Australian Sweet Lupin Flour

Sofia Sipsas

.... from little things, big things grow
Australian Sweet Lupin

Natures Gift

Arguably the worlds highest source of natural protein and fibre flour
A Legume Bean without Starch

Zero Glycemic Load
We Took An Ancient Crop...

- **OLD WORLD** Mediterranean
- **NEW WORLD** Andean Highlands

soil health improver
A Traditional Food….

Egyptian, Greek, Roman
Inca, pre-Inca

Bitter alkaloids removed by leaching
And developed
Australian Sweet Lupin Flour…….

**A World Class Food Ingredient**

- High Protein
- Low Carbohydrate
- Low Glycemic Load
- Gluten Free

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>High Fibre</td>
<td>Low Fat</td>
</tr>
<tr>
<td>Low GI</td>
<td>Non GMO</td>
</tr>
</tbody>
</table>

- Suppresses Appetite
- Controls blood sugar levels
- Lowers blood pressure
- Improves bowel health
- Prebiotic, promotes good bacteria
Global Commercial Species

Australian Sweet Lupin
Lupinus angustifolius
Narrow leafed lupin
- Western Australia - world's largest producer

European white lupin
Lupinus albus
Europe, S. Africa & Australia

Yellow lupin
Lupinus luteus
Poland, Russia & Germany
Approval for Food Use

**Australia**

1988 – Australia New Zealand Food Authority approved the use of Lupin in Food.

**Europe**

2000 – European Union approval for Food

Currently is it estimated that 500,000 tonnes consumed annually in Europe contain lupin (Fletcher 2006)
# Australian Sweet Lupin Flour

Product of moderate lupin processing

## Whole Seed Compositional Analysis

<table>
<thead>
<tr>
<th>Component</th>
<th>g/100g (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed coat (bran)</td>
<td>25</td>
</tr>
<tr>
<td>Protein</td>
<td>31</td>
</tr>
<tr>
<td>Fat</td>
<td>6</td>
</tr>
<tr>
<td>Kernel fibre</td>
<td>26</td>
</tr>
<tr>
<td>Ash</td>
<td>3</td>
</tr>
<tr>
<td>Calcium</td>
<td>0.21</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>0.29</td>
</tr>
</tbody>
</table>

## Pure Kernel Compositional Analysis

<table>
<thead>
<tr>
<th>Component</th>
<th>g/100g (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed coat (bran)</td>
<td>0</td>
</tr>
<tr>
<td>Protein</td>
<td>40</td>
</tr>
<tr>
<td>Fat</td>
<td>7</td>
</tr>
<tr>
<td>Kernel fibre</td>
<td>36</td>
</tr>
<tr>
<td>Ash</td>
<td>3</td>
</tr>
<tr>
<td>Calcium</td>
<td>0.15</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>0.35</td>
</tr>
</tbody>
</table>

## Dehulling Whole Seed (1 tonne)

- **Lupin Hulls**: ~250 kg
- **Kernels splits**: ~750 kg
The story so far......since 1988

Recent years small but concerted effort by the West Australian to introduce lupin into the food chain.

Currently it is estimated that 500,000 tonnes of food containing lupin are consumed annually (Fletcher 2006)
General Application Rates

Techno-functional application
1-5% inclusion rates
- either replacing wheat flour, eggs, or fat

Nutritional improvement application
10-30% inclusion rates
- predominant displacement of wheat flour.
  20% displacement of wheat with lupin
  = complete protein (cereal/legume blend)

Images Courtesy of DAFWA
Lupin Flour - Applications

**Bakery Products**
- Pan Breads
- Flat Breads
- Pizza bases
  - 5-20% inclusion
  - Substitution of wheat flour
  - Increase water addition
  - Softer product texture
  - Improve nutrition

*20% Lupin inclusion in Whole meal Bread*
*Images Courtesy of DAFWA*
Lupin Flour - Applications

Sweet Bakery Products
Croissants
Biscuits,
Cakes
Doughnuts
Pastry....etc

1,2,3, 5 -20% Inclusion
• Substitution wheat, fat & eggs
• Lower fat product (ie pastries)
• Emulsification
• Golden colour

Images Courtesy of DAFWA
Lupin Flour - Applications

Noodles & Pasta
Pasta
Instant Noodles
Yellow alkaline Noodles
- 10-20% Inclusion rates, substitution of wheat flour
- Improvement in colour
- Minimum loss of taste & texture

Nutrition Improvement
20% Inclusion
- Increase Protein (by 56%),
- Increase in Fibre (by 340%)
- Lowers Glycemic Load (by 20%),

10% Lupin inclusion in Instant Noodles
Lupin Flour - Applications

Food Coating Systems
Pre-dust & Batters
• Assists with adhesion of substrate
• Golden yellow colour
• Promotes crisp texture

Smallgoods
Chicken Frankfurter
5% Inclusion replacement of meat
• Insignificant difference in eating qualities.
• No shrinkage was observed after cooking.
• Significant increase in moisture retention after cooking.
Other applications of the Lupin bean

**Whole seed**
Asian Bean sprouts
Higher yielding (36%) compared to soy & mung
Crispier texture, and rated higher than soy in taste

**Lupin Kernels**
Asian Fermented Foods
Miso,
Shoyu (soy sauce)
Tempe
Potential Future Developments:
Lupin Protein Isolates & Fibre Isolate extracts

100g Lupin Flour
Protein (g) 41
Fat (g) 7
Fibre (g) 35

Extraction of Protein & Fibre
Isoelectric precipitation
Spray Drying

Lupin kernel Fibre
Yield 30%

Lupin Protein Isolate
Yield 30%

Fibre Composition (%)

Fibre 77
Protein 14
Fat 4
Ash 5

Isolate Composition (%)

Protein 91
Fat 5
Ash 3
Lupin Proteins: Isolates and Concentrates

**Functionality**
- emulsifying
- foaming
- fat binding
- Stabilising
- water retention
- egg & milk protein replacement

**Products**
Sauces- mayonnaise
Meat extenders - smallgoods
Dairy Substitutes- milk, yoghurt and ice-cream
Sweet Confectionary -glazes, meringues, frozen desserts, bakery, chocolate
Lupin Kernel Fibre Isolates

**Functionality**

White
neutral palette
Neutral odour
Holds x 8 times weight in water

**Health Benefits**

- high feeling of fullness factor of kernel fibre
- marked reduction in blood glucose (non insulin diabetics)
- Prebiotic, promotes good bacteria
- Colon fermentation – butyric acid (colon cancer protection)
  - Research conducted by Deakin Uni/GRDC/GWF/CSIRO
**Phyto-chemicals & Bioactives in Lupin Flour**

**Antioxidants**
- lutein, zeaxanthin
  (protects against age related macular degeneration)
- Beta-carotene
- vitamin E
- zinc & selenium

**Bio-active Peptides**
- Gamma-conglutin – anti-diabetic
- Peptides – skin rejuvenation (production of collagen)

**Bio-active lipid extract**
- Lupeol (oil fraction) – anticancer (melanoma & DNA protection).
Australian Sweet Lupin Flour

The Crisis of the 21st Century: The Obesity & Diabetes Epidemic, commonly referred to as “Diabesity”

Studies have revealed that Australian Sweet Lupins:

- Suppress Appetite
- Reduce blood pressure
- Improve glucose metabolism (diabetes)
- Improve bowel health
- Prebiotic, promotes growth of good bacteria
- Reduce the Glycemic Load of carbohydrate foods
- Modify the Glycemic Index
- Very high source of essential amino acid
- Gluten free
- Non GMO
# Australian Sweet Lupin Flour
## Technical Data Sheet

**Particle size reduction=milling**
- Course < 2mm = meal
- Fine < 250 mm = flour

### Compositional Analysis

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture (%)</td>
<td>9-10</td>
</tr>
<tr>
<td>Protein (%)</td>
<td>40</td>
</tr>
<tr>
<td>Fat (%)</td>
<td>7</td>
</tr>
<tr>
<td>-Saturated fat (%)</td>
<td>1.4</td>
</tr>
<tr>
<td>-Polyunsaturated fat (%)</td>
<td>3.5</td>
</tr>
<tr>
<td>-Monounsaturated fat (%)</td>
<td>2.5</td>
</tr>
<tr>
<td>-Cholesterol (%)</td>
<td>0</td>
</tr>
<tr>
<td>Ash (%)</td>
<td>3</td>
</tr>
<tr>
<td>Digestible Carbohydrates (%)</td>
<td>3</td>
</tr>
<tr>
<td>Dietary Fibre (%)</td>
<td>36</td>
</tr>
<tr>
<td>Calcium (mg/100g)</td>
<td>150</td>
</tr>
<tr>
<td>Sodium (mg/100g)</td>
<td>30</td>
</tr>
<tr>
<td>Potassium (mg/100g)</td>
<td>810</td>
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</table>
Australian Sweet Lupin Flour  
Technical Data Sheet

<table>
<thead>
<tr>
<th>Physical Analysis</th>
<th></th>
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<tbody>
<tr>
<td>Bulk Density (g/ml)</td>
<td>0.58</td>
</tr>
<tr>
<td>pH (10% [w/w] solution)</td>
<td>5.5-5.7</td>
</tr>
<tr>
<td>Water holding capacity</td>
<td>276</td>
</tr>
<tr>
<td>(g water absorbed/100g Flour)</td>
<td></td>
</tr>
<tr>
<td>Oil holding capacity</td>
<td>93</td>
</tr>
<tr>
<td>(g water absorbed/100g Flour)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Particle Size</th>
<th>% retained on sieve</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 micron</td>
<td>1.0%</td>
</tr>
<tr>
<td>500 micron</td>
<td>1.2%</td>
</tr>
<tr>
<td>300 micron</td>
<td>15.8%</td>
</tr>
<tr>
<td>250 micron</td>
<td>8.0%</td>
</tr>
<tr>
<td>150 micron</td>
<td>17.2%</td>
</tr>
<tr>
<td>Pans</td>
<td>56.8%</td>
</tr>
</tbody>
</table>

Particle size reduction=milling  
Course < 2mm = meal  
Fine < 250 mm = flour
Australian Sweet Lupin Flour compared to Soy

Lupin ‘low to negligible’ compared with Soy anti-nutritional factors:
- No Trypsin/Protease inhibitors – digestion inhibitor
- Low Saponins – gastric irritant
- No Lectins (hemagglutinins) – gastric irritant/systemic issues
- Low Phytic acid levels – inhibitor of Ca, Mg & Zn absorption

<table>
<thead>
<tr>
<th>Raw Lupin Flour</th>
<th>Raw Soybean Flour</th>
</tr>
</thead>
<tbody>
<tr>
<td>GMO Free</td>
<td>GMO</td>
</tr>
<tr>
<td>Lower Fat (6%)</td>
<td>Higher Fat (20%)</td>
</tr>
<tr>
<td>High Fibre (36%)</td>
<td>Lower Fibre (12%)</td>
</tr>
<tr>
<td>Stable shelf life</td>
<td>Short shelf life</td>
</tr>
<tr>
<td>Lower rancidity potential</td>
<td>High rancidity potential</td>
</tr>
<tr>
<td>Higher anti-oxidant potential</td>
<td>Lower anti-oxidant potential</td>
</tr>
</tbody>
</table>
Lupin Specific Risks & Issues

An Allergy Caution
Like other legumes such as peanuts and soybean, consuming or coming into contact with Australian sweet lupin may cause allergic reactions (including anaphylactic shock) in some individuals, although such incidents are rare.

Products made with Australian sweet lupin should therefore be clearly labeled.

Alkaloids
Irwin Valley Lupin Flour <200ppm alkaloid content.
Irwin Valley Lupin Flour <5ppm phomospin
(ANZFA – 1988)
Take Home message

Australian Sweet Lupin Flour

Positive Points of Difference

Addressing the need of tomorrow, today