



## Session 4 – The importance of quality seed in agriculture

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# Raising seed quality: what is in the pipeline?

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**with contributions of:**

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**Jan Bergervoet, Steven Groot, Henk Jalink, Jan van der Wolf,  
Plant Research International**

**in cooperation with**





# Seed quality = ?

**Physical and physiological quality**

**Genetic quality = Breeding**





INTERNATIONAL SEED TESTING ASSOCIATION (ISTA)  
[www.seedtest.org](http://www.seedtest.org)



**Good seed quality is made in the field !**

**>> Technologies to raise seed quality after harvest**



# Categories of technology

- **Testing & research**
- **Enhancement (sorting, priming & sanitation)**



# Seed testing & research

**X-ray**

**Image analysis**

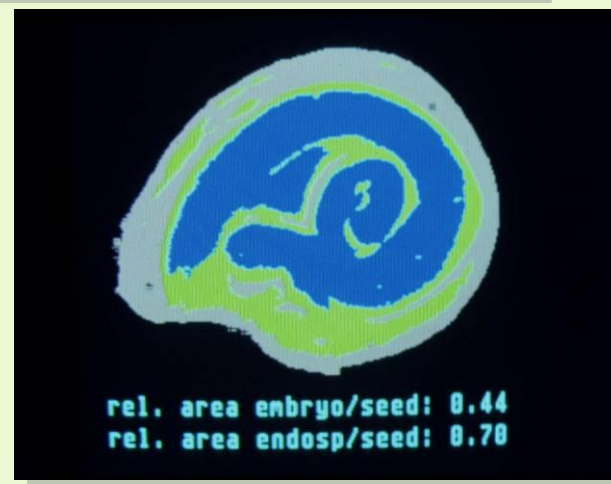
**CF-analyzer**

**Q2 technology**

**Ethanol assay**

**Molecular technologies**

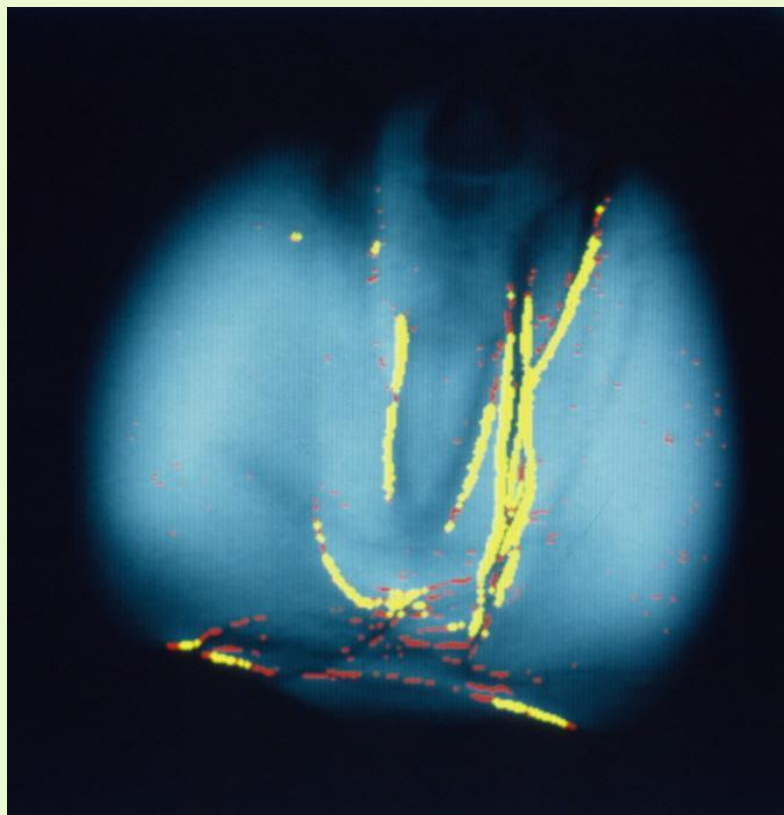
# X-ray and image analysis







# Crack detection





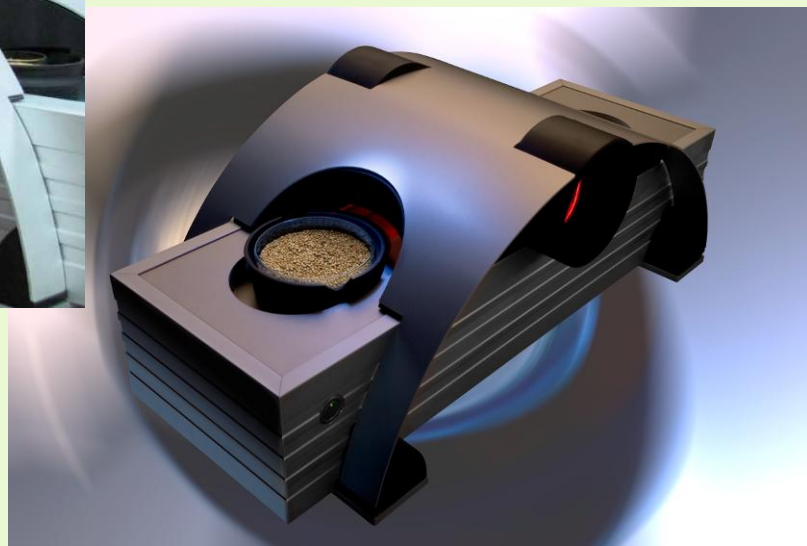
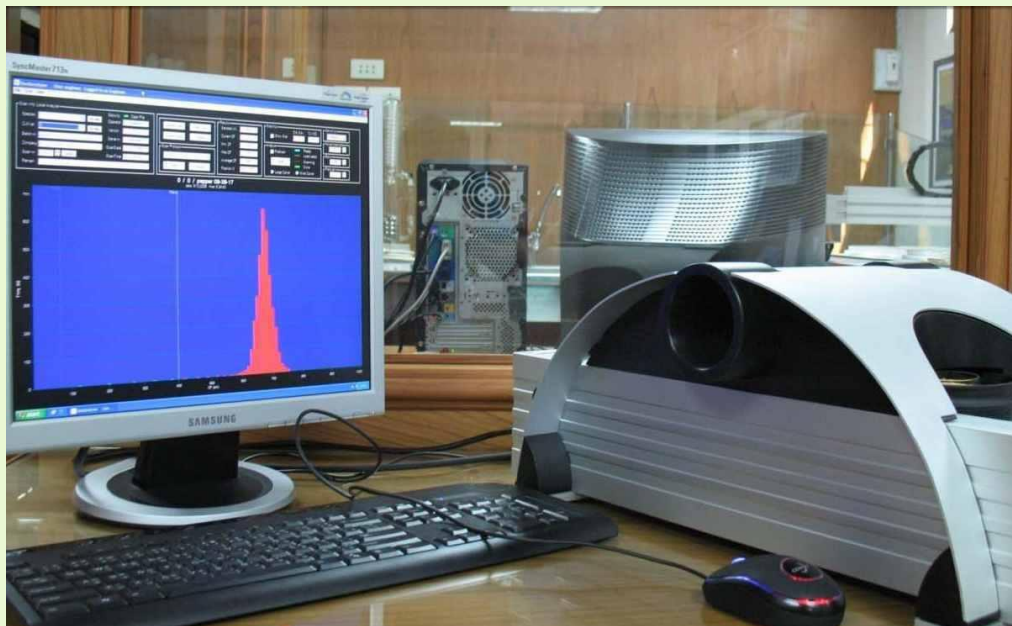


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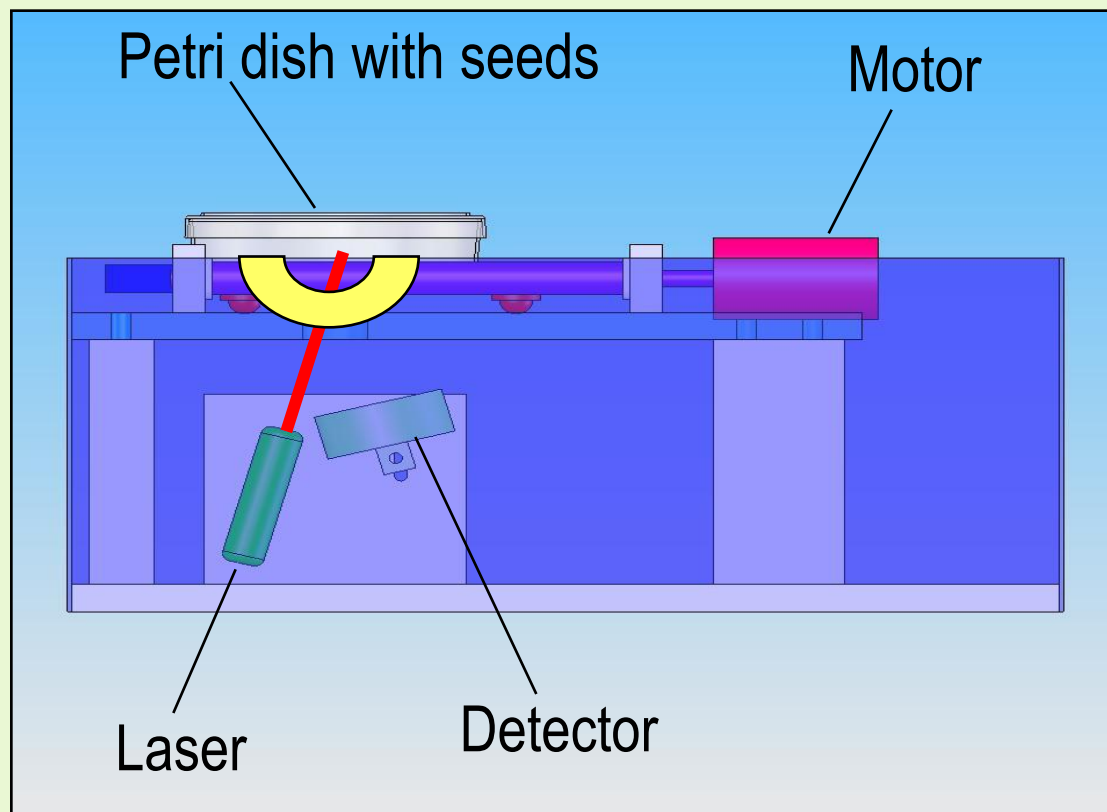


**INCOTEC** INTEGRATED  
COATING AND SEED  
TECHNOLOGY<sup>®</sup>

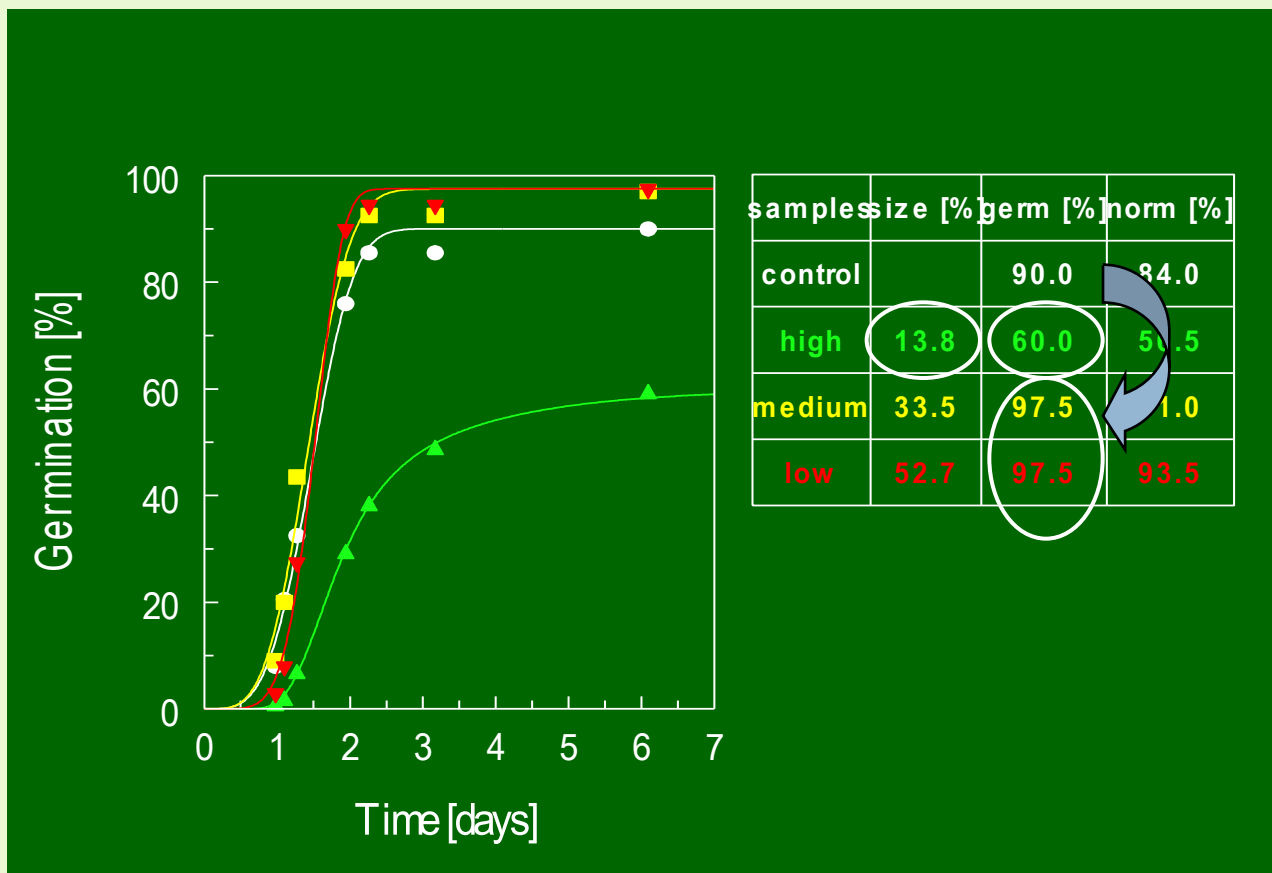
# Chlorophyll fluorescence (CF) analyzer



# Principle of CF



# Germination of CF fractions of paddy



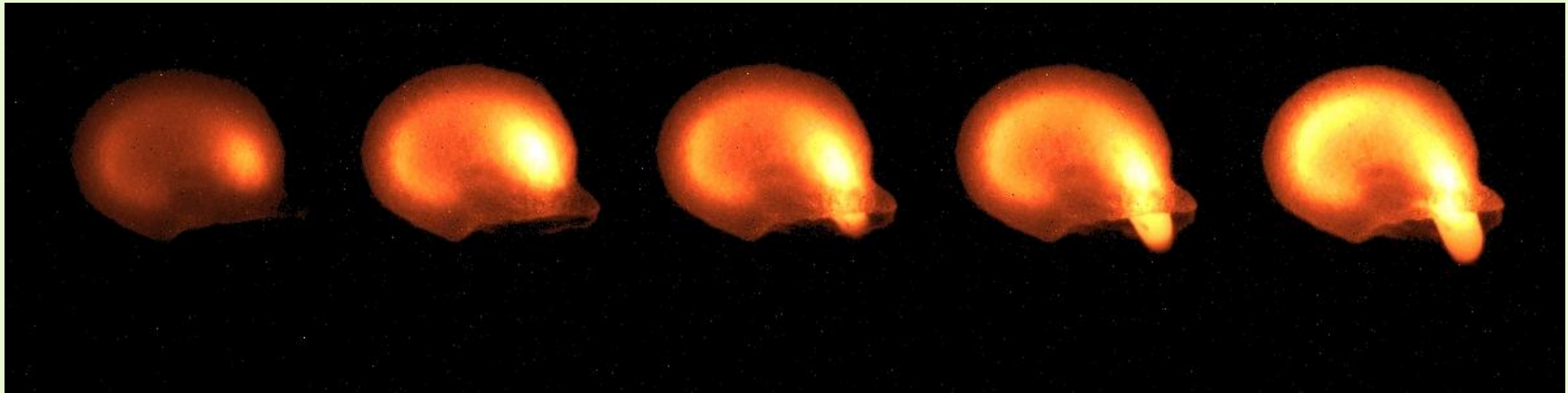
# CF of germinating pepper seeds







# CF-analysis of germinating seeds





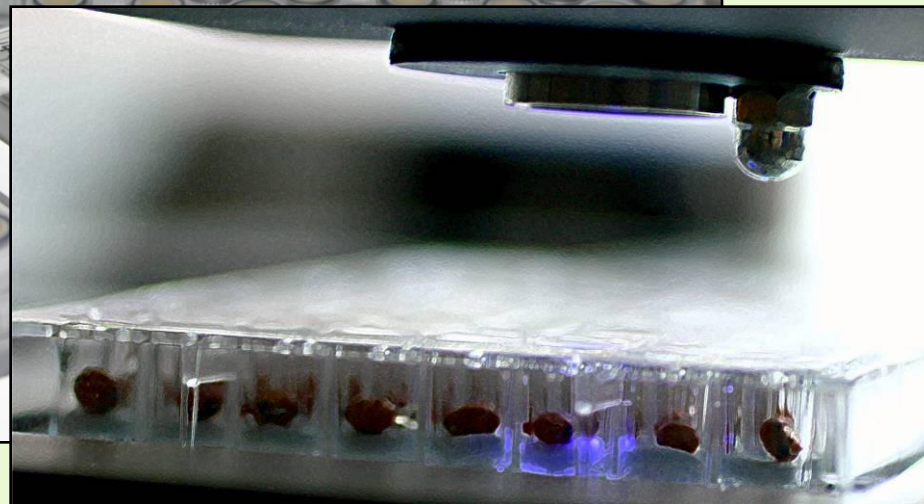
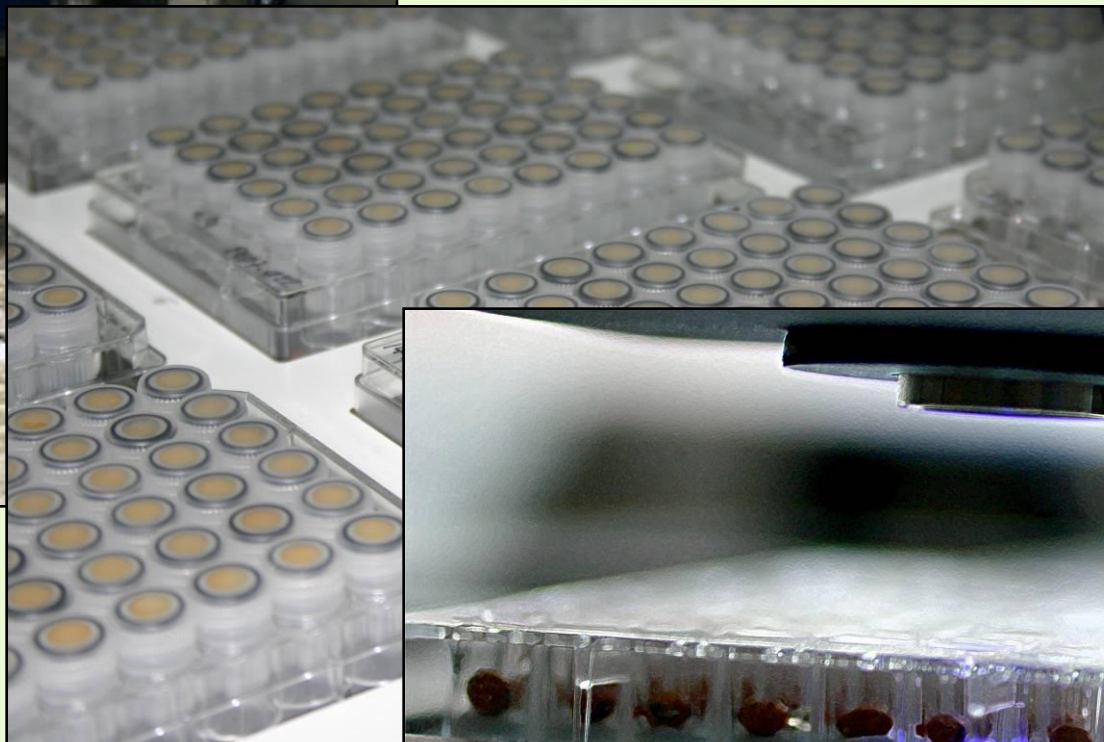
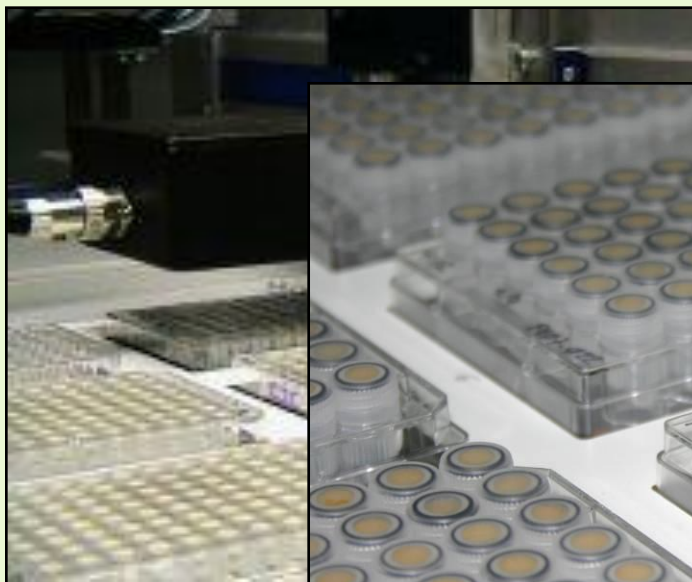
# Gas analyses

- Oxygen
- Ethanol





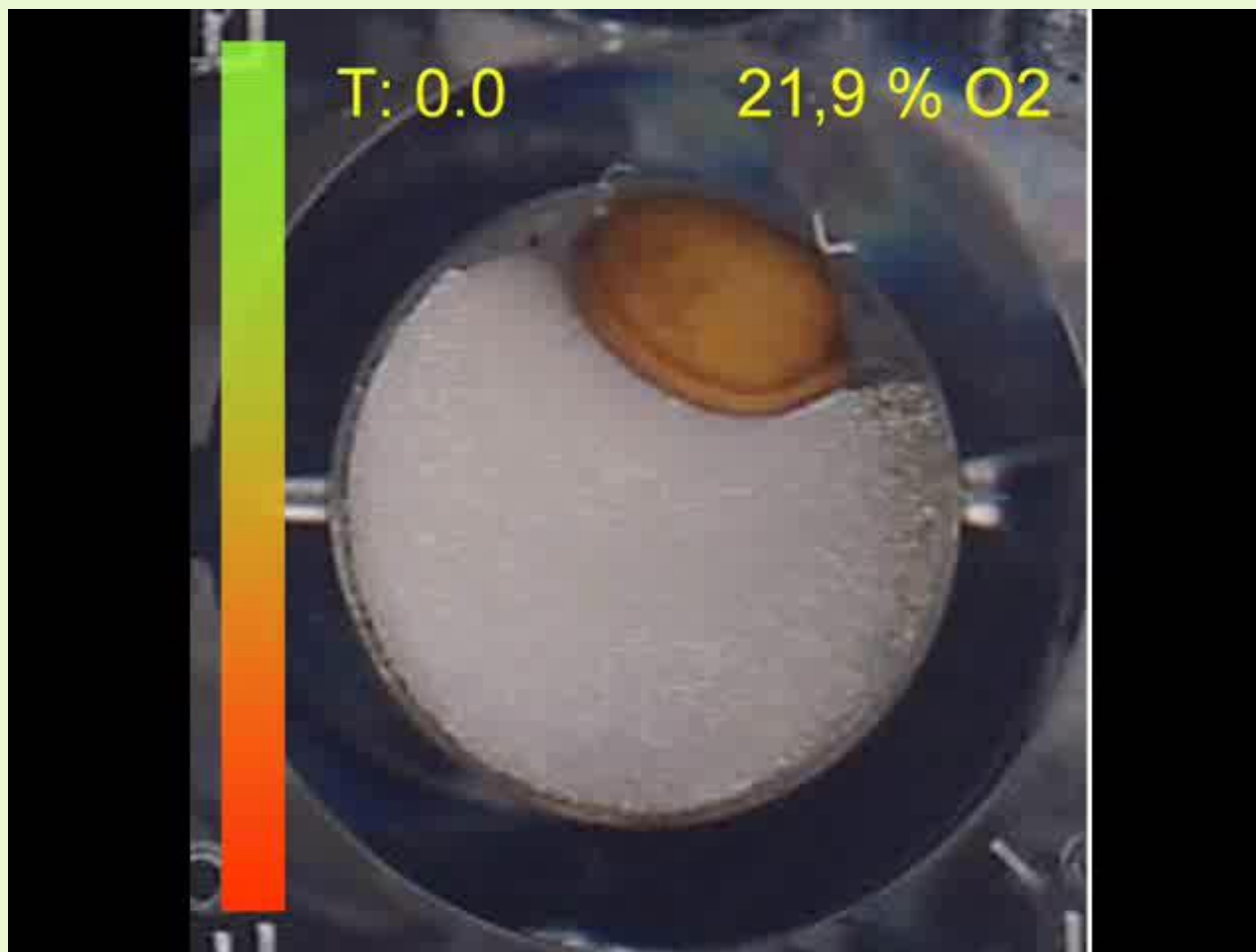
# Real-time O<sub>2</sub> measurements: the Q2





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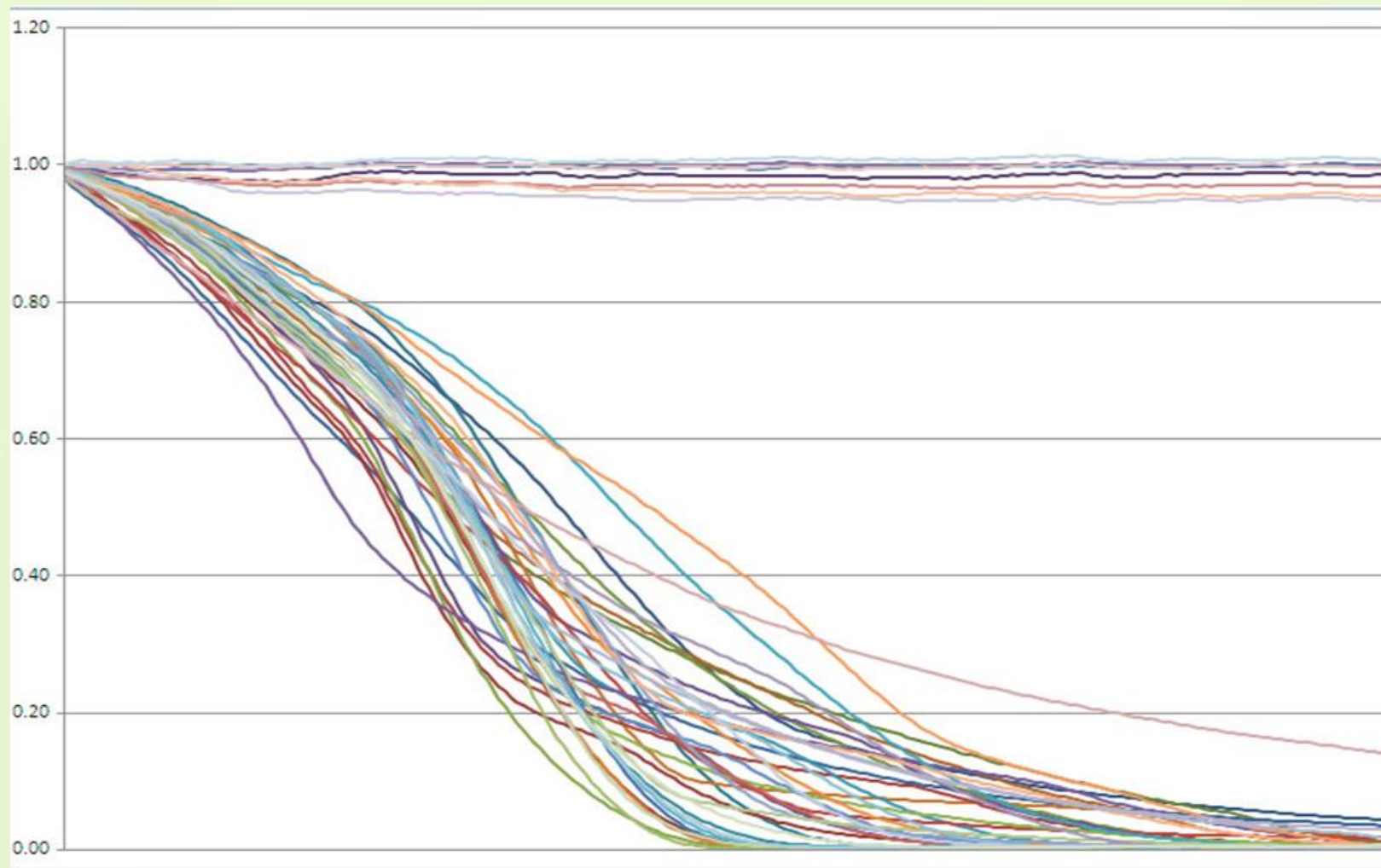
[www.seedtest.org](http://www.seedtest.org)



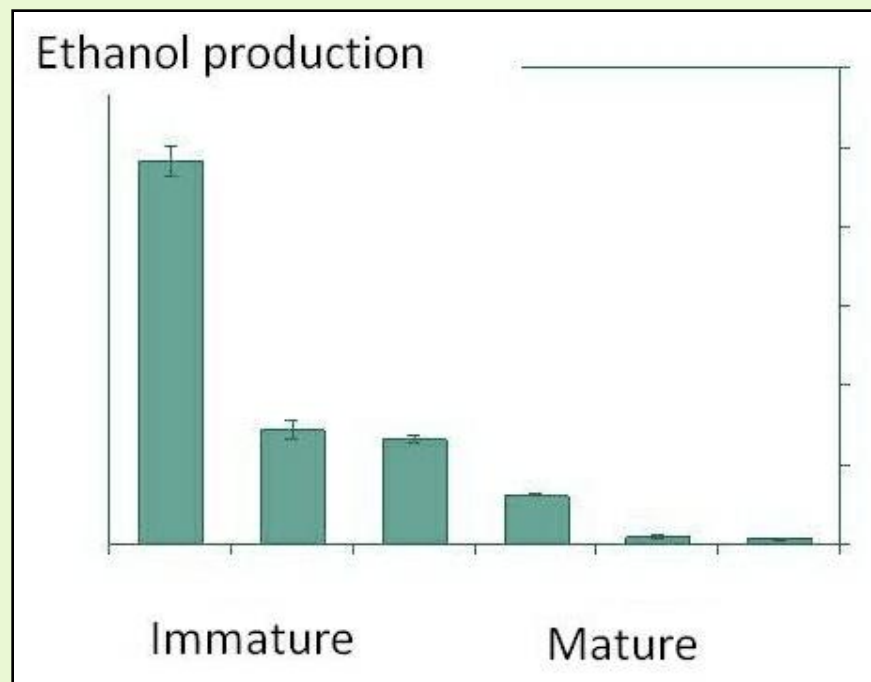


INTERNATIONAL SEED TESTING ASSOCIATION (ISTA)

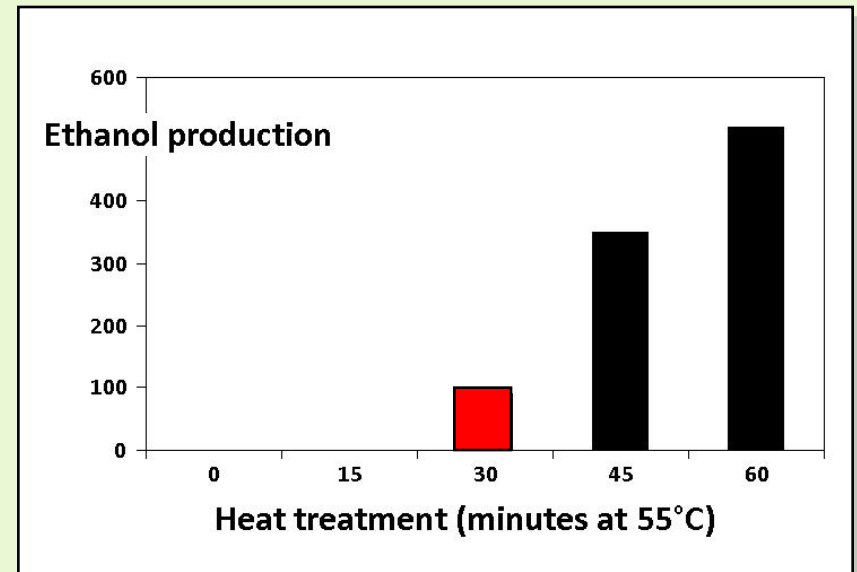
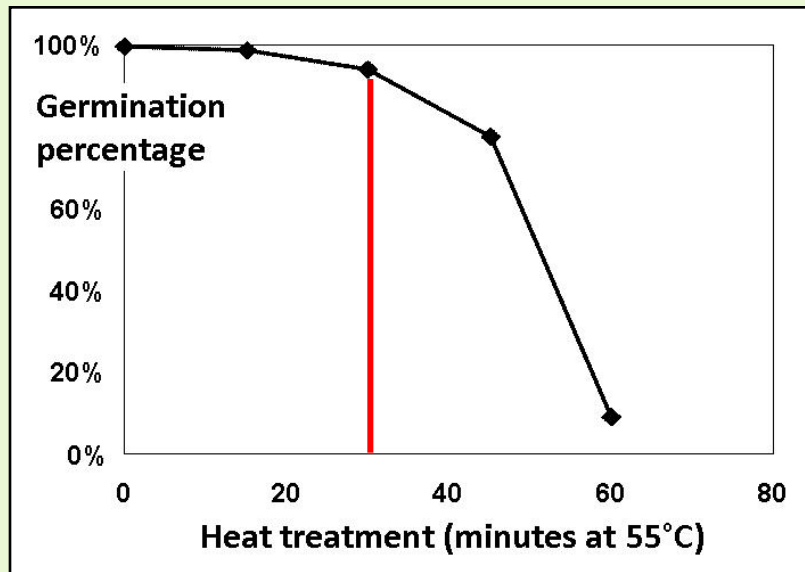
[www.seedtest.org](http://www.seedtest.org)



# Ethanol production as measure for seed quality

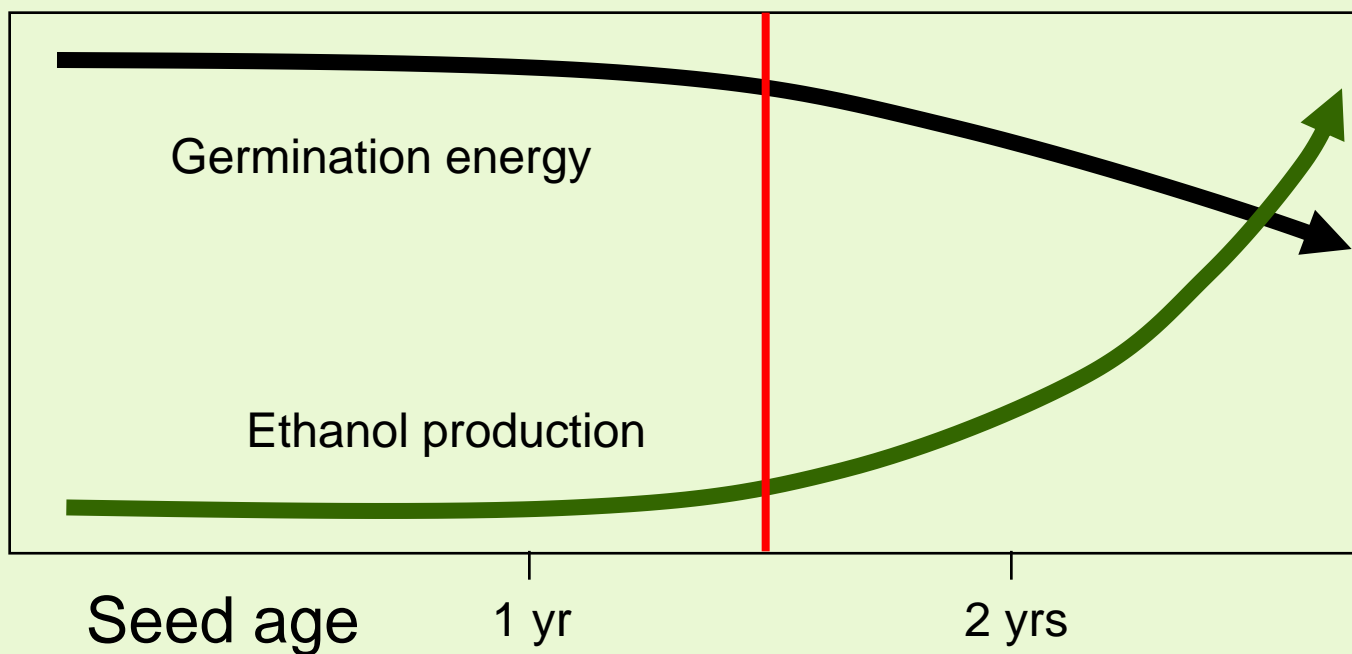


# Optimizing seed treatments

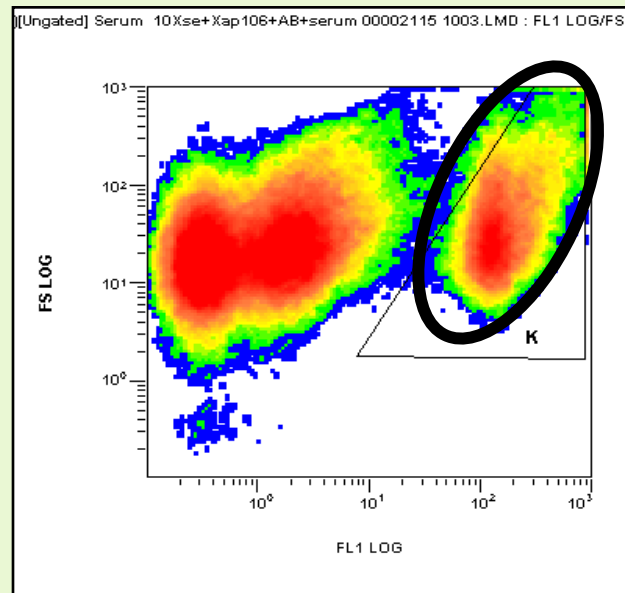
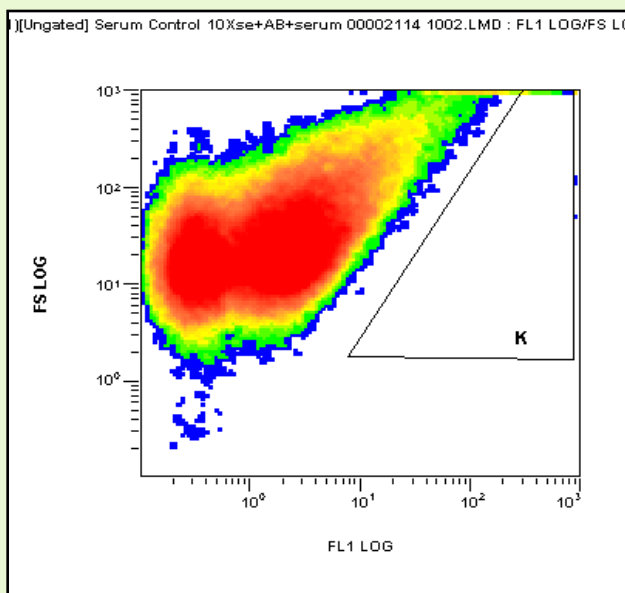




# Ethanol as marker for seed deterioration



# Flow cytometry

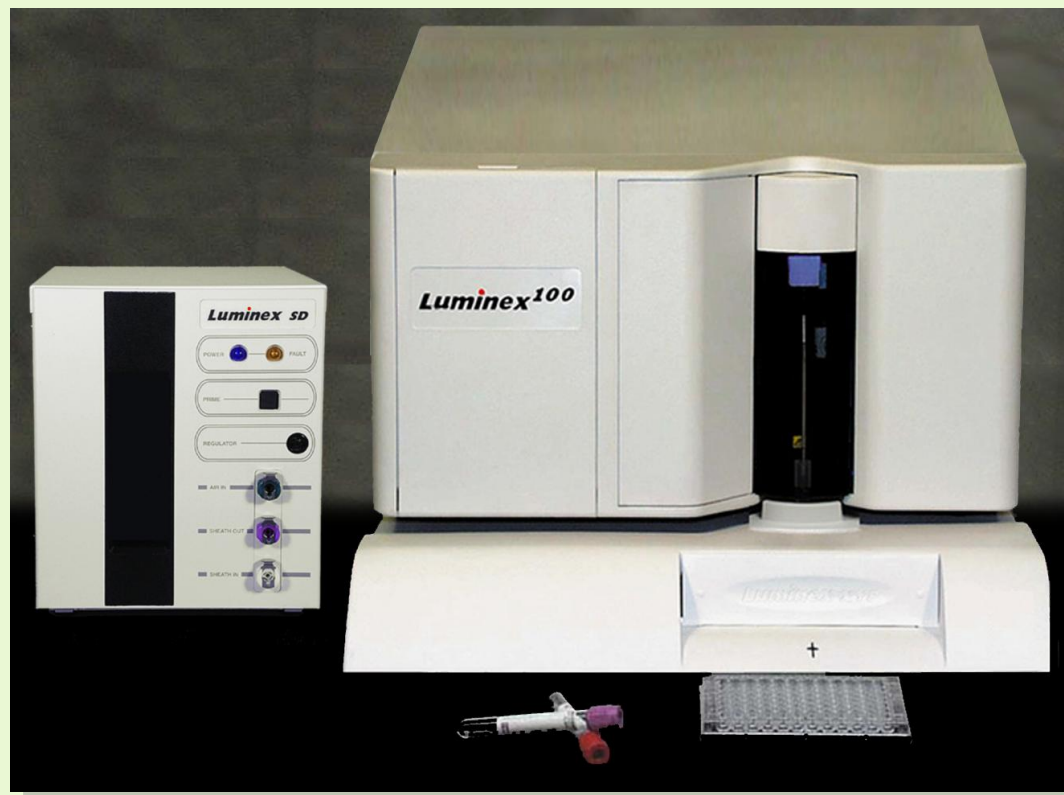


*Xanthomonas axonopodis*  
in beans





# Immunobeads



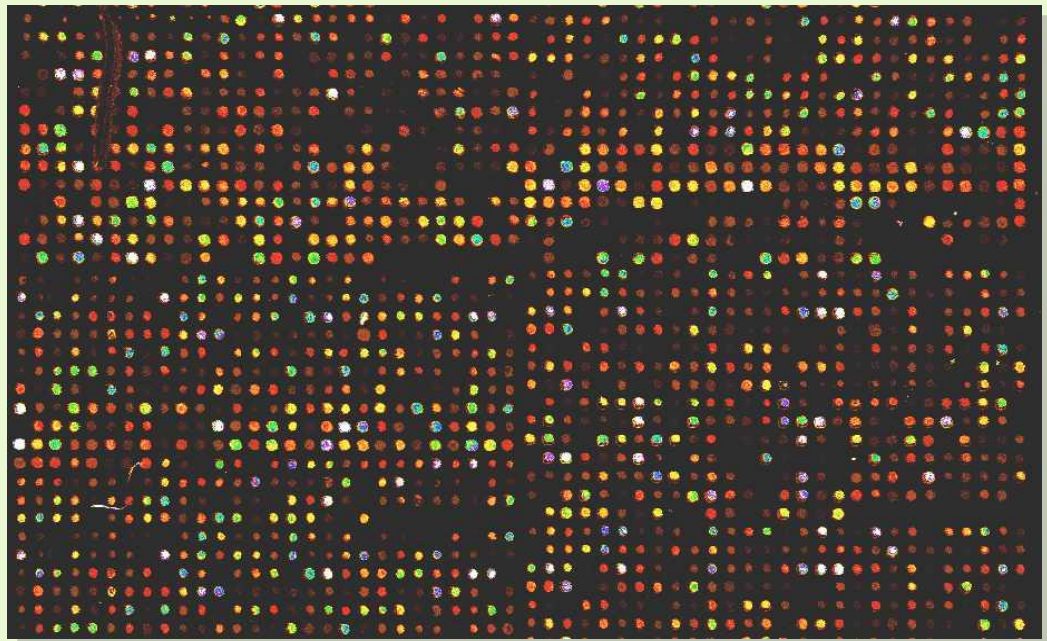
**Luminex.**

# Genomics

cDNA micro-array:  
1536 spots

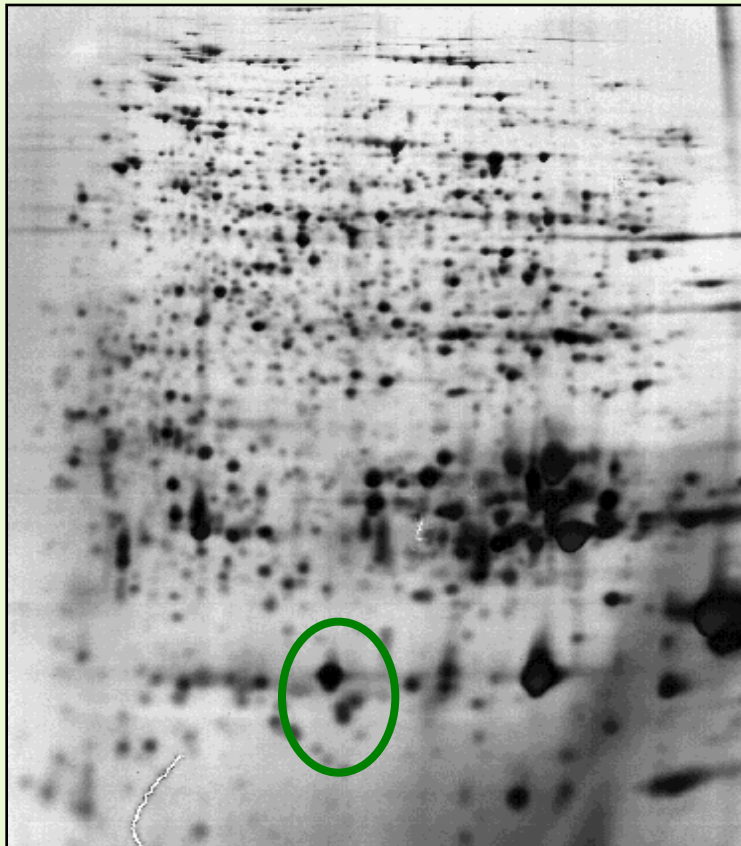
Gene expression  
correlates with:

- maturation,
- germination
- priming

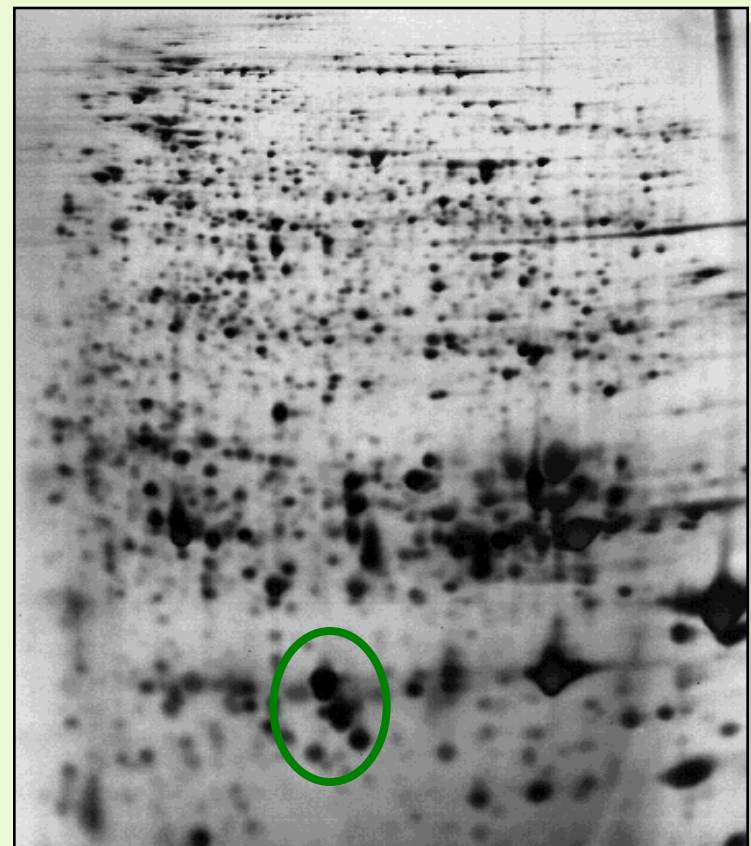


# Proteomics

Dry seed

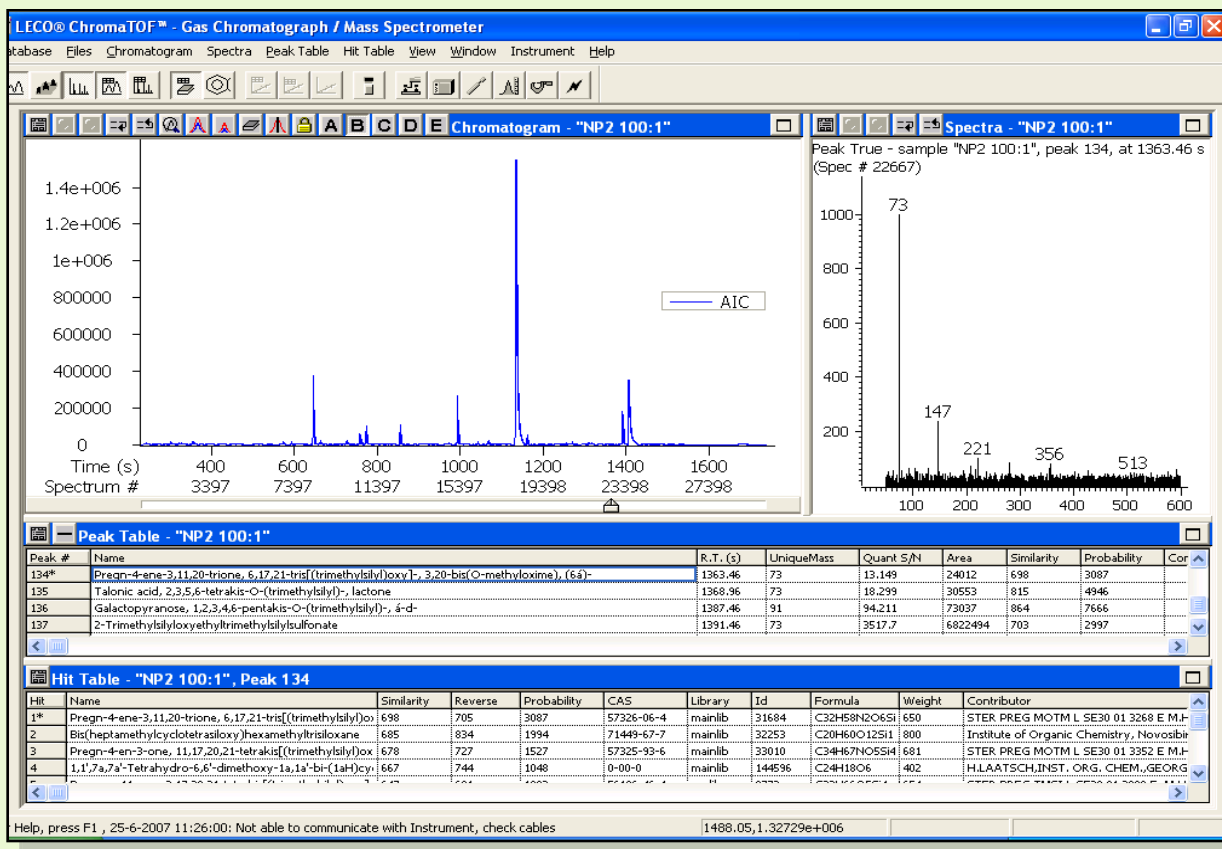


Imbibed seed





# Metabolomics





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# Seed enhancement





INTERNATIONAL SEED TESTING ASSOCIATION (ISTA)

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# A MANUAL OF THE ELECTRO-CHEMICAL TREATMENT OF SEEDS

BY

CHARLES MERCIER, M.D.

F.R.C.P., Etc.

"He gave it for his opinion that whoever could make two ears of corn, or two blades of grass, to grow upon a spot of ground where only one grew before, would deserve better of mankind, and do more essential service to his country, than the whole race of politicians put together."

*A Voyage to Broddingnag.*

LONDON

UNIVERSITY OF LONDON PRESS, LTD.

18 WARWICK SQUARE, E.C.4

1919

1919



8 ELECTRIFICATION OF SEEDS

few would have thought of making, to conjecture that the electrification of seed before it is sown might produce such a change in the seed as to cause it to germinate earlier when subsequently sown, and to produce a more healthy, vigorous, and fertile plant. This was a totally new conception. There were no known facts either in support of it or in conflict with it, and the only thing to be done was to follow the maxim of John Hunter—Don't think: try.

Here, however, occurred the first difficulty. If currents of high tension, such as the inventor had been experimenting with, were passed into the grain, the apparatus required would be very expensive and complicated and would need an expert to work it. It would be desirable, therefore, to use ordinary low-tension electricity. But ordinary low-tension electricity would not have the penetrating power of high-tension electricity, and would not be able to penetrate the seed without the aid of a conducting medium. Such a medium would be furnished by a

*Mercier's Electrification of Seeds.*



*Paris and London Photo Agency.*

Oats grown by Mr Legg, Blashenwell Farm, Corfe Castle. Electrified on the left, unelectrified on the right. The number of straws in each bundle is the same. Note the much stouter straw grown from electrified seed, the longer panicles, and the much more numerous spikelets on each panicle.

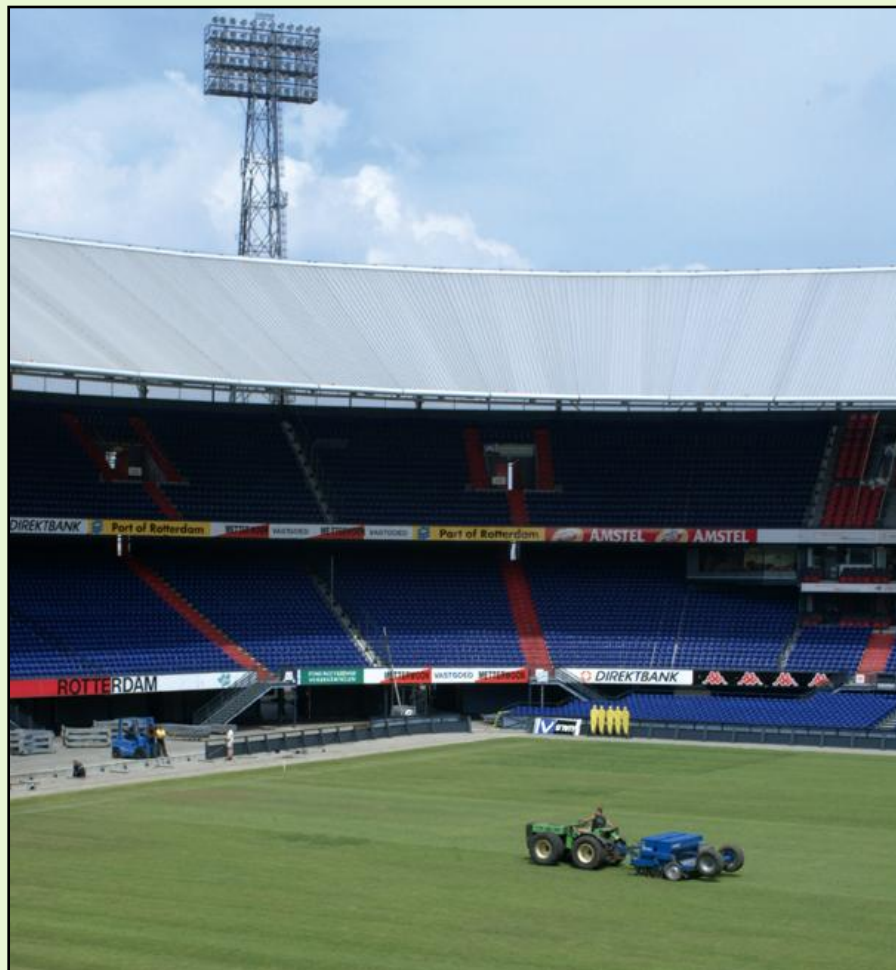


# Priming of grass seed

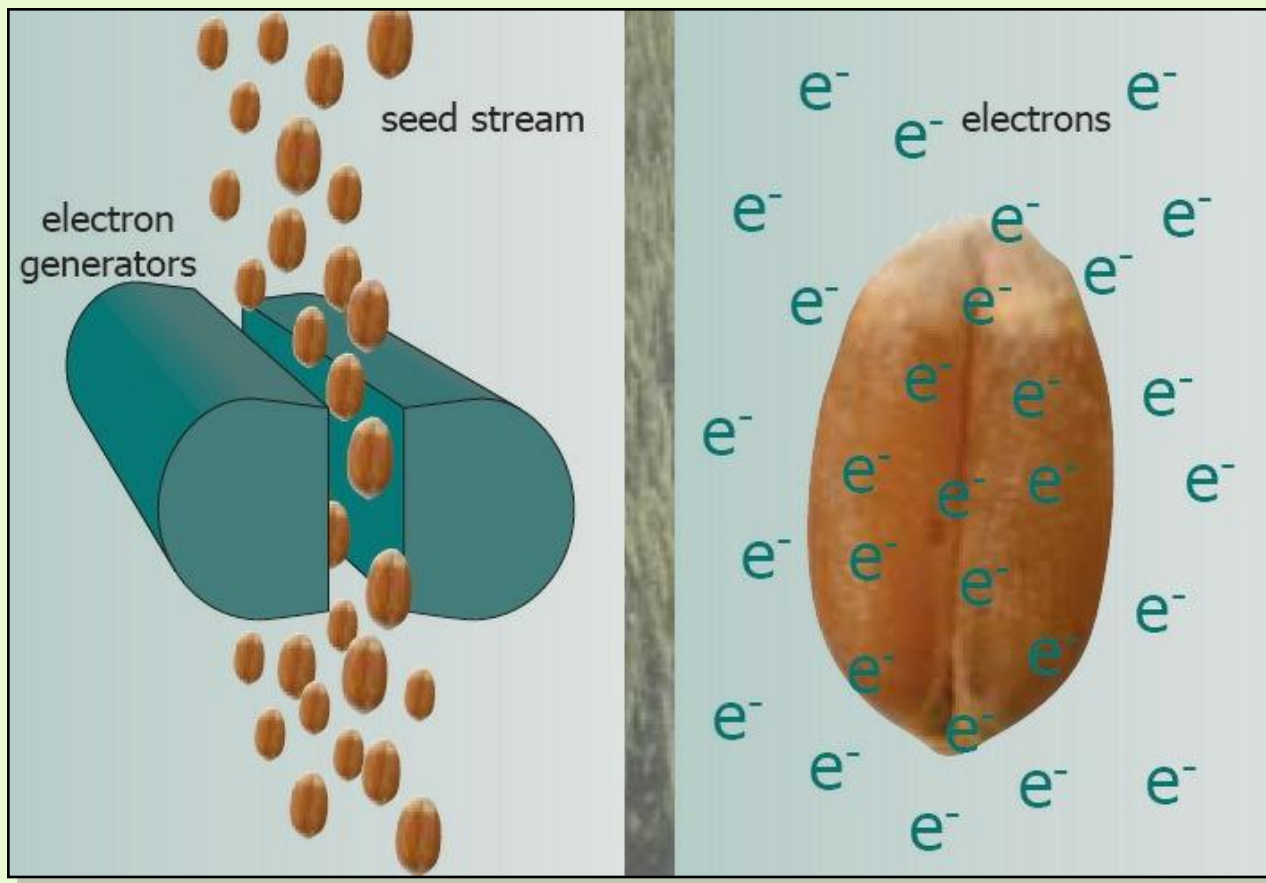
PreGerm® :

5-7 days faster germination

About 2x as much *Poa* survival

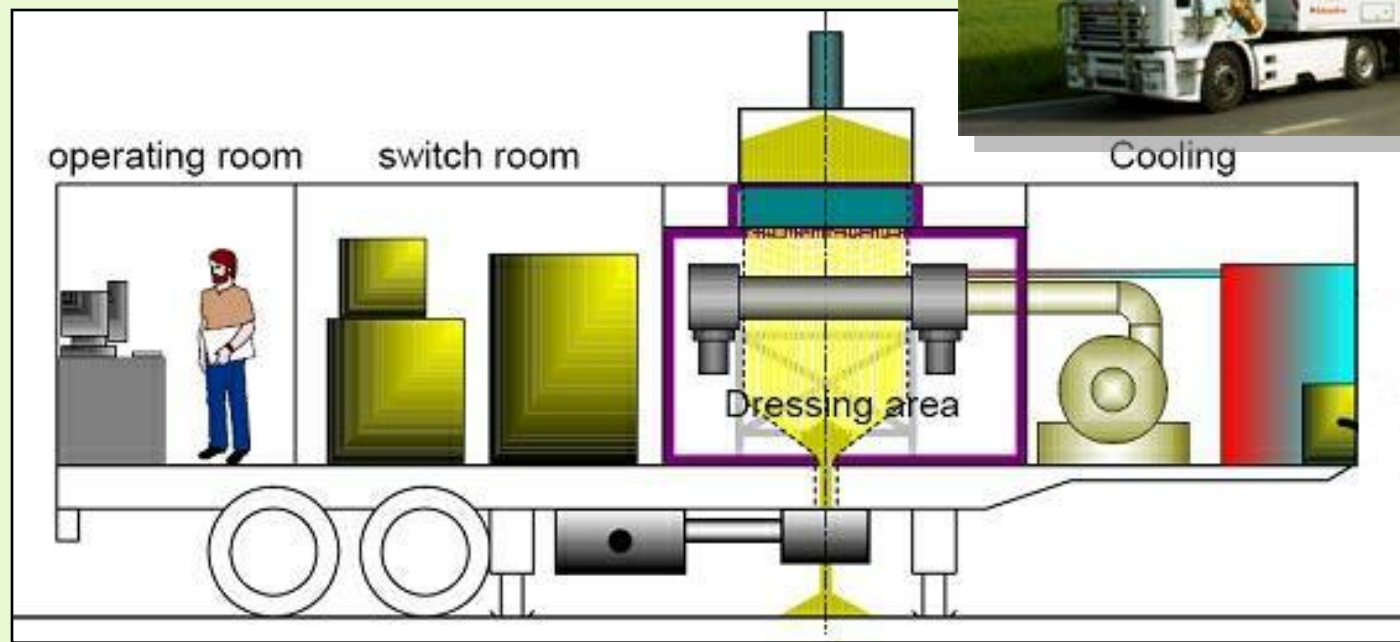


# Electron treatment



# Electron treatment

- throughput 30 t/h
- 2004: 10,000 t





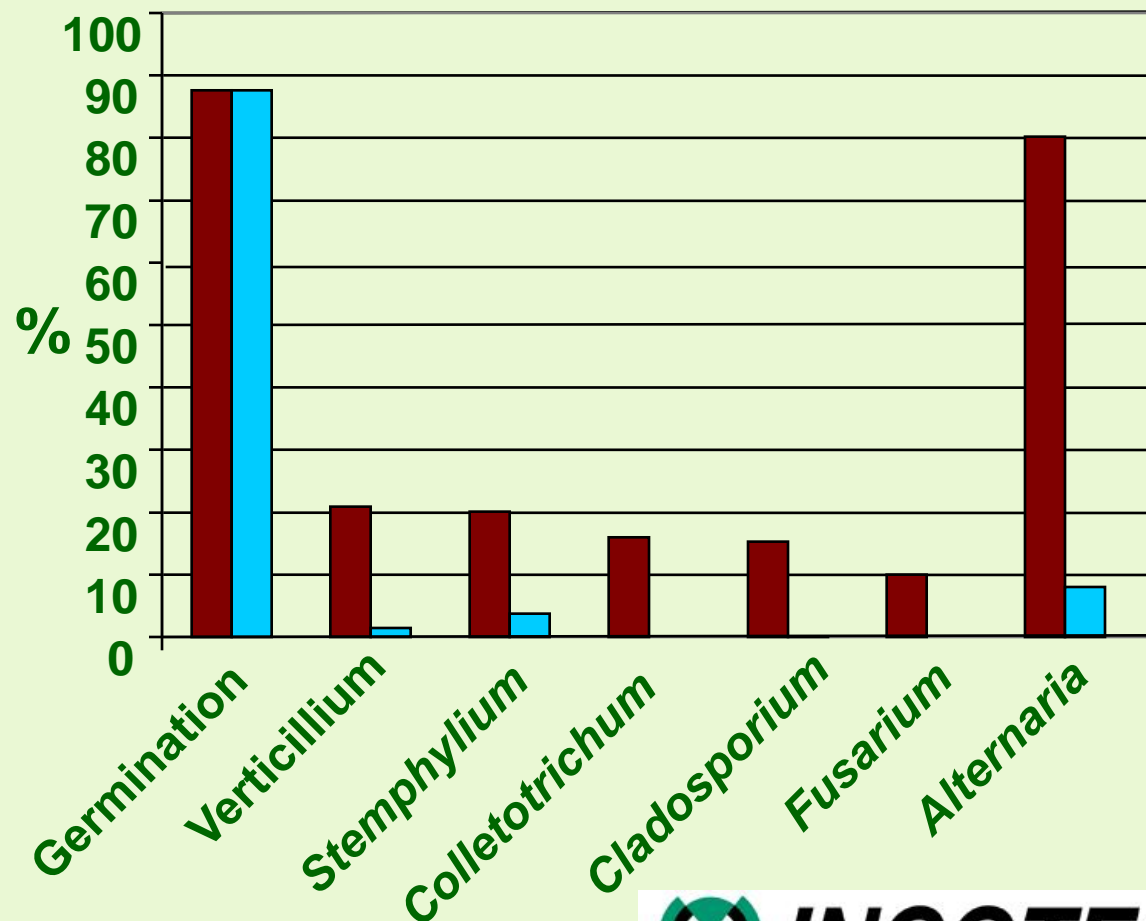
# Aerated steam





## Spinach seed

■ Control    ■ ThermoSeed





# ThermoSeed™ upscaled





# Future

## ISTA Advanced Technologies Committee

