Bag Storage of Canola

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What is the Silobag?

Names

- Grain bag, silobag, harvest bag, grain sausage

Specifications

- Laminated, three layered, UV protected, 9.3 mil (236 μm) thick Polyethylene (PE)

Life of bag

- 1 to 1.5 years

Sealed airtight

- Prevents fungi and insects
Sizes of Silobags?

- 9 ft or 10 ft (2.75 or 3.05 m) diameter
- 200 or 250 ft (≈ 60 or 75 m) length
- Allows 10% stretch
- 9 ft x 200 ft bag weighs 122 kg (270 lbs)
Need for Silobag

Developed in Argentina to:

– Fill the storage capacity gap

– Store dry grain for short duration

– Reduce the high cost of transport during Harvest season - field or yard
Additional Benefits

• Storing a bumper crop

• Possibly obtain some extra profit from grain segregation:
  • niche crops
  • organic crops
  • identity preserved storage
How does it work?

• Clean ground with good drainage and free of sharp objects

• Grain Baggers

• Extractors
Understanding Interactions

Solar Radiation

Precipitation

Wind

Temperature

R.H.
Interactions among variables

Geographical Location

- Wind
- Air Humidity + Temperature
- Solar Radiation
- Atmospheric Pressure

Structure

- Gas
- Heat
- Moisture
- Insect Movement

Transfer models

- Gases
- Energy
- Water

Internal generation

- Gas concentration
- Temperature
- Moisture content

Predicted variable

- Insect number

Biomodels
Limited Evaluation of Silobags Has Been Done

Argentina – wheat and corn

Australia – literature based and farm based with many bags

USA – corn (partial, 2.5 months)

Canada – canola
Manitoba Farm Experiences

Source: Scott Day
U of Manitoba Study

• Three moisture contents
  • 8, 10 and 14% (wet basis)
  • 3 bags per m.c. (20 t canola in each 20 ft bag)
• Richardson Internationals Ltd Elevator, Dauphin, MB
• Loaded on October 7&8, 2010
Sampling locations

- 7 seed collection locations/bag
- 10 temperature & CO₂ data/bag (10th location at the tail of the bag)

Cross sectional view of bag

△ Seed collection
● Temperature & CO₂
# Seed Quality Analysis

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<th>Frequency</th>
<th>Testing protocol</th>
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<td>Gas chromatography</td>
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2010-11 Results
Germination

Germination (%) vs. Storage period (wk)

- 8% - Bottom
- 8% - Middle
- 8% - Top
- 10% - Bottom
- 10% - Middle
- 10% - Top
- 14% - Bottom
- 14% - Middle
- 14% - Top
Intergranular CO₂

![Graph showing the change in CO₂ concentration over storage period for different locations and CO₂ levels.]
Temperature

![Graph showing temperature changes over time for different depths: 8% -Bottom, 8% -Middle, 8% -Top, 10% -Bottom, 10% -Middle, 10% -Top, 14% -Bottom, 14% -Middle, 14% -Top. The graph covers data from 16/11/2010 to 24/07/2011.]
Temperature at Noon

- Temperature (°C)
- 8% -Bottom
- 8% -Middle
- 8% -Top
- 10% -Bottom
- 10% -Middle
- 10% -Top
- 14% -Bottom
- 14% -Middle
- 14% -Top

Date Range:
- 16/11/2010
- 05/01/2011
- 24/02/2011
- 15/04/2011
- 04/06/2011
- 24/07/2011
Unloading of Canola

• Unloaded on August 10, 2011

• 8, 10% m.c. samples
  • Bag unloader / extractor

• 14% m.c. samples
  • Caking
  • Front – end loader
  • Animal feed
Rodents
2011-12 study

• 12% m.c. canola seeds
• 3 bags
  • 70 ft length
  • 67 tonne canola/ bag
• 3 different unloading time
  • 1\text{st} week of March (ground is frozen)
  • Middle of April (ground thawed and accessible)
  • 1\text{st} week of August (after summer storage)
2011-12 Study

- 28 seed sampling locations/ bag
- 36 temperature and CO₂ samplings locations/ Bag
Moisture content

![Graph showing moisture content over storage time for different storage conditions and locations.](image-url)
Germination

![Graph showing germination over storage period for different storage locations and conditions.]
Intergranular CO₂

The graph illustrates the CO₂ concentration (%) over the storage period (wk) for different storage locations: T1-Bottom, T1-Middle, T1-Top, T2-Bottom, T2-Middle, T2-Top, C-Bottom, C-Middle, C-Top, H-Bottom, H-Middle, and H-Top. The x-axis represents the storage period in weeks, ranging from 0 to 40, while the y-axis shows the CO₂ concentration (%) from 0.00 to 25.00.
Intergranular O₂
FAV

FAV (mg KOH / 100 g dry seeds)

Storage Period (wk)

T1- Bottom
T1- Middle
T1- Top
T2- Bottom
T2- Middle
T2- Top
C- Bottom
C- Middle
C- Top
Temperature

![Temperature Graph]

- Temperature (°C)

- Axes: X-axis: Date (10/9/2011 to 7/9/2012); Y-axis: Temperature (°C)

- Lines represent temperatures at different levels:
  - T1-Bottom
  - T1-Middle
  - T1-Top
  - T2-Bottom
  - T2-Middle
  - T2-Top
  - C-Bottom
  - C-Middle
  - C-Top
  - H-Bottom
  - H-Middle
  - H-Top
Recommendations

• Selection of storage location
  • Drainage
  • Accessibility
  • Crest of hill
  • Away from rodents and animals
  • Pack the ground well

• Unload when ground is still frozen

• Continuous monitoring
Recommendations

- Use only for short term storage

- Maximum storage time
  - Dry seeds (8% m.c.)
    » 10 months
  - Straight grade seeds (10% m.c.)
    » 6 months
  - Wet seeds (14% m.c.)
    » 6 weeks
Questions

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