

# Lupin Products

## Challenges in Commercialisation

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# The story so far.....after 40 years

- Australian Sweet Lupin now a major crop in WA
- Smaller crops (albus) in Europe and South America
- 15 m tonnes over 20 yrs sold as feedstock
- Last 15 years small but concerted effort to introduce lupin into the food chain, varying success

*driven by the assumption that this would lead to more stable prices for the grower*

- Currently ~ 15,000 tonnes used globally as food
- 500,000 tonnes of food containing lupin consumed annually in Europe

**Is this too fast, too slow or just right given the particular factors of the lupin industry?**



# Products of moderate lupin processing

**Dehulling:**  
*in a perfect world*



Whole seed (1 tonne)

Lupin Hulls  
~250 kg

Kernels splits  
~750 kg

## Compositional analysis

'as is g/100g (%)'

Seed coat (bran)*	25
Protein	31
Fat	6
Kernel fibre (NSP)#	26
Ash	3
Calcium	0.21
Phosphorus	0.29

\* Predominantly cellulotic material

#NSP-Non starch polysaccharides

**no alkaloid in hull**

**alkaloid in kernel**

## Pure Hulls Composition

'as is g/100g (%)'

Seed coat (bran)	100
Protein	4
Fat	1
Cellulose fibre	51
Other fibre (NSP)	32
Ash	2.5
Calcium	0.57
Phosphorus	0.05



## Pure Kernel Composition 'as

'as is g/100g (%)'

Seed coat (bran)*	0
Protein	41
Fat	7
Kernel fibre	35
Ash	3
Calcium	0.15
Phosphorus	0.35

# Dehulling in reality...



Whole seed (1 tonne)



Hulls ~310 kg

Kernels ~690 kg



## Lupin pellets Compositional analysis

'as is g/100g (%)'

<b>Lupin hulls</b>	<b>80%</b>
<b>Kernel bits</b>	<b>20%</b>
<b>Protein</b>	<b>12</b>
Fat	2.5
Cellulose fibre	36
Other fibre (NSP)	46
Ash	2.5
Calcium	0.30
Phosphorus	0.10

- pure separation between kernel and hull is unattainable
- will always have kernel fraction in the hulls, and vice versa

# Markets for products of lupin processing

**Asian Sprouts markets**  
 Japan  
 China  
**Animal Feed Markets**



**Whole seed (1 tonne)**

**Hulls = ~ 250 kg**

**Kernels ~ 750 kg**



Markets	% WA crop	Valued Component
Ruminant	60 %	whole seed
Pigs	25 %	kernel
Poultry	10 %	kernel
Fish	5 %	kernel
Humans	minor	kernel

**Stock feed – Ruminants**  
 Low lignin fibre (highly digestible)

**Human Markets**  
 Hi-fibre (bran) gluten free markets

**Kernel/splits food markets**  
 Indonesia – Tempe  
 Japan – Shoyu & Miso

**Kernel meal markets**  
 Aquaculture  
 Europe – Salmon  
 S.E. Asia Shrimp

## Whole seed

- Asian Bean sprouts (*concept*)

36% yield advantage cf soy & mung

Crispier texture, higher sensory rating



## Lupin Hulls

- High Fibre supplements (*product*)

Vitafiber (Avelup Chile)

- High Fibre Cereals (*gluten free*)

A patent has been granted for an extruded high fibre product similar to Kellogg's All- Bran®



## Lupin Kernels

- Asian Fermented Foods

Miso, Shoyu (soy sauce) and Tempe



# Lupin kibble, Lupin meal & Lupin flour



Kernels

Particle size reduction=milling

Course < 2mm = meal

Fine < 500  $\mu\text{m}$  = flour



Lupin flour

*The chemistry doesn't change*

Average Kernel Composition as is g/100g (%)'	
<b>Protein</b>	<b>41</b>
Fat	7
<b>NSP*</b>	<b>35</b>
<i>Kernel fibre (Soluble &amp; Insol.)</i>	29
<i>Oligosaccharides</i>	6
Ash	3
Calcium	0.15
Phosphorus	0.35
<i>NSP: Non starch polysaccharides</i>	

*Milling issues:*

*flavour stability*

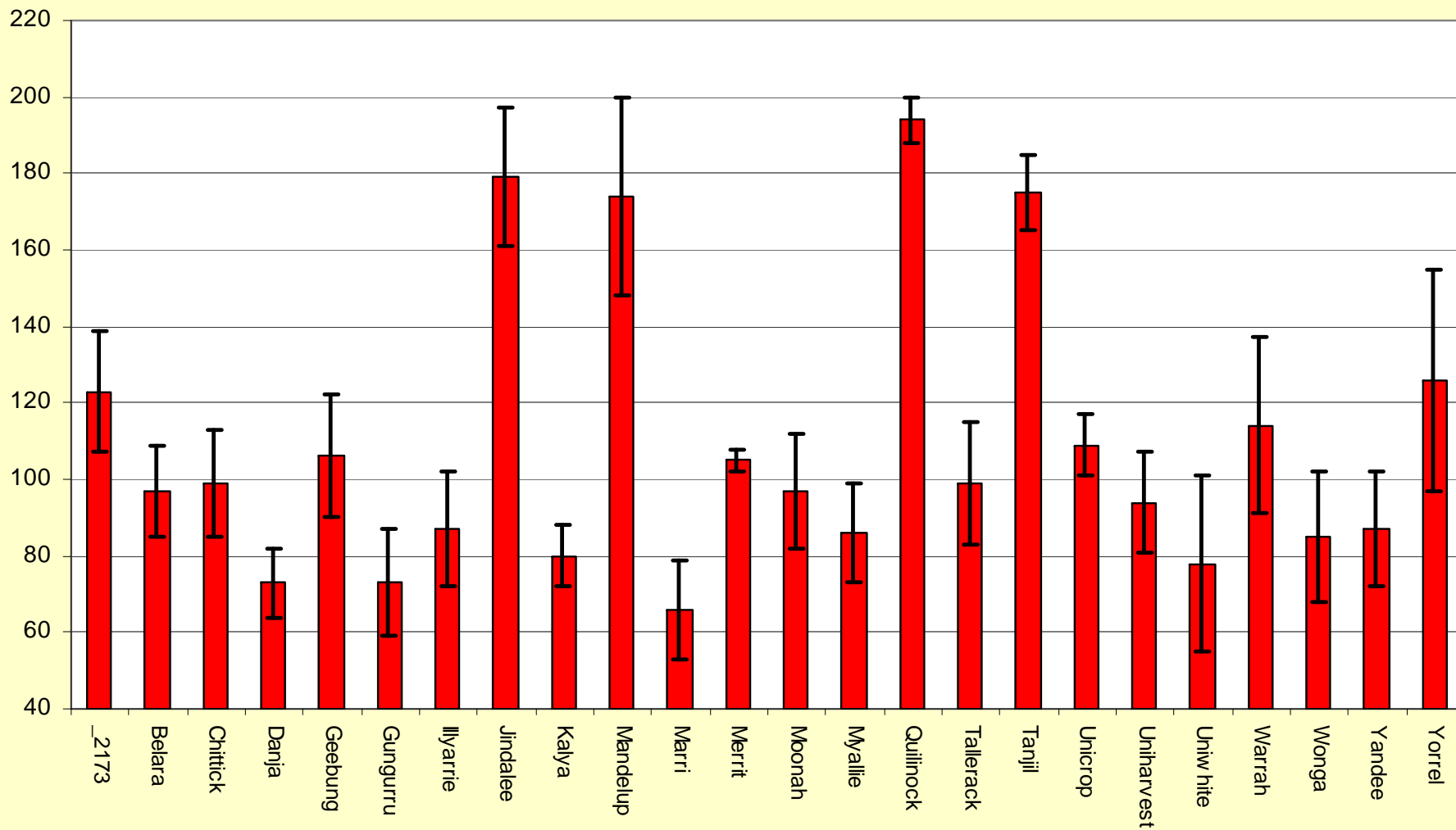
*enzymatic activity (LOX & Lipases)*

*hardness of kernel,*

*high energy input to micronise*

# Alphabetical order of LOX activity for historical set

=act/min/mg protein



# Lupin tasting for “lupiness, beaniness” & “bitterness”

Soy standard

Apple juice  
rinse b/w

Trick or Treat



Taste assessment for 6 varieties of lupin flour

Thank you for taking a minute to taste some lupin flour.  
Work your way through the samples in the order presented to you.  
Feel it is okay to go back & taste a sample again but try them all in order first.  
So here we go:

- 1) Spoon a level teaspoon of flour into a tray
- 2) Add a set amount of water to the tray
- 3) Mix up a slurry with the teaspoon
- 4) Taste. Roll the sample around your tongue.
- 5) Mark the lines below where each sample fits in.
- 6) Use the dilute apple juice to dilute your taste buds b/w samples.

**Bitter?**

Not at all \_\_\_\_\_ Totally bitter \_\_\_\_\_

**Beany?**

Not at all \_\_\_\_\_ Totally beany \_\_\_\_\_

**Comments:** If you would like to add any  
Maybe you liked a particular variety?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

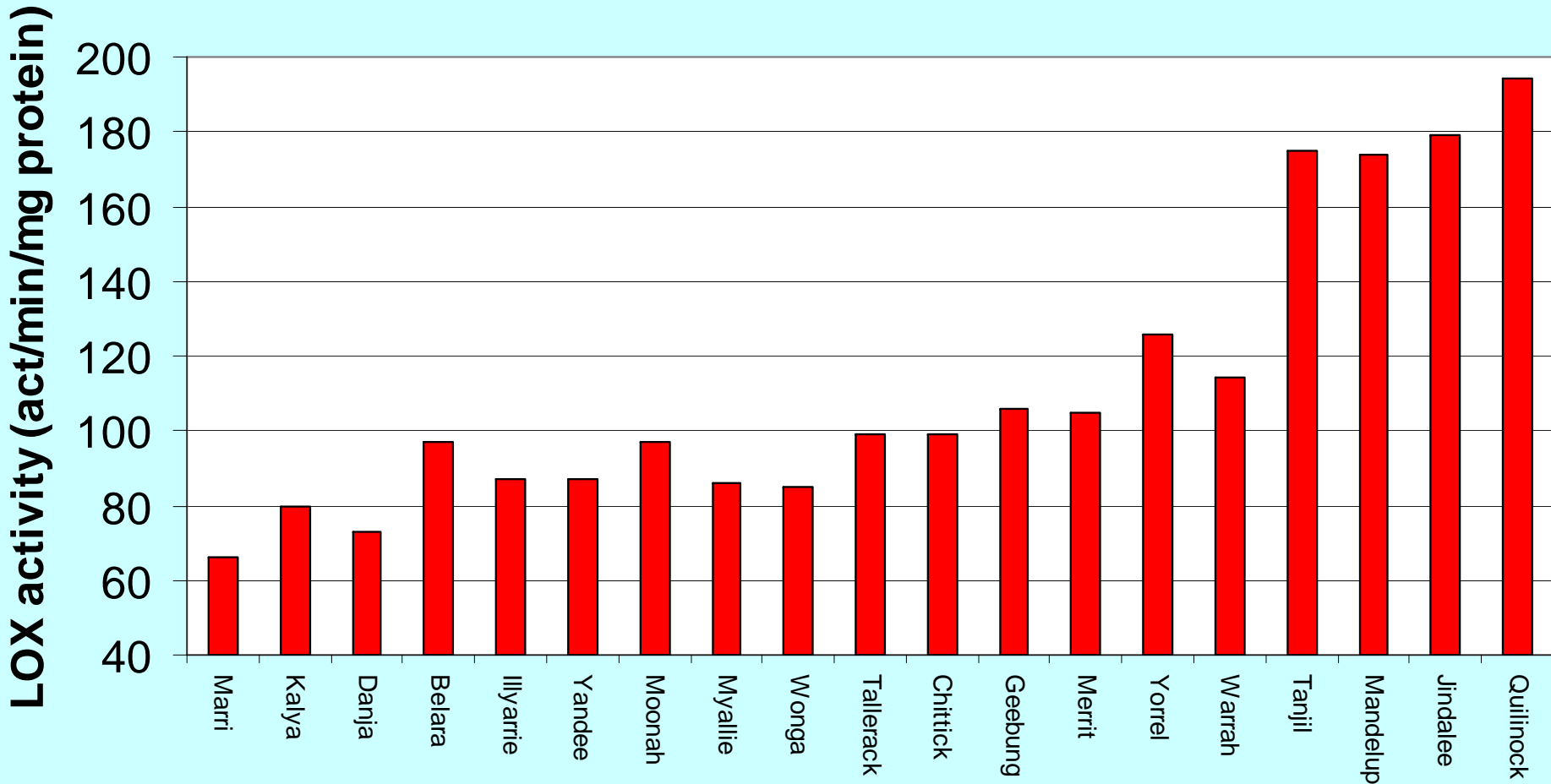
Tasting some lupins can be:

**REALLY AWFUL!!**



# Developing order of least "beany" to most versus LOX activity values

(Soy=255, Mung = 185)



# Lupin Kernel Flour (ingredient/product)

- NaProFoods ([www.naprofood.de](http://www.naprofood.de)).
- Lup'ingredients (Terrana) ([www.lupin.fr](http://www.lupin.fr))
- Fa. L.I.FRANK ([www.lifrank.nl](http://www.lifrank.nl))
- Soya Austria ([www.soja.at](http://www.soja.at))
- Lupidor ([www.lupidor.com](http://www.lupidor.com))
- Irwin Valley ([www.lupinflour.com](http://www.lupinflour.com))
- **Lupin Kernel Flour (application)**
  - Bakery Products (products)
    - ✓ Breads, Pizza bases, Biscuits, Cakes
    - ✓ Croissants etc..
  - Sweet confectionary
  - Pasta and Noodle products (concept)



# Protein concentrates

## 100g Flour composition (db)

	g
<b>Protein</b>	<b>46</b>
Fat	8
<i>Kernel fibre (insoluble)</i>	<i>27</i>
<i>Kernel fibre (soluble)</i>	<i>6</i>
<i>Oligosaccharides</i>	<i>8</i>



## Three likely options:

1. Wash flour (solvent)
2. Wash flour (heat treatment and acidified water)
3. Air classification: (separation of protein from fibre particles)

**Wash flour (solvent)**  
Removed the soluble components  
Dry flour

## 77g Concentrate composition (db)

(loss 23g)

	g	%
<b>Protein</b>	<b>41</b>	<b>53</b>
Fat	6.5	8.4
<i>Kernel fibre (insoluble)</i>	<i>27</i>	<i>35</i>

*The chemistry does change*

## Lupin Protein Concentrates (ingredient)

- NaProFoods ([www.naprofood.de](http://www.naprofood.de)).
- Terrena Ingredients (Lup'ingredients) ([www.lupin.fr](http://www.lupin.fr)).
- Fa. L.I.FRANK ([www.lifrank.nl](http://www.lifrank.nl))
- Lupidor ([www.lupidor.com](http://www.lupidor.com))

## Lupin Protein Concentrates (application)

- Protein shakes/drinks
- Dairy substitutes
- Smallgoods / meat application
- Bakery
- Mayonnaise/sauces





[www.lupidor.com](http://www.lupidor.com)

Lupidor® can be used for a wide range of applications, including milk-free chocolate, cholesterol-free mayonnaise, and reduced-fat sausage products.

Discover the boundless possibilities of Lupidor®!



# Protein isolates & fibre extracts

**100g Flour**

	(g)
<b>Protein</b>	<b>41</b>
Fat	7
<b>Fibre</b>	<b>35</b>

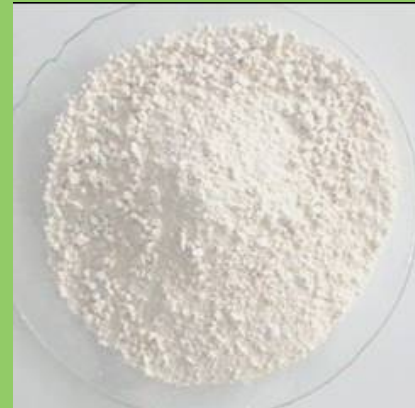


**Extraction of protein**  
**Isoelectric ppt**  
**Spray Drying**

**Lupin kernel fibre**



**Lupin Protein isolate**



**32g Fibre composition**

	%
<b>Fibre</b>	<b>77</b>
<b>Protein</b>	<b>14</b>
Fat	4
Ash	5

**30g Isolate composition**

	%
<b>Protein</b>	<b>91</b>
Fat	5
Ash	3

# Lupin Protein Isolates (concept)

- Protein shakes/drinks
- Dairy substitutes
- Smallgoods / meat application
- Bakery
- Mayonnaise/sauces

## Lupin Fibre Isolates (concept)

### Hydrocolloid (vegetable gum)

- stabilising ice cream (crystal retardation)
- protein stabilisation in acidified dairy beverages
- stabilising dressings and sauces
  - water binding in meat,
  - gelling fruit systems



## Bioactives:

- Gamma-conglutin - antidiabetic
- Carotenoids - antioxidants
  - Lutein & Zeaxanthin - age related macular degeneration
- Lupeol (oil fraction) - anticancer (melanoma)
- Peptides - skin rejuvenation (production of collagen)

- *Hailed as a miracle anti-ageing serum, the Boots No 7 Protect & Serum sold out in days*





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## COLLAGENEER®

### More Information

#### • [Request more information](#)

#### • Visit websites:

- <http://www.expanscience.fr/con>
- <http://www.expanscience.com>

**Collageneer® , a Lupin extract with no preservative, promotes the synthesis of a high quality collagen.**



# The reality of the 'food space'

**Creating conditions that drive a 'Demand' is critical, it is a mistake to assume that a 'need' calls for a Market**

The Soy Industry's first attempts failed.

- Poor palatability and texture profile.
- Poor definition of the market segment
- Failure to consider the demands a new product would make on the customer's technical and operational skills

Soy made inroad into the food chain in the 1990's

- Health claim –Soy protein benefits in terms of cholesterol
- Significant R&D in development of improved functional and sensory properties



**The successful introduction of lupin derived food depends on the dynamic relationship between :**

- the processing technologies**
- each individual market demand**
- the price of the raw grain**
- and the processors ability to add value to the derived products**



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