**Mackenzie Applied Research Association**
P.O. Box 646, Fort Vermilion, Alberta T0H 1N0.
Tel: 780-927-3776, Fax: 780-927-4747
Email: manager@mackenzieresearch.ca. www.mackenzieresearch.ca

# Seed quality, seeding depth, and fertilizer placement effects on crop establishment and yield of wheat, barley and peas

**Introduction**: Deterioration and aging cause the loss of seed quality. Careful handling of seed is especially important for large seeds. For example, mechanical damage can occur readily on low moisture peas and cause faster spoilage. Frost damage caused by freezing temperatures during final developmental stages will lower seed quality. Heating damage, which may be linked with fungal activity, can be very detrimental as well. Other factors that will affect seed quality include insects, fungi and other pathogens. Good crop management starts with getting as much information on the quality of your seed.

Germination is the most widely used test for assessing seed viability. A germination test conducted with a vigor test has more value than the germination test alone. Vigor testing is the opposite of germination test because the seed is introduced to an environment that is known to suppress and stress the seedling growth. Vigor tests are more sensitive than germination tests and vigor loss may be noted before a loss in germination. Few of the vigor tests include the cold test for cereals, the pre-chill test for canola and the electrical conductivity test for peas and beans. Germination plus vigor tests will assess storage and planting potentials of the seed lots.

**Objectives**: To test the effects of seeding depth and fertilizer placement on performance of low quality seed lots.

**Methods**: Field trials were done to test the effects of seeding depths (**1”**- normal and **2.5”**-deep) and fertilizer placements (side band placement-**BP** and seed placement-**SP**) on the performance of low vigor seed lots. Fertilizer rate of 150 lb/ac (26-15-5-5 mix of N-P-K-S) was used for all crops. Establishment and yield of crops were monitored.

## Results and Discussion

**Low vigor wheat seed**: Two low vigor seed lots were tested (Table 1). In general the wheat yielded better than expected, which may be attributable to adequate precipitation received in the growing season. As expected, deeper seeding and SP fertilizer treatments tended to reduce crop establishments and yield.

Table 1. Wheat establishment (Est.) and yield from two low vigor seed lots with different treatments.

| Depth inches | Fert. placement | Seed Lot # | Est. % | Yield bu/ac |
|---|---|---|---|---|
| 1 | BP | 02 | 78.0 | 54.9 |
| 1 | BP | 03 | 74.2 | 54.1 |
| | | | (95)* | (99)* |
| 1 | SP | 02 | 75.6 | 54.3 |
| 1 | SP | 03 | 69.2 | 38.9 |
| | | | (92)* | (72)* |
| 2.5 | BP | 02 | 72.9 | 50.9 |
| 2.5 | BP | 03 | 52.0 | 36.6 |
| | | | (71)* | (72)* |
| 2.5 | SP | 02 | 68.5 | 46.7 |
| 2.5 | SP | 03 | 49.8 | 30.8 |
| | | | (73)* | (66)* |
| | *$LSD_{0.05}$* | | | *10.15* |
| | *CV%* | | | *12.5* |

* Numbers in brackets are the relative values of seed lot #3 compared to seed lot #2 as 100.

Interestingly, lower vigor (lot # 03) wheat seed stressed with deep seeding (2.5”) and seed-placed (SP) fertilizer performed poorly in terms of establishment and yield. The yield was significantly lower for the # 03 than # 02 seed lot with 1” seeding depth for the SP fertilizer treatment, and with 2.5” seeding depth for both the BP and SP fertilizer treatments. A similar trend was exhibited by the wheat establishment data. Relative values (in brackets for seed lot #3 compared to seed lot #2 as 100) clearly showed greater differences between the seed lots under

the 2.5" treatments (stressed) than under the 1" treatments (normal). Thus stress increased the differences due to seed quality.

**Barley seed infected with root rot**: One seed source was tested (Table 2). Again, barley yielded well due to adequate rain received during the growing season. The management stressors, both seeding depth and fertilizer placement, did not have a negative affect on yields as expected.

Table 2. Barley establishment and yield from a vigor seed lot with different treatments.

| Depth inches | Fert. placement | Est. % | Yield bu/ac |
|---|---|---|---|
| 1 | BP | 80.2 | 66.3 |
| 1 | SP | 83.8 | 90.3 |
| 2.5 | BP | 81.3 | 75.1 |
| 2.5 | SP | 80.5 | 81.4 |
| | *$LSD_{0.05}$* | | *29.15* |
| | *CV%* | | *18.6* |

**Mechanical and Glyphosate damaged field peas**: One seed source was tested with use of inoculants as another factor (Table 3). Both the establishment and yield were improved with deeper seeding. Apparently, the 1" seeding stressed the large sized pea seeds. The benefits from deeper seeding were greater when fertilizer was also applied. Though peas can fix nitrogen, application of phosphorus, potassium and sulphur fertilizers can improve yield.

Seed placement of fertilizer reduced both establishment and yield of peas. Combination of the SP and 1" treatments completely prevented crop establishment.

Unexpectedly, application of inoculants did not have consistent effect on yield of peas, probably due to presence of nitrogen fertilizer in the fertilizer mix.

Table 3. Field peas establishment (Est.) and yield from a mechanically and glyphosate damaged seed lot with different treatments.

| Depth inches | Fert. | Inoculants | Est. % | Yield bu/ac |
|---|---|---|---|---|
| 1 | None | No | 27.5 | 27.4 |
| 1 | None | Yes | 20.1 | 23.7 |
| 1 | BP | No | 15.6 | 25.9 |
| 1 | BP | Yes | 18.2 | 20.3 |
| 1 | SP | No | 1.0 | 0 |
| 1 | SP | Yes | 0 | 0 |
| 2.5 | None | No | 44.2 | 30.8 |
| 2.5 | None | Yes | 31.0 | 27.8 |
| 2.5 | BP | No | 46.0 | 37.3 |
| 2.5 | BP | Yes | 51.5 | 44.4 |
| 2.5 | SP | No | 14.5 | 16.1 |
| 2.5 | SP | Yes | 25.2 | 23.5 |
| | *$LSD_{0.05}$* | | | *19.84* |
| | *CV%* | | | *31.6* |

**Conclusions**: The results showed that stress can sometime magnify the seed quality related differences in seed lots. Thus a crop is more likely to suffer from environment or agronomic stress when lower quality seed is used. Use of good quality seed is suggested.

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*For more information, please contact MARA.*