Session 4 – The importance of quality seed in agriculture

The influence of seed quality on crop productivity

Mrs. Rita Zecchinelli
CROP PRODUCTIVITY

Satisfactory results are reflected in a high yield of valuable products, resulting in economical profits.
Many factors may affect the output of the cultivation:

- environmental conditions
- soil characteristics
- watering
- fertilization, treatments
- tillage
- farmer
- local and global market
- others
The seed is the first determinant of the future plant development. The seed is the master key to success with the cultivation.
SEED QUALITY FACTORS AFFECTING CROP PRODUCTIVITY:

- genetic characteristics
- yield
- market quality
- storability
Benefits from the breeding can only be transferred to the farmer if good quality seed is released.
Farmer’s expectations can only be achieved if the seed is true to the selected variety.
SEED SECURITY:
availability of the appropriate variety at the right place and time, in sufficient quantity and quality

VARIETY TESTING:
may be aimed to identify the variety, to discriminate different varieties, to check the genetic purity (SEED TRADE, CERTIFICATION SCHEMES) or to provide a characterization of the variety (NEW VARIETIES)
Crop yield

Germination capability, seed vigour: master key to achieve

- rapid germination
- good emergence
- appropriate plant population
Maize
(South Africa)
Sunflower (South Africa)
Groundnuts
(South Africa)
<table>
<thead>
<tr>
<th>Species</th>
<th>Sample</th>
<th>Laboratory germination (%)</th>
<th>CD germination (%)</th>
<th>MET (days)</th>
<th>Final emergence (%)</th>
<th>Plant height (1st leaf stage)</th>
<th>Coefficient of variation of plant height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cauliflower</td>
<td>1</td>
<td>98</td>
<td>99</td>
<td>4,4 (4)</td>
<td>92</td>
<td>26,7</td>
<td>21,5</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>90</td>
<td>37</td>
<td>6,2 (14)</td>
<td>88</td>
<td>19,8</td>
<td>25,9</td>
</tr>
<tr>
<td>Brussels sprouts</td>
<td>1</td>
<td>98</td>
<td>100</td>
<td>4,2 (3)</td>
<td>100</td>
<td>30,8</td>
<td>23,9</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>100</td>
<td>57</td>
<td>4,7(3)</td>
<td>50</td>
<td>27,2</td>
<td>19,7</td>
</tr>
<tr>
<td>Dutch cabbage</td>
<td>1</td>
<td>98</td>
<td>95</td>
<td>4,4 (4)</td>
<td>98</td>
<td>21,8</td>
<td>27,0</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>93</td>
<td>66</td>
<td>5,3 (6)</td>
<td>92</td>
<td>18,2</td>
<td>36,9</td>
</tr>
<tr>
<td>Red cabbage</td>
<td>1</td>
<td>97</td>
<td>97</td>
<td>4,6 (5)</td>
<td>98</td>
<td>25,6</td>
<td>22,1</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>85</td>
<td>32</td>
<td>5,7 (7)</td>
<td>100</td>
<td>16,8</td>
<td>32,5</td>
</tr>
<tr>
<td>Calabrese</td>
<td>1</td>
<td>99</td>
<td>100</td>
<td>4,1 (9)</td>
<td>96</td>
<td>21,0</td>
<td>14,7</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>93</td>
<td>54</td>
<td>4,1 (13)</td>
<td>92</td>
<td>21,0</td>
<td>20,5</td>
</tr>
</tbody>
</table>

Table modified from Powell et al, 1991
A noxious weed infestation reduces the yield
Seed-borne diseases:
- reduction of the yield
- introduction of new pathogens
- spread of dangerous pests

Fusarium in wheat
Fusarium in rice
Sclerotinia in legumes
Plasmopara in sunflower
Ustilago in barley
Ustilago in wheat
Tilletia in wheat
Wheat (Italy)

Sunflower (Hungary)

Containment in the use of chemicals:
- organic farming
- low availability/high costs
Seeds quality standard
- germination
- physical purity
- other seed determination

*Pisum* spp in field-bean (Italy)
Sample of *Trifolium resupinatum*  

*Cuscuta* spp.
Cuscuta infestation
Persian clover
(Italy)
Orobanche in sunflower (Hungary)

Orobanche in field-bean (Italy)

Orobanche hederae (http://www.ars-grin.gov/npgs/images/sbml/Orobanche_hederae_seeds.jpg)
Sample of *Trifolium incarnatum*

*Melilotus spp.*
Melilotus infestation
Crimson clover (Italy)
Quality of the products of the cultivation

Marketable quality affects the productivity

- intrinsic futures of species/varietiy
- health conditions of the product (symptoms)
- uniformity of the product (size, stage)
Triticum durum

Triticum aestivum

Soft wheat in durum wheat (Italy)
Xanthomonas campestris in pepper

Photo from the Internet: www.ces.ncsu.edu/.../bspepfr2.jpg
Fusarium spp. in wheat
Lettuce
(New Zealand)
Seed storage

Seed storability depends on:
- storage conditions (humidity, temperature)
- moisture content of the seed
- initial quality of the seed

Poor storage conditions:
- the seed loses the ability to germinate

Low moisture content of the seed:
- negative for recalcitrant seeds
- positive for orthodox seeds

Initial quality of the seed:
- as lower it is, as quicker the loss of viability
Moisture content is one of the parameters taken into account to determine the market value of seeds.
Unified system to provide the user with good quality seed in respect of:

- varietal identity and purity
- germination capability
- specific purity
- seed health
57 countries participate to the schemes for varietal certification (6 schemes—agricultural species) or control (1 scheme—vegetables) of seed moving in International trade.

Each scheme provides a set of rules and directions aimed at the assessment of seed quality, based on agreed principles.
FAO recognizes the pivotal role of seeds in agricultural development. Increasing the quality of seeds can increase the yield potential of the crop and is one of the most economical and efficient inputs to improve crop production and productivity. The FAO/
**Vision:** Uniformity in Seed Testing world wide

**Mission:** ISTA achieves its vision by producing internationally agreed rules for seed sampling and testing, accrediting laboratories, promoting research and providing international seed analysis certificates, training and dissemination of knowledge in seed science and technology to facilitate seed trading nationally and internationally.
ACKNOWLEDGEMENTS

Alison Powell (United Kingdom)
Alessandra Sommovigo (Italy)
Pamela Strauss (South Africa)
Fabio Ferrari (Italy)
Katalin Ertsey (Hungary)
Martin Luis Vassallo (Spain)
Ilaria Alberti (Italy)
Theresia A.S. Aveling (South Africa)
Romana Bravi (Italy)
Manuel Chavez (Mexico)
Giovanni Corsi (Italy)
Eddie Goldschagg (South Africa)
Mario Leandri (Italy)
Masatoshi Sato (Japan)
Luigi Tamborini (Italy)

Thank you!