



High Oleic, Low Linolenic (HOLL) Specialty Canola Development in Australia

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HOLL (High Oleic, Low Linolenic) Canola

- HOLL >65% Oleic acid (C18:1), <3% Linolenic acid (C18:3)
- No trans fatty acids
- Increases the oxidative stability
 - Longer shelf and cooking life
 - No longer a requirement to hydrogenate oil for stability
 - Low levels of saturated fats
 - Excellent taste in products
 - Liquid at room temperatures



Why HOLL? Performance Characteristics of Specialty Canola Oils



Typical Oil Profiles - HOLL vs. Traditional Canola Oil

| | C16:0 | C18:0 | C18:1 | C18:2 | C18:3 | C20:0 | C20:1 | C22:1 |
|------------------------|----------|---------|-------|----------|-----------|-----------|------------|--------|
| | Palmitic | Stearic | Oleic | Linoleic | Linolenic | Arachidic | Eicosenoic | Erucic |
| _ | acid | acid | acid | acid | acid | acid | acid | acid |
| V3001 | 3.8 | 2.08 | 68.0 | 19.9 | 3.0 | 0.7 | 1.0 | 0.0 |
| ^{AV} Sapphire | 4.0 | 2.1 | 62.2 | 21.5 | 7.8 | 0.5 | 1.0 | 0.0 |

* Indication of typical oil profiles only, values derived from 2007 advanced Vic DPI sites

Oil profile can be influenced by outside factors

- Environment
- Outcrossing (0-25%)
- 3.5 4.0% increase in linolenic acid
- 3.0 4.0 % decrease in oleic acid
- Increases the difficultly to breed for using traditional pedigree breeding

Development of Cargill HOLL Canola

- Collaborative project between DPI Victoria and Cargill Specialty Canola Oils (since 2000)
- Original crosses between Canadian specialty varieties (CV65 and CV75) and Australian germplasm
- Crossing and backcrossing undertaken in Australia
- Doubled haploids produced in Canada
 - To fix quality and agronomic traits of interest and achieve homozygosity
 - Quicker route to market
- DHs tested for specialty oil genes using Marker Assisted Selection (MAS) and for Adventitious Presence (AP)
- Extensive blackleg and yield field trials in Australia



Blackleg, Blackleg, Blackleg....

- Canadian blackleg resistance not strong enough in Australian environment
 - Large number of doubled haploids lost in blackleg nurseries due to inadequate blackleg resistance
 - In 2005 >96% of the DHs (543/562) died from lack of blackleg resistance
 - 42% of the survivors did not fit the requirements for oil quality
 - This left only 11 lines to do further analysis for yield and agronomic suitability in following years
 - Highlights the benefit there will be when molecular markers for a range of blackleg genes are available as will be able to select DHs with increased blackleg resistance







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Blackleg









Increasing the Australian content of HOLL canola

- Backcrossing program to Australian lines to enhance
 blackleg resistance
 - Backcrossed lines sent for DH production
 - Blackleg resistance increased with each generation of backcrossing
 - Increasing the Australian content of material
 - DHs are tested using MAS to ensure they still have the genes for specialty oil quality





DEPARTMENT OF PRIMARY INDUSTRIES **Overview of double haploid breeding**



Breeding Transition

Open pollinated HOLL cultivars

• HOLL hybrids

RoundUp Ready HOLL hybrids

First products – Open-pollinated Cultivars

- OP lines limited release in 2007 and 2008
 - Cargill 100, Cargill101 and Cargill 103
- Moderate blackleg resistance
- Yields approx. 15% lower than best conventional OPs
- Grown in southern NSW near crushing plants, under IP Contract
- Premiums for specialty product
- First lines to market increased market and consumer awareness of the product
- DROUGHT!



Second Products - Hybrids

Two high yielding HOLL hybrids released for 2009

V3001 (06H932)

- Conventional hybrid
- Excellent vigour
- R-MR blackleg resistance
- Early mid maturity
- Medium height (similar to Hyola 50)
- High yield and broad adaptability

V3002 (06H939)

- Conventional hybrid
- R-MR blackleg resistance
- Mid maturity
- High yield potential in better environments
- Limited seed for 2009 planting, demo and strip areas only



2008 NSW NVT trials

| Site | Croppa Creek | Ariah Park | Grenfell | Harden | Wagga | | |
|----------------|--------------|--------------|--------------|--------------|--------------|----------------------|-------------------|
| | Yield (t/ha) | Average yield (t/ha) | % Hyola 50 and 76 |
| V3001 (06H932) | 2.44 | 0.91 | 2.81 | 2.05 | 1.42 | 1.93 | 106 |
| V3002 (06H939) | 1.34 | 0.67 | 1.96 | 1.98 | | 1.49 | |
| AV Garnet | 1.97 | 0.78 | 2.65 | 2.05 | 1.61 | 1.81 | 100 |
| AV Sapphire | 1.86 | 0.51 | 1.69 | 1.35 | 1.07 | 1.30 | 72 |
| Hyola 50 | 2.10 | 0.74 | 2.39 | 2.27 | 1.39 | 1.78 | 98 |
| Hyola 76 | 2.51 | 0.79 | 2.36 | 2.24 | 1.31 | 1.84 | 102 |

Third Products- RR HOLL Hybrids

Roundup Ready HOLL hybrids

07H5000

- Tested in 2008 NVT trials
- R-MR blackleg resistance
- Early mid maturity
- Limited data but high yield potential
- New hybrids being tested



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