MUSTARD HYBRIDS

SASK MUSTARD

2018 AGM

SASKATOON, SK

MUSTARD 21 CANADA Inc.
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January 11, 2018
Manage Destiny
Create the Future
Mustard Hybrids

- Background
- Hybrids 101 (*B. juncea*)
- Opportunity
- Value Chain ⋯ Win : Win
- Future
- Need support
Background

- M21 ⋯ 2009
- Mandate
  - Increase Yield
  - Create New Opportunities
    - Condiment mustard
    - Other applications
  - Production Agronomy - Manage Weeds
  - Non GMO
- “Canadian Advantage” to remain #1 Global Exporter
MUSTARD

HYBRIDS 101
Cross a sterile female parent with a fertile male parent to produce a hybrid with superior performance.
Making A Hybrid - 3 Parent Lines

P LINE 1
Maintainer (B) X Female (A) = Sterile Female (A)

P LINE 2
Maintainer (B) = Maintainer (B)

P LINE 3
Pollinator (Rf) = Pollinator (Rf)

CREATE
Pollinator (Rf) X Sterile Female (A) = HYBRID SEED
What Is A Hybrid?

- Cross a sterile female parent with a fertile male parent to produce a hybrid with superior performance.
Mustard Hybrid ••• Advantage

- Hybrid vigour - Increase yield
- Consistent / Stable ••• yield
- Broader diversity in parent lines ••• larger hybrid vigour opportunity
- Protect variety ••• R & D investment
  - IP infringement - Difficult
  - Mustard Value Chain needs to take this seriously
MUSTARD HYBRIDS (B. juncea)
TODAY … REALITY

- FIRST MUSTARD HYBRID VARIETY
  - Nine years
  - Developed hybrid system
  - Lost two years – drought / water

- HYBRID CROPS TODAY vs. FIRST HYBRIDS
MUSTARD VARIETY

- OPEN POLLINATED vs. HYBRID
Certified Seed
Open Pollinated vs. Hybrid

- To Get To The Same End Point i.e. Certified Seed
  - OP = 1 Breeder Seed Line increase
  - Hybrid = 3 Parent Lines to increase
    - A Line – Female
    - B Line – Maintainer
    - Rf Line - Pollinator
Making A Hybrid - 3 Parent Lines

**P LINE 1**
Maintainer (B) \( \times \) Female (A) = Sterile Female (A)

**P LINE 2**
Maintainer (B) = Maintainer (B)

**P LINE 3**
Pollinator (Rf) = Pollinator (Rf)

CREATE
Pollinator (Rf) \( \times \) Sterile Female (A) = HYBRID SEED
Certified Mustard Seed Production

- **Open Pollinated Production**
  - Start with Breeder seed
  - 2 or 3 individual Increases … 50,000 ac

- **Hybrid Seed Production**
  - Start with 100 grams of each parent line
    - A Line – Sterile Female
    - B Line – Maintainer
    - Rf Line - Pollinator
  - Hybrid – 3 Individual Line Increases to achieve 50,000 ac
    - A line, B line, Rf line and finally “Certified Hybrid”
Input Comparison

1 ac Brown Mustard OP
- Land, Crop Inputs, Rogueing, Standard Production Actions

1 ac Brown Mustard Hybrid
- Land, etc. … Same As Above, plus
- 2 planting operations, male & female
- Parent line trimming, male or female
- Daily Rogueing throughout flowering is critical
- Honey Bee Pollination - $550/acre
- Male removal
- **Yield per acre is ~60%**
Hybrid Seed Production

- Process is Technically Challenging
  - Maintenance of pure parent lines

- Process is Capital Intensive
  - Specialized field operations
  - Quality Risk – isolation, volunteers
  - Pollination - $550/acre
  - Inventory Risk - Cost

- Critical to streamline operations, focus on activities to reduce cost/risk
Brown Mustard Hybrid Launch

- **2019 – Pre Launch** 5,000 acres
- Large scale on farm experience
- Across mustard growing areas
- 160 acre maximum / grower
- Collect feedback on grower experience
- **2020 Full Launch** 50,000 acres
- Commercial availability
- Need to build Hybrid Seed inventory
- **Planning**
- **Starts Now ... 2018**
Hybrid Certified Seed Costs

- Assumptions:
  - Brown Certified (OP) Retail cost - $2.25/lb.
  - Market price Brown mustard seed = $0.30/lb.
  - Planting Seed rate = 6 lbs./ac
  - Grower Share 50% of Increased Yield Value
## ESTIMATED RETAIL BROWN MUSTARD CERTIFIED HYBRID SEED

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Value Brown Mustard (BM)</td>
<td>$270.00</td>
</tr>
<tr>
<td>Yield /A = 900 lbs. x @ $0.30/lb.</td>
<td></td>
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<tr>
<td>Market Value from Hybrid Seed @ 20% increase</td>
<td>$324.00</td>
</tr>
<tr>
<td>Yield /A = 1080 lbs. x @ $0.30/lb.</td>
<td></td>
</tr>
<tr>
<td>Extra $ Value /A</td>
<td>$54.00</td>
</tr>
<tr>
<td>EXTRA VALUE SHARED 50:50 ($54.00)</td>
<td></td>
</tr>
<tr>
<td>Grower 50% $54.00 = $27.00</td>
<td>$27.00</td>
</tr>
<tr>
<td>Towards Hybrid Seed cost 50% = $27.00</td>
<td>$4.50/lb.</td>
</tr>
<tr>
<td>6 lbs. seeding rate (27/6 = 4.50)</td>
<td></td>
</tr>
<tr>
<td>Retail Brown Certified Seed $2.25/lb.</td>
<td>$2.25/lb.</td>
</tr>
<tr>
<td>RETAIL HYBRID SEED</td>
<td>$6.75/lb.</td>
</tr>
<tr>
<td><strong>Note:</strong> The values are calculated based on the market prices and yields provided.</td>
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</tbody>
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Mustard Hybrid Timeline

- Technology and Production System are Developed or in Development
  - Brown Mustard – 2019
  - Synthetic Yellow – 2020
  - Oriental Mustard – 2021
- Continuous Improvement Focus
  - Yield
  - Cost
  - Quality
Mustard Hybrids

Create the Future Manage Destiny

- Background – Priority; KEY was/is Focus
- Success
  - First Brown Mustard Hybrid (*B. juncea*)
- Huge opportunity for future improvement
- Value Chain ⋮ Win : Win
- Future is now brighter for staying competitive
- Need the Mustard Industry Value Chain to:
  - Get behind hybrid technology
  - Support Hybrid Certified Seed
  - Help maintain Canada’s position as #1 exporter
THANK YOU

Comments

Questions?