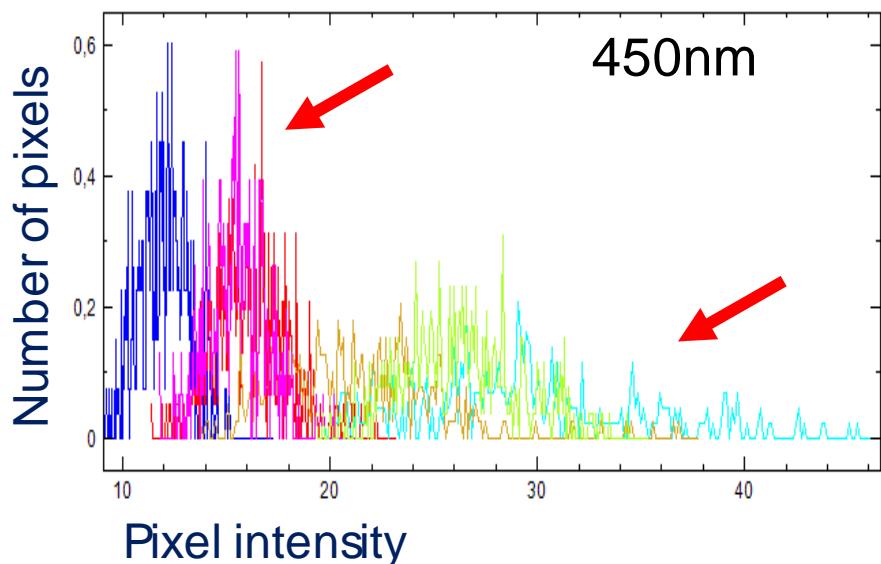


Verticillium



HISTOGRAM OF PIXEL VALUE

Alternaria spp. *Fusarium spp.* *Stemphylium spp.*
Cladosporium spp. *Verticillium spp.* Uninfected



INSTRUMENT FOR LARGE-SCALE MULTISPECTRAL IMAGING

VIDEOMETERLAB XY

- › VideometerLab Sphere with Multispectral light
- › XY positioning system
- › Presentation plate for samples
- › Vibration Device for even distribution of samples
- › Vacuum system for automatic removal of samples



SEED QUALITY, GRASSES

Festuca rubra, L
L: 6.2; W: 1.0; H: 0.8



Vulpia bromoides
L: 6.3; W: 0.7; H: 0.6

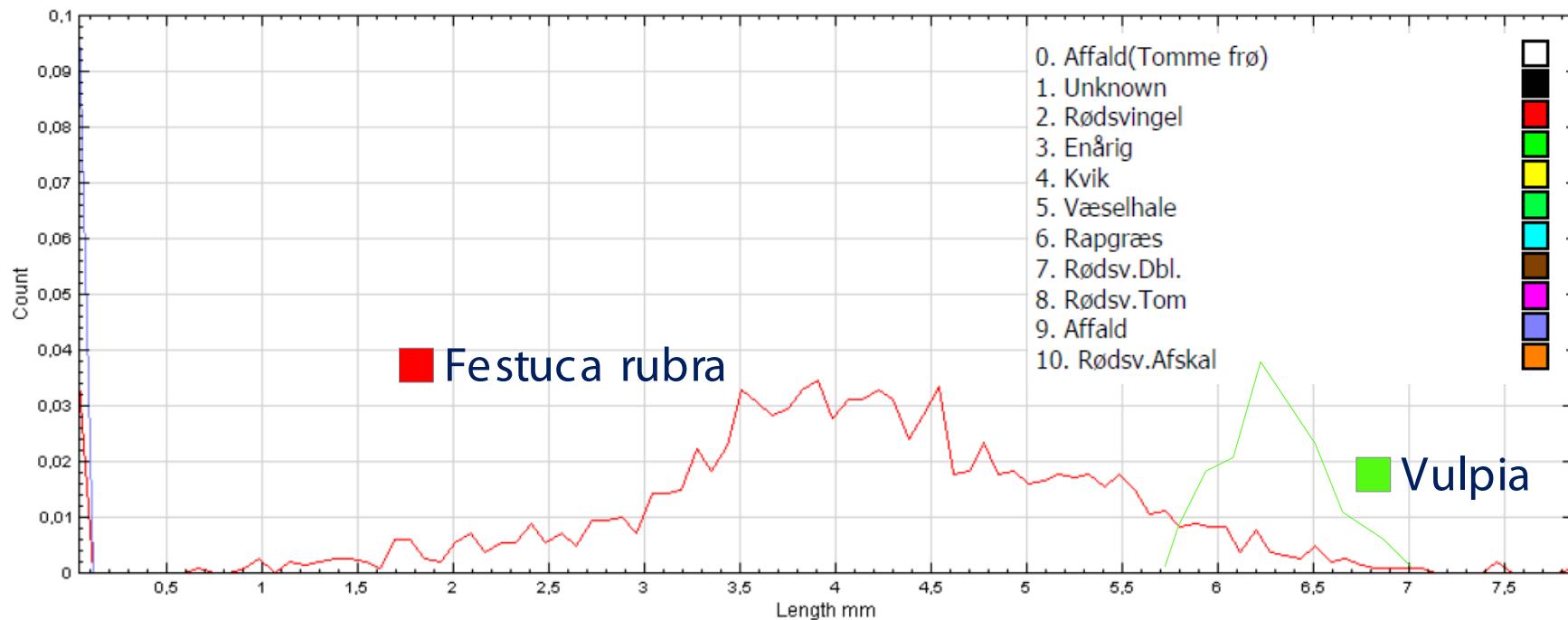


REPORT: SEED LENGTH



SeedLab Analyse Rapport

22-05-2007 18:53:57



GERMINATION PROCESS

Detection of chitting-germination process in malting barley.

Grains without any germ will be marked in a red rectangle and grains with germ will be marked with a green rectangle



Perspective:

Automated single count of radicle emergence to predict seed and seedling vigour?

(Seed Testing International, Matthews and Powell, 2011)



FUTURE OUTLOOK

- › Multispectral cameras and imaging hold a potential for measuring seed quality parameters
- › Can new methods based on multispectral imaging be accepted in the ISTA rules?



SPECTRASEED



- › Newly granted project with the aim to develop multispectral technology for fast, cost-efficient, and non-destructive analysis of seed quality
- › **Participants:**
- › University, technology provider (Videometer) and the Danish seed industry and seed processors.

SPECTRASEED

- › Work with commercial seed lots
 - › Build models based on results and input from trained seed analysts and spectromorphological information for seed health and germination
 - › Test and document the accuracy
-
- › Implementation barriers:
 - › Looking at seeds from only one side / test of more seeds
 - › Seed weight / area, optically estimated volume or weight

THANK YOU FOR YOUR ATTENTION



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