

innovations

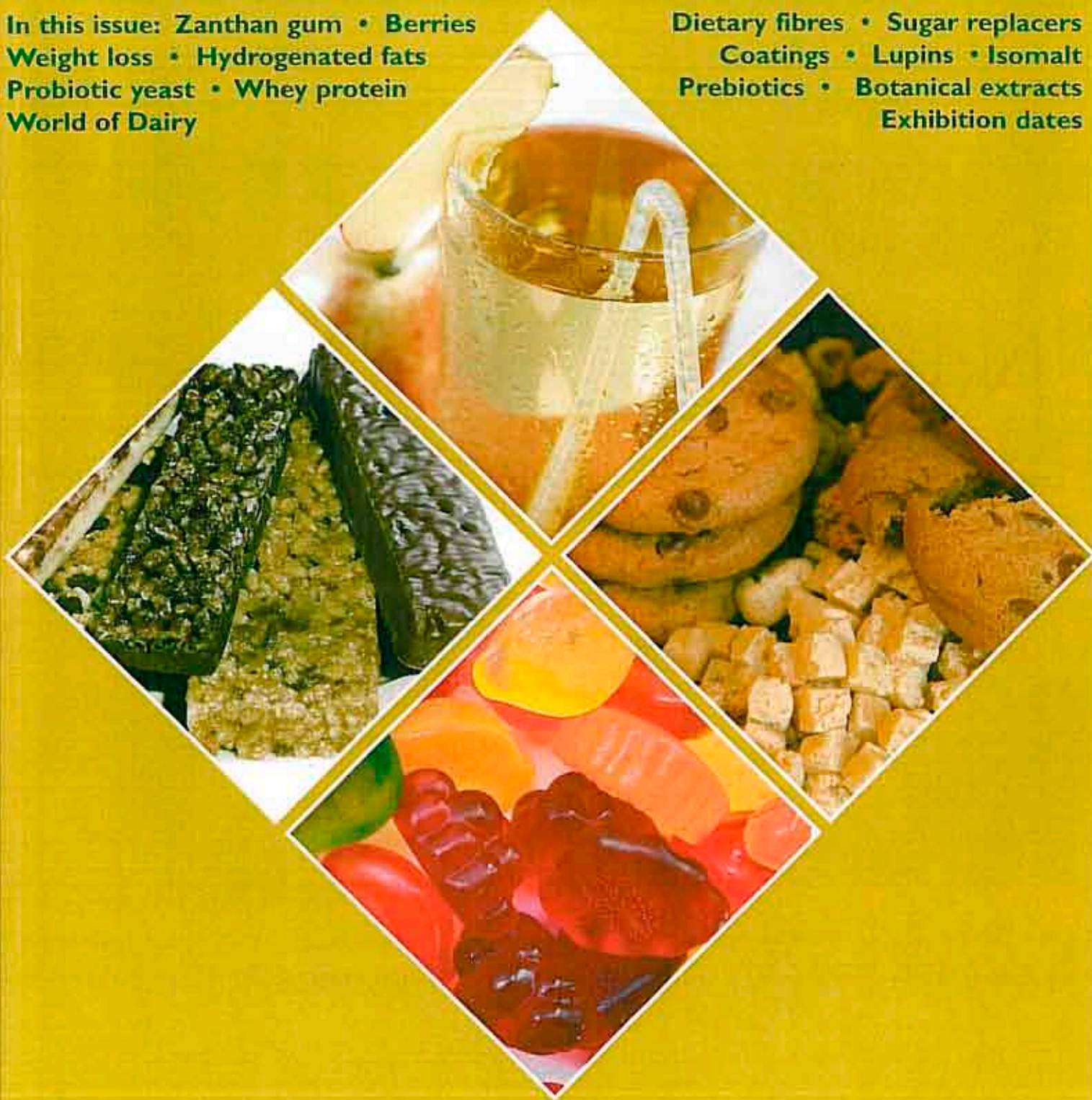
IN FOOD TECHNOLOGY

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In this issue: Zanthan gum • Berries
Weight loss • Hydrogenated fats
Probiotic yeast • Whey protein
World of Dairy

Dietary fibres • Sugar replacers
Coatings • Lupins • Isomalt
Prebiotics • Botanical extracts
Exhibition dates



www.innovfoodtech.com

Protein Concentrate PROTILUP 160

> Protein: 60% on DM

Richness in Arginine and in Glutamic Acid: 11 and 22% of the proteins
- Amino acid score of the proteins: 75 (AFSSA 2007 profile)
- Amino acids profile complementary to the cereals profile (significant amount of Lysine). Limiting amino acids: Methionine + Cysteine

> Fat: 15% on DM

Excellent quality of the fatty acid profile: low content of Saturated Fatty Acids (14%), high content of Mono and Poly-Unsaturated Fatty Acids (86%):
- 67,3% of Mono-Unsaturated Fatty Acids: Oleic Acid
- 18,7% of Poly-Unsaturated Fatty Acids
- Omega 6: 65%
- Omega 3: 35% = 0,7g/100g of flour
- Ratio Omega 6 / Omega 3: highly satisfying (= 2)

Fibre concentrate FIBRILUP 155

> Fibre: 58% on DM

- 98% of insoluble fibres: Hemicellulose, Cellulose
- Decrease in the calorie intake of the finished goods
- Increase in the fibre intake of the population

> Protein: 29% on DM

- Richness in Arginine and in Glutamic Acid: 9 and 15% of the proteins
- Amino acid score of the proteins: 98 (AFSSA 2007 profile)
- Amino acids profile complementary to the cereals profile (significant amount of Lysine). Limiting amino acids: Methionine + Cysteine

> Fat: 9% on DM

Excellent quality of the fatty acid profile: low content of Saturated Fatty Acids (14%), high content of Mono and Poly-Unsaturated Fatty Acids (86%):
- 67,3% of Mono-Unsaturated Fatty Acids: Oleic Acid
- 18,7% of Poly-Unsaturated Fatty Acids
- Omega 6: 65%
- Omega 3: 35% = 0,6g/100g of flour
- Ratio Omega 6 / Omega 3: highly satisfying (= 2)

NB: indicative data

APPLICATIONS:

- Enrichment with fibre, protein (dietary products: high proteinic, low-carb etc...)
- High nutritional density goods (fibre, protein, Omega 3, vitamins & minerals...)
- Foods for specific populations: gluten-free, lactose free
- Products with a controlled Glycemic Index (good result *in vitro* for biscuits)
- Food complements

Claudie AUGEREAU, Sales Manager • LUPINGREDIENTS
www.lupin.fr • www.lupingredients.com • www.terrena.fr

New study confirms that Carnipure™ supplementation can help during ageing in multiple ways

Research from the University of Dijon, France, adds new evidence that supplementation with Carnipure™ could play a role in supporting healthy aging. A new study released in the October 2008 issue of the Journal of Gerontology demonstrates that supplementation with Carnipure™ can restore age-decreased L-Carnitine levels in the muscle cells of old rats, restore muscle oxidative capacity and further induce positive changes in body composition. The study found that without any change in food intake, the old animals showed a decrease in abdominal fat mass and an increase in muscle capabilities.

In elderly people both dietary intake of L-Carnitine and the nutrients required for the body to naturally make L-Carnitine are frequently reduced, leading to reduced L-Carnitine levels in various body compartments. This may result in a reduction in energy metabolism. Skeletal muscles constitute the main reservoir of L-Carnitine in the body since they have high energy needs, and L-Carnitine plays an important role in energy generation. Muscle mass and muscle strength tend to decrease with age, which can lead to a reduction in physical ability and may cause adverse metabolic effects. The new study found a statistically significant difference of 34% in muscle L-Carnitine content between young and old rats. This can be restored in the old animals with Carnipure™ supplementation. Although more research is needed, these findings, combined with additional animal and human research, suggest a potential role for L-Carnitine supplementation in supporting healthy aging.

Generally the capacity for energy generation from fatty acids as measured via β -oxidation rates

is reduced in the elderly. Supplementation with Carnipure™ was found to increase the β -oxidation rate and thus muscle oxidative capacity in old rats by 55%. Also in healthy adults, Carnipure™ supplementation has been shown to stimulate *in vivo* long chain fatty acid metabolism.

Body weight in old rats normally increases over time, which was also true for the old rat control group without Carnipure™ supplementation. In old rats, Carnipure™ supplementation seemed to limit body weight increase by limiting fat gain and possibly by increasing fatty acid oxidation. At the same time the data clearly showed that food intake is not modified by Carnipure™ supplementation. These findings support another human trial: one month's treatment with L-Carnitine in subjects aged from 70 to 92 was found to be associated with a significant increase in total muscle mass, compared with placebo. The total fat mass was reduced at the same time.

"With the world's elderly population predicted to nearly triple by 2050, it is not surprising that the market for anti-aging foods and supplements will see increased levels of activity and opportunity for manufacturers. Carnipure™ may help support functions that seniors need to stay fit and healthy in both mind and body", says Professor Jean Demarquoy, leading researcher of this study.

Lonza is the only manufacturer of the Carnipure™ brand of L-Carnitine products including Carnipure™ tartrate (U.S. Patent 5073376, Japan Patent JP 2546068 and other international patents). Carnipure™ tartrate consists of 68% pure L-Carnitine and 32% L-tartaric acid and is self affirmed as GRAS

(Generally Recognized as Safe). Carnipure™ products are crystalline, white, water-soluble and heat stable which makes them ideal for use in various food and drink applications. In addition, Carnipure™ tartrate is non-hygroscopic, odorless, has a pleasant citrus taste and excellent flow-ability. Carnipure™ products are kosher certified. www.carnipure.com

D.D. Williamson hires He Jian, Ph.D. in science and innovation

D.D. Williamson announces the addition of He Jian, Ph.D. to its Science and Innovation team at the Support Center in Louisville after he completed a summer internship in its applications laboratory.



Dr. He recently received his Ph.D. degree in Food Science & Technology from Ohio State University, where he studied anthocyanin properties. He moved to the United States in 2002 from his hometown of Huainan, China in the Anhui province. The new food science position was created to add strength to Science and Innovation efforts and manage increased demand from customers for application projects.

"Dr. He's knowledge and ability adds a synergistic element to our existing expertise, said Margaret Lawson, Vice President, Science and Innovation. "He brings a fresh approach to the scientific understanding of the complexity of natural coloring sources," added Lawson. www.ddwilliamson.com

Using lupin based ingredients for naturality and clean labelling

From the plant's selection to the ingredient, the 1st co-operative French group TERRENA owns a whole lupins network.

The lupin ingredients are produced and sold by LUP'INGREDIENTS.

Although still a niche market in the world of vegetable proteins, lupin-based ingredients have been consumed widely for twenty years in everyday foods: historically in bakery, pastry and biscuits products and now increasingly in health foods and gluten free products.

The LUP'INGREDIENTS range offers natural ingredients from sweet white lupins seeds (*Lupinus albus*): flours and grits (40 to 45% protein), protein concentrate (60%), fibres (bran and concentrate).

A new product is about to be launched for springtime.

The company

Sweet white lupins growing and processing: the Lup'Ingredients expertise

As opposed to other European lupin ingredients manufacturers, the French co-operative TERRENA (1st co-operative group in France - 3 billion turnover), is producing and processing white lupins (*Lupinus albus*).

TERRENA performs:

- the selection of tomorrow's lupins varieties
- the seeds sales to TERRENA's farmers
- the contractual farming of the selected varieties
- the selection and storage of the harvested lupins seeds
- the seeds processing into food ingredients under the brand LUP'INGREDIENTS

LUP'INGREDIENTS is strongly invested in secure sourcing, traceability and quality of products.

In times where remaining competitive despite expensive raw materials, quality is definitely the best option for sustainability (no loss of image, management of the sanitary risks).

Lupin history

Over 4000 years old (lupin seeds were found in Egyptian pyramids; the Mayan Civilization also ate lupins), the seeds have traditionally been used in the human diet for their high protein content.

- Nowadays five species are grown as crops:
- the white lupin (*Lupinus albus*), the most common in France and Chile,
 - the blue lupin (*Lupinus angustifolius* or narrow-leaf), widely grown in Australia
 - the yellow lupin (*Lupinus luteus*), grown in Central Europe
 - the variable lupin (*Lupinus mutabilis*), grown in South America
 - the garden lupin (*Lupinus polyphyllus*), not

to be eaten!

Only white, blue and yellow lupins are used as ingredients in human foods (absence of bitterness thanks to their low content in alkaloids).

White lupins offer a high quality vegetable protein: amino acid profile complementary to cereals, emulsifying capacity, excellent nutritional profile (high protein content, fibre, antioxidants, vitamins and minerals).

The products

Lupin based ingredients: vegetable protein for healthy foods

Lupin ingredients are characterized by both functional properties and nutritional benefits.

A wide variety of ingredients made from lupin seeds (*Lupinus albus*, *luteus*, *angustifolius*, or *mutabilis*) are used by food manufacturers: lupin flours (wholegrain, de-hulled, toasted, non-toasted, enzymatic, fortified with lecithin, cysteine, ...), grits, flakes, meal, bran, protein concentrates and isolates, bran and fibre concentrate.

Most of the LUP'INGREDIENTS are kosher and an organic flour is also available.

There is no GM lupin in Europe (GM lupin farming is not authorized).

Sweet white lupins (*Lupinus albus*) nutritional profile:

The specificity of white lupin is their higher content in protein (about 5 points compared to blue lupin).

In addition to having a high protein content (bio-availability ((1)Mariotti et al., 2002), an amino acid profile complementary to that of cereals, high arginine content, and cholesterol-lowering properties ((2)Sirtori et al., 2003), lupin flour also has a high fibre content, and a favourable fatty acid profile (mainly rich in Omega 3 fatty acids). It also contains large quantities of micro-nutrients, including vitamin E, B-complex vitamins, manganese (many scientists believe manganese to have anti-allergic virtues), magnesium, iron, zinc, and phosphorus.

Consequently, these ingredients are ideal for use in dietetics or nutritionally dense products.

Average Nutritional Value for 100g of Lupin Flour (sweet white):

Protein	43%	Soluble Sugars	10%
Fibre	30%	Vitamin E	3.7 I.U.
Fat	10%	Vitamin B1	0.42mg
- Saturated	14% of lipids	Calcium	180mg
- Monounsaturated	60% of lipids	Phosphorus	500mg
- Polyunsaturated	27% of lipids	Magnesium	150mg
Omega 6	1.4% of lipids	Iron	3.6mg
Omega 3	0.8% of lipids	Zinc	5mg

reduced glycaemic index foods, high-protein products, gluten-free and lactose-free products, etc.

Lupin ingredients have a number of functional benefits.

Emulsifier: Lupin proteins are composed of 85% of globulins, which offer significant emulsifying properties. Because lupins also contain lipo-proteins (amphiphilic molecules and phospholipids, mainly phosphatidylcholin), the emulsifying properties are strengthened.

Possible emulsifiers replacement: for soy lecithin, yolk and E additives. (fatty acids mono and diglycerides ...)

Water retention: With the fibres and soluble proteins action, lupin present a strong water and oil retention capacity.

Natural colouring: Lupins contain carotenoids (lutein), and provide finish products with a nice yellow colour (especially when eggs or fat are substituted).

Taste enhancer: The high proportion of GLUTAMIC ACID (7%) in lupins intensifies several types of taste (butter, salt, nut...).

Organoleptical improvement: texture, colour and taste can be improved, especially in gluten free formulation where the usual ingredients are white and tasteless. Also in speciality breads, pasta, cereals and legumes blends, biscuits, ...

Lupins and the allergy

Lupin is part of the European list of allergens (since the end of 2006), like most of the basic proteins used in the food industry: gluten, milk, eggs, soy, ...

We notice that many European industries are visionary and aware of the interest of using natural products instead of too many additives. They are companies strongly involved in the production of high value foods and their Quality Departments are final consumer minded: foods must be good to eat and good for health.

The food industry must be well prepared to the addition to this list of other raw materials or ingredients in the near future (potentially any protein is allergenic), otherwise the formulation will soon reach an incredible amount of E numbers.

There are very few cases of lupin allergy (a reaction to the product and a declared allergy are different matters), compared to other protein sources.

Yet the number of food products containing lupin in Europe is estimated to be several billion portions per year.

The crucial concern and trend is now to offer good products: naturality and nutrition are the

**LUPIN PROTEIN AMINO ACID PROFILE:
PROTILUP 160 - FARILUP 500 - FIBRILUP 155**

Essential Amino Acids, B Vitamins
Others AA, g/100g Protein

	PROTILUP 160 Protein Concentrate	FARILUP PEPILUP Flours/ Grits	FIBRILUP 155 Fibres enriched Flour
Proteins content, %	60	40	28
Lysine	4,62	4,6	5,04
Threonine	3,82	3,3	3,75
Methionine	0,65	0,7	0,89
Cystine / Cysteine	1,08	1,25	1,36
Met + Cys	1,73	1,95	2,25
Tryptophan	0,56	0,6	0,82
Valine	4,09	3,7	4,07
Isoleucine	4,86	4,1	4,04
Leucine	7,30	7,1	6,71
Phenylalanine	4,19	3,7	3,75
Tyrosine	5,67	4,3	3,79
Phe + Tyr	9,86	8	7,54
Histidine	1,97	2,2	2,43
Arginine	10,55	9,7	8,68
Aspartic acid	9,92	11,2	8,89
Serine	5,25	5,6	4,68
Glutamic acid	22,01	20,6	14,54
Proline	4,39	4,1	3,75
Glycine	4,03	4,3	3,57
Alanine	3,52	3,5	3,25

words.

Lupins and soy :

Lupin and soy are close relatives : they offer same protein content.
Lupin is still a good option to replace soy (for purposes for instance) because they are both edible proteins. But the clever option would be to consider the complementarity of all grains (soy, pea, lupin, ...).
On a nutritional point of view, we should eat vegetable proteins and the choice is wide.
There are differences between soy and lupin: lupins contain twice more fibre and less fat (therefore less energetic).
Lupin, as opposed to soy, does not contain phytoestrogens (to be moderately consumed).
Lupin ingredients provide finished goods with a nice yellow colour and : foods look rich.
In terms of taste, especially when toasted the lupin ingredients have a pleasant nutty taste, less earthy than soy.

But again, it appears very interesting to look at vegetable proteins as the ingredients of the future.
For instance, a drink (or "juice" or "milk") composed of lupin + soy would offer the perfect nutritional profile.

Lupins and animal proteins :

Lupin ingredients are often used to complement or substitute part of the animal proteins (especially dairy or eggs) ; for a cheaper formulation, for allergy purposes or simply for healthier foods.
Vegetable proteins offer attractive functionalities, such as the emulsion capacity. As an example, INNOVATIONS has formulated a 100% vegetable mayonnaise type sauce with PROTILUP 30 (the lupin protein concentrate), with a golden colour and rich taste.
Nutritionally vegetable and animal proteins

are also complementary and must be both consumed for a balanced healthy diet.

**The production
Production : seeds and ingredients.
Agronomic interest :**

Lupins, like all legumes, absorb the nitrogen contained in the air, recycle it in the soil and therefore reduce the need for fertilizers for subsequent crops. It is a hardy and disease resistant plant, and far more tolerant than soya or peas of farming methods which do not use herbicides or fungicides. Of all the sources of protein, it is undoubtedly the crop best suited to Western Europe.

For farmers, the value of lupins is not determined just by the return from the harvested grains; factors such as the disease break for following crops, nitrogen fixation by lupins and the value of stubble and lupin grain for stock feed must be considered, or the profitability of lupins will be underestimated. It is therefore important to look at lupins in rotation with other crops and not in isolation.

Lupin farming is definitely a matter of health and wealth

World and Europe seeds production :
In the recent years, the world production of lupin (for both animal and human consumption) was estimated at 1 million tons, spread over five continents. Australia produced 80%, the 25 European countries produced 15% and the remainder was produced in Latin America, Africa and Russia. Australia produces mainly blue lupins (*L. angustifolius*), Chile and France produce white lupins (*L. albus*).

Production of ingredients for the food industry:
Lupin consumption in Europe is definitely not recent nor insignificant: lupin-based ingredients

have been commonly found in the European diet for 20 years.

10,000 tons of lupin-based ingredients are sold in Europe per year for use in human foods, with a highly concentrated offering (five major producers are identified).

Lupin-based ingredients are used in moderate proportions in foods, with a maximum of 10% and an average of two to three per cent for their functional properties as well as nutritional benefits.

Extruded foods and batter mixes can contain up to 80%.

Lupins in the future

The consumer wants good value food, especially in times of economic downturn: good quality, good taste, good nutritional profile. He may buy less but buy clever. He is an actor for sustainable development.

The demand for vegetable proteins is booming, and the offer is a source of diversity.

Lupin ingredients compile the leading trends: they are vegetable and use a very clean process (only physical).

The trendy application fields for natural lupin ingredients in Europe are definitely in health foods, in specific populations foods (coeliacs, seniors) and cosmetics (conventional and organic).

Projects for expanding the use of lupin in human food are also under way in Australia, especially for healthy diets, and the Asian market, a big consumer of vegetable proteins.

Bibliography : lupin and health benefits.
According to recent scientific articles, lupin ingredients would have beneficial action on :
treatment of hypercholesterolemia (2, 3, 6, 8)
glycaemia, diabetes (1, 7)
faecal microbiota (prebiotic effect) (4, 5)
hypertension (9)
satiety (10)
bowel function (11)

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LUP'INGREDIENTS NUTRITIONAL BENEFITS

Lupin ingredients specificity compared to other vegetable ingredients

FREE from GLUTEN, STARCH and LACTOSE

Lupin Flours & Grits : FARILUP & PEPILUP 1300

> Protein > 40% on DM

- Richness in **Arginine** and in **Glutamic Acid**: 10 and 20% of the proteins
- **Amino acid score** of the proteins: **85** (AFSSA 2007 profile)
- Amino acids profile complementary to the cereals profile (significant amount of **Lysine**). Limiting amino acids: **Methionine + Cysteine**

> Fibre > 30% on DM

- 90% of **insoluble fibres**: Hemicellulose, Cellulose
- Decrease in the **calorie intake** of the finished goods
- Increase in the **fibre intake** by the population

> Fat: 10% on DM

Excellent quality of the **fatty acid profile**: low content of **Saturated Fatty Acids** (14%), high content of **Mono and Poly-Unsaturated Fatty Acids** (86%):

- 67,3% of **Mono-Unsaturated Fatty Acids**: Oleic Acid
- 18,7% of **Poly-Unsaturated Fatty Acids**
 - **Omega**: 65%
 - **Omega 3**: 35% = 0,7g/100g of flour
 - **Ratio Omega 6 / Omega 3**: highly satisfying (= 2)

> Carbohydrates: 10% on DM (Soluble sugars)

Stacchiose (57%), Saccharose (24%), Raffinose (11%), Verbascose (8%)

> Vitamins

Significant amount of **E Vitamin** (gamma-tocopherols) and of **B group vitamins** (B1, B2, B3, B6, B9, B12)

> Minerals

Good content of **Phosphorus, Magnesium, Zinc, Iron, Calcium, Potassium & Manganèse**

Applications

BAKERY PRODUCTS

Finished products : speciality breads, dry bread, rusk, croissants ...

Semi-finished products : mixes and pre-mixes, bread improvers, ...

Colour, visual improvement

Nutritional enrichment (proteins, fibres...)

Yolk and emulsifiers substitution

Taste enhancer

Increase of the hydration while processing

Fermentation improvement

Cracking prevention in dry products

Easy to use

Inventiveness / creativity in formulation

Better dough behaviour in freezing / de-freezing cycles

Gluten free formulation : colour, taste and texture.

PASTRY

Pies, tarts, pizzas, blinis ...

Colour (yellow)

Increase of the hydration while processing

Dough easily workable

Yolk and emulsifiers substitution

Nutritional enrichment (proteins, fibres...)

Fat substitution

Dough retraction decrease

Dough sticking decrease

Longer texture preservation

Better dough behaviour in freezing / de-freezing cycles

BATTER MIX - TEMPURAS

Increase and standardisation of batter viscosity

Pick-up increase while processing

Positive action on substrate adhesion

Appetising colour

Texture improvement

SAUCES

Cold and hot emulsion based sauces ...

Protein binder / Emulsifier

Egg and dairy protein substitution

Texture improvement

Cholesterol free-products formulation

MEAT OR FISH BASE

ELABORATED PRODUCTS

Preparations for nuggets, cordons bleus, delicatessen, sausages, pâtés, ...

Texture improvement of cooked finished products (better firmness / cutting)

Animal protein substitution

Protein binder

Taste enhancer

CEREALS OR VEGETABLE MIXES

Cereals / legumes blends, hot or cold, pre-cooked or not ...

Taste and visual inventiveness

Firm and non sticky texture of PEPILUP (grits) after cooking

Healthy ingredients : vegetable proteins and cereals are complementary, substantial fibre content.

DELICATESSEN

Salads, fresh pasta, soups, ready prepared meals, vegetable pâté, ...

Egg substitution

Imaginative and pleasant visual : yellow pieces

Texture

Healthy ingredients : proteins, fibres, ...

Creative and well-balanced prepared meals formulation

Taste enhancer

AND

Extruded products, ...

PASTRY

Pastry base, pies, yellow pastry / paste, pancakes and waffles, brownies, cakes, crumbles, sponge cakes, ...

Colour, visual improvement

Emulsifier

Yolk and emulsifier substitution

Fat substitution

Taste enhancer

Nutritional enrichment (proteins, fibres...)

Increase of the hydration while processing

Longer texture preservation

Butter, almond or hazelnut powder

substitution

Gluten free formulation: colour, taste and texture

BISCUITS

Biscuits, wafers, speculoos ...

Colour, visual improvement

Yolk and emulsifier substitution

Increase of the hydration while processing

Nutritional enrichment (proteins, fibres...)

Taste enhancer

Gluten free formulation: colour, taste and texture

SWEET BREADS and BUNS

Morning goods, Danish pastry, brioches, croissants ...

Colour and visual improvement.

Yolk and emulsifiers substitution

Fermentation improvement

Longer texture preservation (moistness)

Taste enhancer

Butter substitution

Salt replacement

DRIED FRUITS PREPARATIONS

Fillings, praliné, nut paste, almond paste, almond or hazelnuts based products, ...

Taste enhancer

Emulsifier

Dried fruits powder substitution

Yolk and emulsifier substitution

Texture improvement

Colour and visual improvement

CHOCOLATE PRODUCTS

Chocolate products, spreads, ...

Emulsifier

Taste enhancer

Texture improvement

Hazelnut powder substitution

Animal protein substitution

OTHERS

Cereals for breakfast, ...