Industrial Hemp Plant Breeding & Harvesting

Biomaterials – Back to the Future Conference
March 18, 2008

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Manitoba Agriculture, Food and Rural Initiatives (MARFI) – Dauphin
Agrifood Innovation and Adaptation Branch
Canadian Industrial Hemp Plant Breeding Programs

- Alberta – John Vidmar
- Saskatchewan – Bert Vandenberg
- Manitoba – Parkland Industrial Hemp Growers Coop – John Baker
- Ontario
  - John Baker
  - Art Mcleroy
  - Ontario Hemp Alliance (OHA) Gordon Scheifele
Height Range of Varieties
ARC Industrial Hemp Feedstock Development – John Vidmar

- Industrial Hemp Cultivars for Western Canada
- Improving hemp fibre characteristics through advanced, non-GMO molecular technologies. (Designer fibres).
- ARC seeking partnerships to create customized fibre feedstocks for specific applications.

Use and development of advanced biotechnology platforms
- Genomics
- Reverse Genetics
- Molecular (DNA) Markers
- Classical

To efficiently incorporate desired traits (Non-GMO) into hemp germplasm
Molecular Breeding - ARC

• Development of Genetic Map & QTL Localization
  • Over 50 DNA markers developed and mapped
  • 300 markers developed (untested)
• Mapping population
• DNA markers (SSR, SNP and AFLP)
• Evaluation of genetic variability amongst Hemp Cultivars
Saskatchewan
– Bert Vandenberg

• Maintenance of Grain varieties
  – USO 14, USO 31
    – Crag
    – Finola

• New Varieties
  – Lines to be registered in 1 – 2 years

• High yielding grain, shorter varieties
Ontario – John Baker
Sterling, Ontario

- Ferral Hemp varieties/lines
- Upper Canada area – along great lakes
- Dioeceous Fibre varieties
- 200 year old Upper Canada (UC) germplasm
- Survived in old yard sites
- 2 to 3 UC varieties to be registered in 3 years
- 2 to 3 Hybrid varieties (UC x EU) to be registered in 3-5 years.
- All varieties will carry fall planting / cold germination trait.
PhytoGene Resources Inc.
A.R. McElroy

- Orleans, ON – Ottawa area
- The first variety, ESTA-1
- hemp breeding program since 2000
- focus is on developing high-yielding, short-stature grain varieties adapted to eastern Canada.
- private-sector
- second population will be registered this spring, and several more
Ontario Hemp Alliance (OHA)

Gordon Scheifele Tavistock, Ont

- Registered varieties Anka, Carman
- Hemp grain/dual purpose and fibre varieties
- Adapted to Ontario & Quebec
- Large seed, low THC, high yield
- High quality, primarily high GLA
- Lines
Parkland Industrial Hemp Growers (PIHG) Dauphin, Mb

- **Grain Varieties**
  - **Alyssa** – Registered in 2004
    - Certified seed available
    - Large Seed, Dual Purpose
  - **Delores** - Registered in 2007
    - Large Seeded, Grain Variety
    - Certified Seed available in 3 years
PIHG Hemp Plant Breeding Program
Fibre Only Varieties
Registered Variety
Petera – 2007
Seed Available in 3 yrs
Canadian Grown Varieties

• THC testing exempt varieties
  – Crag, USO 14, USO 31, Zolo 11
• Alyssa – THC exempt – Mb only
• Anka – THC exempt – Ont. only
• THC testing required
  – Carmen, Delores, Esta-1, Finola, Petera

Health Canada:
http://www.hc-sc.gc.ca/dhp-mps/pubs/precurs/list-cultivars-liste/index_e.html
Manitoba Hemp Variety Trials

• Evaluate varieties/lines of Industrial Hemp
• Grain and Fibre Yields
• 6 Locations in Manitoba in 2007
• Crop Diversification Centers
  – Roblin, Melita, Arborg, and Carberry
  – Applied Research Centers

PESAI (Prairies East Sustainable Agriculture Initiative)

PARKLAND INDUSTRIAL HEMP GROWERS Co-op Limited

MCDC

Manitoba Agriculture, Food and Rural Initiatives
Hemp Grain Yields

INDUSTRIAL HEMP

New for 2008

Variety Code Distributor Seed Availability
Delores RC 54 Parkland Industrial Hemp Growers Coop Ltd. 2010

Comments:
A license from Health Canada is required to grow Industrial Hemp.
THC testing for some varieties required. Check Health Canada Website

Variety Descriptions

<table>
<thead>
<tr>
<th>Variety</th>
<th>Yield of Check</th>
<th>% of Check</th>
<th>Site' Years Tested</th>
<th>2007 Yield: % of USO 14</th>
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<tbody>
<tr>
<td>Alyssa</td>
<td>127</td>
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<td>Alyssa</td>
<td>Carberry Dauphin Melita</td>
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<td>Delores</td>
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<td>9</td>
<td>Crag</td>
<td>152 78 106</td>
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<td>Finola</td>
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<td>Delores</td>
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<tr>
<td>USO 14</td>
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<td>Finola</td>
<td>43 67 66</td>
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<td>USO 31</td>
<td>110</td>
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<td>USO 14</td>
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<td>Zolo 11</td>
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<td>6</td>
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CHECK CHARACTERISTICS

<table>
<thead>
<tr>
<th>Variety</th>
<th>Yield (USO 14 lb/acre)</th>
<th>CV %</th>
<th>LSD %</th>
<th>Sign Diff</th>
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<tr>
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<td>9 lb/acre site years</td>
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<td>600</td>
<td>19.7</td>
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</table>

1 While 2007 is the first year Industrial hemp has been reported in Seed Manitoba, it has been tested since 2000 in Manitoba. The current database contains data from 2006 and 2007 growing seasons.

Source: Manitoba Crop Diversification Centers
Hemp Grain Harvest

- Conventional Equipment
- Straight Cut
- Grain Moisture 10 to 25%
- Some Equipment Modification
- Drying required
Combine Modifications

John Deere

- Narrow opening at feeder
- Rubber mat for Feeder Chain - 9600
- New Generation –
  - 9560 – 9560 STS
  - 9960 - Conventional
Hemp For Grain
## Hemp Biomass Yields

### Industrial Hemp Fibre (Total Biomass per Acre)

<table>
<thead>
<tr>
<th>Variety</th>
<th>Yield % of Check</th>
<th>Site years tested</th>
<th>2007 Yield</th>
<th>% of USO 14</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Arborg</td>
<td>Carberry</td>
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<tr>
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<td>UC-B</td>
<td>79</td>
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### CHECK CHARACTERISTICS

<table>
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<tr>
<th>USO 14</th>
<th>Yield (USO 14 t/acre)</th>
<th>CV</th>
<th>LSD</th>
<th>Sign. Diff.</th>
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<tbody>
<tr>
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<tr>
<td>t/acre</td>
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<td>10.6</td>
<td>19.1</td>
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<td>site years</td>
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<td>17</td>
<td>28</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Caution - Limited Data**

Source: Manitoba Crop Diversification Centers
Industrial Hemp Fibre Harvesting

- Europe
- Self Propelled Units
- Used for Corn Harvest for Silage
- Cost
• Cut in \( \frac{1}{2} \) to 1 metre lengths
• Left to dry
• Left to ret
Optigép Machine Manufacturing and Trading Ltd - Hungary
Optigép Machine Manufacturing and Trading Ltd - Hungary
Modify Conventional Equipment

• Dual Purpose
  – Sharp Knife
  – Wrapping
  – Weather
Storage

- Requires research
- Dependant on processing method?
- Covered vs. Open
- Moisture Content
Harvesting

• Can be a challenge
• Innovative producers and Industry
• Harvest
  – E.g., 1 square meter = ~ 10 tonnes per acre
Biomaterials for the Future?

Industrial Hemp

Questions or Comments