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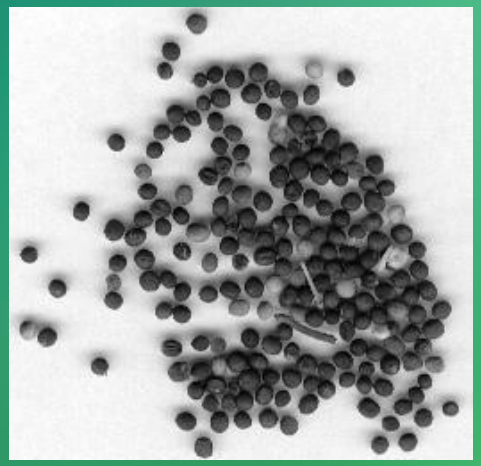

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# Seed vigour of spring oilseed Brassica in Norway

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Spring oilseed Brassica crops such as rapeseed and turnip rape seed (*Brassica napus* and *B. rapa*) are currently the most common crops and among the few species suited in rotation with cereal crops in Norway. Uniform and vigorous plant establishment is crucial to achieve high yields and competitive crops. However, managing a proper plant establishment of oilseed Brassica is often a challenge for the growers. In standard germination tests, seeds are germinating in optimal conditions. In the field, conditions are often not as favourable and emergence is normally less than predicted by the germination test. Differences in field performance, including rate and uniformity of seedling growth, between seed lots with similar and high germination potential are sometimes observed. Results from germination tests alone may therefore not provide enough information about seed quality. Additional information on the quality of a seed lot based on its physiological condition, which may be influenced by aging and other deteriorating factors, can be obtained from vigour tests. A vigour test for oilseed Brassica seed, based on counts of radicle emergence (RE), was approved by the International Seed Testing Association (ISTA) in 2015. The method was recently established at the Kimen Seed Laboratory in Norway. Seeds are placed in moist pleated paper and kept at 20 $\pm$ 1$^{o}$C. After 30 hours ($\pm$ 15 minutes), the number of emerged radicles is counted. Standard germination and the RE test have been conducted on a number of seed samples, including commercial seed lots from 2015 and 2016. The results so far revealed that some seed lots which all germinated well (above 90% normal seedlings), showed a wide range of variation in seed vigour (from 18% to 94%). Seed lots with lower percentage of normal seedlings, but still high enough for certification according to EU regulation (minimum 85%), also showed substantial differences in seed vigour, ranging from 5% to 88%. It was also observed that samples from sub seed lots originating from the same main seed lot showed similar seed vigour, even though the sub seed lots had been stored in different locations. The results from laboratory analyses will be correlated to seedling emergence recorded in growth chambers and field trials. This work is in progress and some preliminary results will be presented at the conference.

# Oil seed Brassica crops are needed as ‘break crops’ in Norwegian cereal production

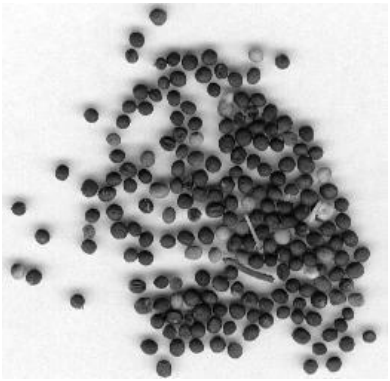
- Rapeseed (*Brassica napus*)
- Turnip rapeseed (*B. rapa*)

(mainly spring types in Norway)

# Norwegian project (BRAKORN) 2015-2019

- Optimize cultivation practice and improve profitability of spring oilseed Brassica production
- One major challenge is plant establishment (important to obtain uniform and vigorous establishment for both optimal yield and uniformity at maturity)

- Plant establishment is influenced by a number of factors (e.g. seed quality, seeding amounts and depths, soil type, soil temperature, seed bed preparations, insect damage, diseases …..)
- Seed quality assessed by standard germination test is an accepted criterion for seed viability (seeds germinated under optimal conditions)
- In field, conditions are often not optimal and field emergence is normally less than predicted by the germination test



# Seed vigour

- How good is the standard germination test as an indicator of field performance?
  - seed lots with similar germination potential can differ in rate and uniformity of seedling growth
  - high germinating seed lots may have poor field emergence
- The recognition of performance differences among high germinating seed lots is generally known as differences in «seed vigour»
- Seed vigour is influenced by storage conditions, aging and other deteriorating factors

# Seed vigour tests

- Different vigour tests have been developed to detect seed lots with low vigour (as a to supplement to standard germination test)
- A vigour test for oilseed rape, based on early counts of radicle emergence (RE), was found to be a good indicator for field performance (it is a 'very early' germination test)
- The RE method was approved by the International Seed Testing Association (ISTA), and recently adopted by Kimen Seed Laboratory in Norway
- Seeds are placed in moist pleated paper and kept at 20 ±1 $^{o}$C
- Number of seeds showing appearance of a radicle breaking through the seed coat after exactly 30 hours (± 15 minutes) are counted
- Sample size: 2 x 100 seeds

# Exploring vigour of oil seed Brassica seed lots used in Norway 2015 and 2016

# Standard germination and radicle emergence (RE, vigour) of spring oilseed Brassica seed samples (germination ≥ 94%)

| Cultivar | Standard germination (%) | RE (vigour, %) |
|---|---|---|
| | Normal seedlings (and first count) | |
| Belinda | 96 (68) | 18 |
| Jopin | 94 (90) | 50 |
| Majong | 97 (93) | 53 |
| Builder | 95 (87) | 64 |
| Cordelia | 97 (94) | 65 |
| Sunder | 99 (98) | 69 |
| Mosaik | 100 (84) | 78 |
| Trapper | 96 (94) | 83 |
| Cordelia | 96 (96) | 83 |
| Simba | 98 (83) | 89 |
| Cordelia | 98 (97) | 94 |

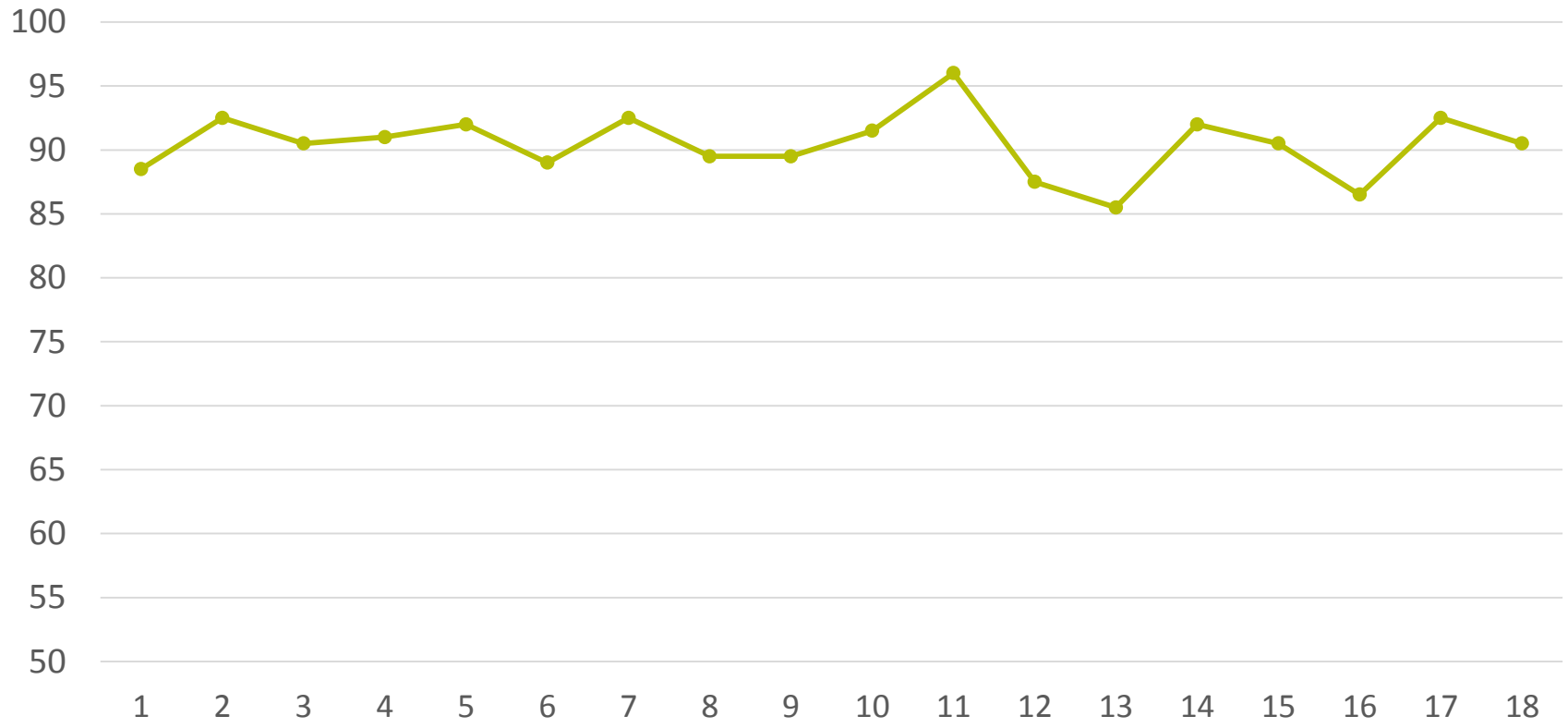
# Standard germination and radicle emergence (RE, vigour) of spring oilseed Brassica seed samples (germination 85-90%)

| Cultivar | Standard germination (%) | RE (vigour, %) |
|---|---|---|
| | Normal seedlings (and first count) | |
| Mosaik | 85 (46) | 5 |
| Mosaik | 86 (81) | 13 |
| Silver Shadow | 90 (74) | 34 |
| Majong | 90 (86) | 63 |
| Majong | 85 (78) | 75 |
| Pilani | 89 (88) | 85 |

# Standard germination and radicle emergence (RE, vigour) of spring oilseed Brassica seed samples (germination < 85%)

| Cultivar | Standard germination (%) | RE (vigour, %) |
|---|---|---|
| | Normal seedlings (and first count) | |
| Marie | 76 (49) | 1 |
| Marie | 83 (33) | 7 |
| Lyside | 82 (79) | 56 |
| Drago | 81 (80) | 74 |
| | | |

# Radicle emergence (%) after 30 hours at 20°C of one sample (2x100 seeds) used as control sample (18 tests)



Emergence in soil at 10 $^{o}$C (2 x 100 seeds in plastic pots, 4 x 50 seeds in ‘cassetts’

Evaluation after 14 days (normal seedlings, abnormal seedlings and dead/not germinated seeds)

Number of plants in three heights (data not presented)


Standard germination: 88%
Vigour (RE) test: 46%
Emergence soil: 53%

Standard germination: 96%
Vigour (RE) test: 84%
Emergence soil: 88%

High germination/medium RE  High germination/low RE

Low seed vigour resulted in seedlings that were shorter and more variable in height at first leaf stage

# Standard germination, radicle emergence (RE, vigour), and seedling emergence in soil (growth chamber, after 14days)

| Cultivar | Standard germination (%) | RE (vigour, %) | Emergence (%) in soil growth chamber 10°C |
|---|---|---|---|
| | Normal seedlings (and first count) | | |
| Cordelia | 96 (96) | 84 | 83 |
| Mosaik | 100 (84) | 78 | 87 |
| Majong | 100 (96) | 66 | 86 |
| Majong | 94 (73) | 65 | 84 |
| Majong | 92 (74) | 61 | 84 |
| Majong | 97 (93) | 50 | 87 |
| Joplin | 94 (90) | 44 | 84 |
| Lyside | 95 (91) | 18 | 69 |
| Marie | 82 (50) | 7 | 72 |
| Mosaik | 88 (46) | 5 | 53 |

# Standard germination, radicle emergence (RE, vigour), and seedling emergence in soil (after 21 days in growth chamber) of three seed lots

| Cultivar | Standard germination (%) | RE (vigour) (%) | Emergence (%) in soil (average 1, 2, 3 and 4 cm sowing depths) | | |
|---|---|---|---|---|---|
| | Normal seedlings (and first count) | | 6°C | 9°C | 12°C |
| Majong | 94 (73) | 65 | 21 | 65 | 76 |
| Mosaik | 91 (60) | 8 | 12 | 48 | 72 |
| Valo | 88 (87) | 64 | 20 | 52 | 77 |

# Conclusions

- High germinating seed lots may have poor field emergence
- A vigour test is a supplement to standard germination and provide additional information about the planting value (and also storage potential) of seed lots
- Seed lots with similar germination potential can differ in vigour and seedling emergence
- Still need for more laboratory experience and method ‘refinement’ (repeatability, accuracy……)
- We will continue the studies to correlate results from RE and germination tests with seedling emergence in soil (both growth chamber and field)
- Seed companies are recommended to do vigour tests of their seed lots in addition to standard germination