Seed Quality Assurance and Control

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Quality Assurance
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What is seed quality?

• Quality is what the customer requires
  – Fitness for use as defined by the customer
  – Uniformity around an expected performance

→ Farmers are becoming increasingly critical of seed quality, with the subsequent increase in claims not only for seed value, but also for damages incurred in a crop that did not meet with expectations.
WHAT COULD BE DONE TO IMPROVE THE SEED LOTS LABELED WITH A, B, AND C?
Seed Quality

• Genetic
  – Fixed in Hybrids and Self-Pollinated Crops
  – May be variable in OPVs
  – Determined principally during growth

• Analytical
  – Percentage of pure, undamaged seeds of the variety

• Physiological
  – Ability of the seed to germinate (with vigour)

• Sanitary
  – Absence of diseases and pests on or in the seed
  – Absence of foreign seed, especially noxious weeds

• Chemical
  – Correct dose and distribution of seed dressing chemicals
  – Uniformly applied to the seed
Factors that Affect Seed Quality

• Genetic:
  – Genetic Instability
  – Genetic Drift
  – Genetic Contamination

• Physical:
  – Environment during seed filling and maturation
  – Handling during and after harvest
  – Processing and packaging
  – Storage conditions

• Biological:
  – Storage conditions
  – Seed age
Diagrammatic representation of seed quality
Germination
The percentage of seeds in a seed lot that develop within a given time into normal seedlings under optimum conditions.

Three classes of seedlings:
• **Normal seedlings** – capable of producing a normal plant
• **Abnormal seedlings** – may produce a radicle and shoot, but are not capable of producing a normal seedling.
• **Dead seed** – do not germinate
Genetic Testing of Hybrid Corn

- Isoelectric focusing (IEF) electrophoresis is used to test the genetic purity of various hybrid seeds, including corn and vegetables.

- In IEF, proteins are separated by the differences in their electrical charges within a gradient of pH.

Male and female marker bands appear in the male and female parental lines on the gel in certain locations, and the genetic purity of F1 seeds can easily be determined.

(Courtesy of STA Laboratories)
Advances in Purity Testing

Ergo-vision Purity station

Increases efficiency - Ergonomic

Conventional Purity board
9. Digital X-ray

Larvae inside the seeds

Empty seeds

Well-developed seeds

Under-developed seeds

Germination = normal seedling

Germination = abnormal seedling
Advances in Precision Farming
Global Positioning System (GPS)

• Change from assuming homogenous fields to dividing them to smaller zones & managing them separately.

• It depends on linking Satellite GPS with computers, on-the-go sensors.

Application

• Mapping yields (combine yield monitor).
• Field mapping for records and insurance purposes
• Variable rate planting (planter drive).
• Variable rate of fertilizer, herbicide, and pesticide application (spreader drive).

• Ag robot: used for various Ag. applications
Chlorophyll Fluorescence (CF analysis)

Concept:

❖ Use chlorophyll fluorescence as an indicator of seed quality is correlated with the level of seed maturity.

❖ Seed analyzer can be used to determine physiological & harvest maturity.

❖ Optimize harvest time.

❖ Alternative methods.
Measuring oil and protein contents
Nuclear Magnetic Resonance (NMR) for oil, protein, and seed moisture analysis
Ethanol Test

Measure for seed quality

Ethanol test is used as an indicator of seed quality/deterioration.

Principles of the test

➢ Incubate the seeds at certain temperatures (40-50°C) for a period of time, and then measure the amount of ethanol produced.

➢ The higher the ethanol production, the lower the quality of the seeds.

➢ Withanawasam and Groot found that ethanol assay is a reliable vigor test for *Oryza Sativa* (*Rice Res. Sta., Sri Lanka & the Plant Res. Int., Wageningen Univ., Netherlands*).

Advantages and disadvantages

Gas analysis

Q2 test- $O_2$ measurements

Q2 stands for Quality and Quick

Principle of the test

➢ The Q2 instrument measures the consumption of $O_2$ using single seeds in closed micro titer plates, 24-48-96 wells on regular time intervals.

➢ The $O_2$ consumption of seeds over time is correlated with the quality of the seed.

➢ Correlation between this test and conventional seed quality tests was found. (As. J. Food Ag-Ind. 2009, Special Issue, S88-S95).
Thank you for your interest!