



Lupin Bioeconomy
Development

LIBBIO: *Lupinus mutabilis* for Increased Biomass from marginal lands and value for BIOrefineries



Horizon 2020
European Union Funding
for Research & Innovation



Bio-based Industries
Consortium

This project has received funding from the Bio Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 720726.



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Food and feed applications of Andean lupin



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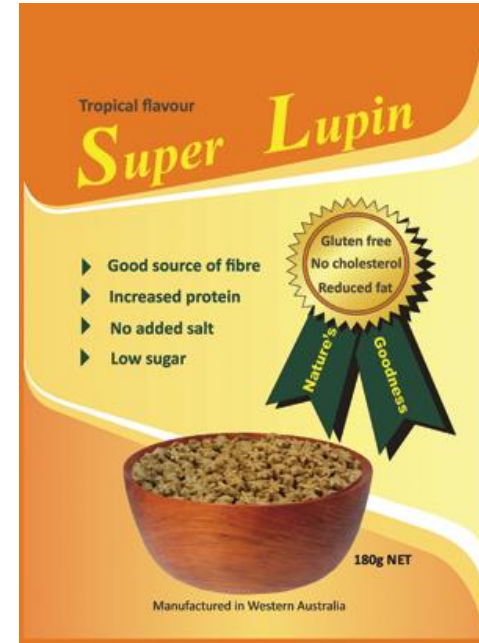
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LIBBIO workpackages

WP4: Biomass fraction properties and applications assessment (food, feed and non-food)

- Oil composition, properties and applications
- Protein composition properties and applications
- Oligosaccharides, alkaloids and lecithins
- Other applications
- Green silage



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LIBBIO: healthy and delicious food

- Oil based
 - Mayonnaise, Margarine
- Protein based
 - Milk, Yoghurt, Ice cream
- Prebiotic carbohydrates
 - Stachyose & Raffinose
- Functional ingredients
 - Foaming, gelling, emulsification, stabilisation, color



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LIBBIO: feed for animal nutrition

- Feed for
 - Pigs
 - Poultry
 - Cattle
- Andean lupin can replace soy bean !



LIBBIO oils

- Andean lupin has excellent fatty acid profile
- More than 80% unsaturated fatty acids
- Fatty acid profile is comparable with soy bean oil
- Andean oil can replace soy bean oil in many food applications



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Fatty acid composition

- Andean lupin oil is high in unsaturated fatty acids



	saturated fatty acids						
	C12:0	C14:0	C16:0	C18:0	C20:0	%SF	
	lauric acid	myristic acid	palmitic acid	stearic acid	araquidic acid		
olive oil	na	0.7%	11.5%	2.0%	0.2%	14%	
palm kernel	41.0%	16.0%	8.0%	2.0%	na	67%	
soy bean oil	na	0.5%	9.0%	4.0%	na	14%	
sunflower oil	na	na	3.7%	2.0%	2.3%	8%	
white lupin oil			7.9%	1.6%	1.0%	11%	
bleu lupin oil			10.3%	5.2%	0.7%	16%	
andean lupin oil			10.4%	4.7%	0.9%	16%	
	unsaturated fatty acids						
	C16:1	C18:1	C18:2	C18:3		%UF	U/S
	palmitoic acid	Oleic acid	Linoleic acid (w6)	Linolenic acid (w3)			
olive oil		78.40%	7%	na		85%	5.9
palm kernel		22%	1.25%	na		23%	0.3
soy bean oil		28.50%	49.50%	8.00%		86%	6.4
sunflower oil		31.50%	59.50%	na		91%	11.4
white lupin oil	na	54%	18.70%	8.60%		81%	7.7
bleu lupin oil	na	33.90%	40.30%	5.60%		80%	4.9
andean lupin oil	13.90%	46.40%	33.10%	2.50%		96%	6.0

LIBBIO proteins

- Andean lupin has most of the relevant amino acids for healthy products
- Drinks: milk, smoothies
- Yoghurts
- Ice cream



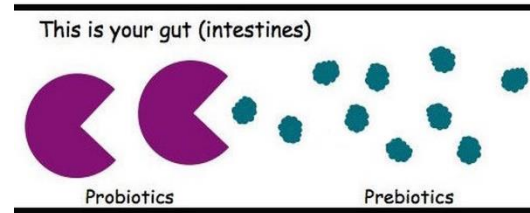
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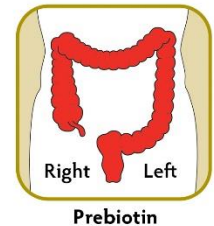
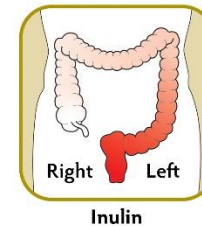
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LIBBIO prebiotics

- Andean lupin has no starch as carbohydrates
- Andean lupin has oligosaccharides as carbohydrates
- Stachyose and raffinose
- Andean lupin has low glycemic index
The glycemic index or glycaemic index (GI) is a number associated with a particular type of food that indicates the food's effect on a person's blood glucose



THE COLON Where do the prebiotics act?



Prototypes made of bleu lupin by C&B



Amino acid composition

Andean lupin has an amino acid profile which is comparable with soy bean



amino acids		L.albus	L.angustifolius	L.mutabilis	G.max
g/100 g protein		white lupin	bleu lupin	andean lupin	soy bean
alanine	ala	na	na	3.3	5.2
arginine	arg	12.4	12.0	10.2	8.6
asparagine	asn				
aspartic acid	asp	na	na	9.6	14.0
cysteine	cys	1.5	1.6	1.6	1.8
glutamine	gln	na	na		
glutamic acid	glu	na	na	24.3	21.6
glycine	gly	na	na	3.8	5.2
histidine	his	2.0	2.6	3.5	3.0
isoleucine	ile	4.1	4.0	4.2	5.4
leucine	leu	6.8	6.9	7.0	9.1
lysine	lys	4.5	4.6	5.8	7.4
methionine	met	0.7	0.7	0.8	1.5
methionine+cysteine		2.2	2.3	2.4	
phenylalanine	phe	3.4	3.7	3.5	5.8
proline	pro	na	na	3.8	6.5
serine	ser	na	na	4.9	6.5
threonine	thr	3.4	3.4	3.5	4.8
tryptophan	trp	0.9	0.9	0.8	1.6
tyrosine	tyr	4.8	3.4	4.0	4.2
valine	val	3.8	3.7	3.9	5.6

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Andean lupin for pig feed

Andean lupin has an amino acid profile which is comparable with soy bean

Recipe for pig starter feed without soy bean		
Ingrediënt		%
Gerst	rye	27.2
Tarwe	wheat	28.0
Maïs	corn	4.8
Tarwegries 2	wheat	1.3
Profit P1	Profit P1	5.3
Lupinen	Bleu lupin	10.9
Raapschroot	rapeseed meal	9.9
Zonnepitschroot 28 P	sunflower meal	7.4
Palmolie	palm oil	0.5
Melasse riet	melasse	1
Overig	rest	3.7
nutrienten		
ruw eiwit	total protein	167.8
ruw vet	total fat	33.2
ruwe celstof	fibre	72
EW*100		108
iv Lysine		9.07
FK		143.9

amino acids	L.mutabilis	G.max
	andean lupin	soy bean
g/100 g protein		
alanine	3.3	5.2
arginine	10.2	8.6
asparagine		
aspartic acid	9.6	14.0
cysteine	1.6	1.8
glutamine		
glutamic acid	24.3	21.6
glycine	3.8	5.2
histidine	3.5	3.0
isoleucine	4.2	5.4
leucine	7.0	9.1
lysine	5.8	7.4
methionine	0.8	1.5
methionine+cysteine	2.4	
phenylalanine	3.5	5.8
proline	3.8	6.5
serine	4.9	6.5
threonine	3.5	4.8
tryptophan	0.8	1.6
tyrosine	4.0	4.2
valine	3.9	5.6

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LIBBIO

- Pre-industrial processing is developed and optimized for the lupin. New product development will create new opportunities. Techno-economical evaluation of the supply chain will assess agricultural viability, sustainability and effect on farm and biorefinery income.



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