Sneak Peek into the ILPS Webinar Series

ILPS
International Lecithin & Phospholipids Society

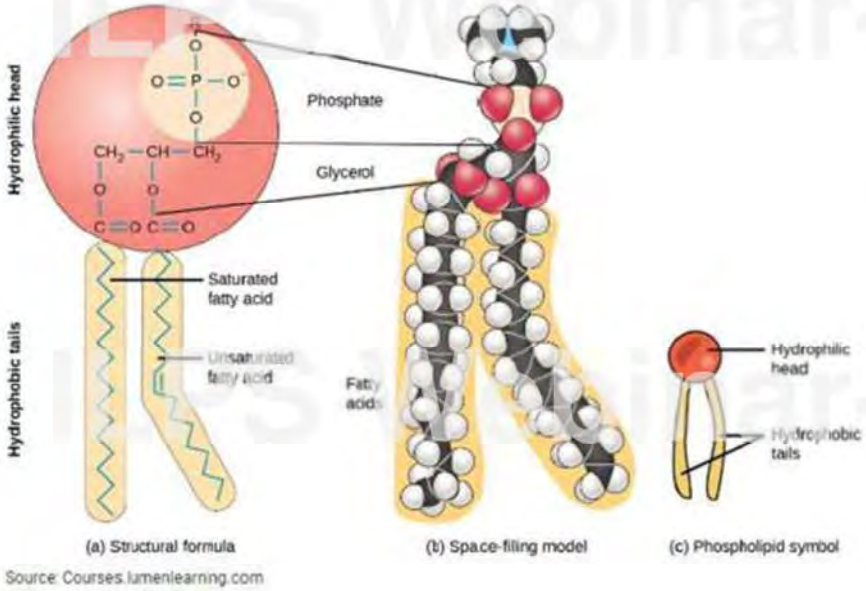
ILPS Webinar: Module 1

History, Origin & Production of Lecithin

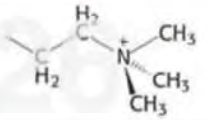
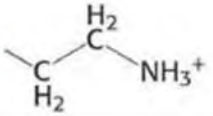
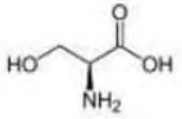
Tuesday, February 19th

Lecithin, A Natural Emulsifier

Lecithin has unique surface-active properties due to the concurrent hydrophilic and lipophilic properties of the phospholipid

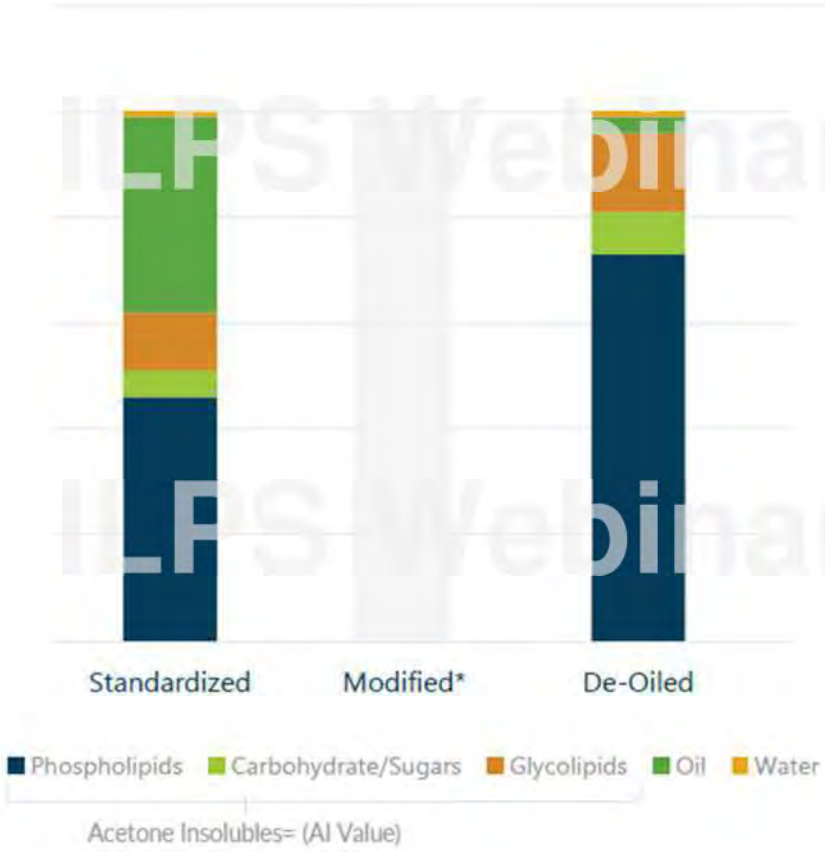


Source: Courses.lumenlearning.com

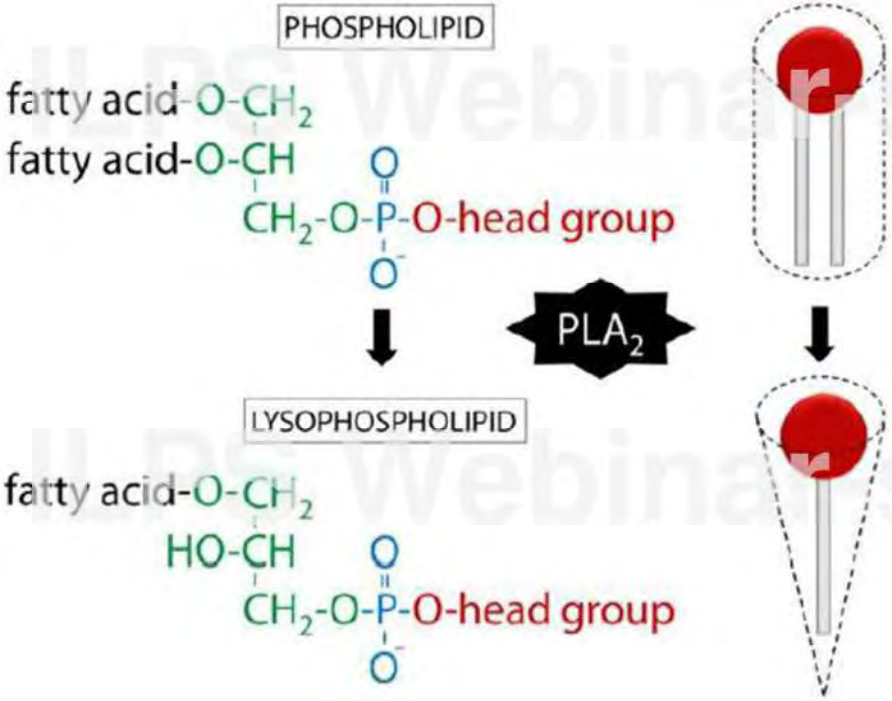
Phospholipid	Functional group
Phosphatidylcholine (PC)	
Phosphatidylinositol (PI)	
Phosphatidylethanolamine (PE)	
Phosphatidic acid (PA)	-H
Phosphatidylserine (PS)	

Lecithin, A Versatile Ingredient

The Impact of Naturals Variations and Modifications



Enzymatically Modified Lecithin



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ILPS Webinar: Module 2

Analysis parameters & Phospholipids

Thursday, February 26th

The analytical composition of Lecithin

A complex mixture of Phospholipids, Triglycerides and Glycolipids

- As outlined in Module 1 of this webinar, most commercial lecithins are co-products of vegetable oil processing, obtained during the crushing and extraction of oilseeds such as soybean, sunflower, and rapeseed (canola).

- The functional properties of lecithin stem primarily from its phospholipid content.
  Phospholipids are essential components of cell membranes, forming the lipid bilayer—a double molecular layer composed mainly of phospholipids.
  For more details on functional properties, chemical modifications, and industrial applications:
  Modules 3 and 4 of this ILPS webinar series.

- Lecithin yields vary depending on the raw material and the efficiency of the crushing process.
  On average, yields are approximately as follows:
  - Soybean: ~0.4 - 0.6%
  - Sunflower: ~0.3 - 0.4%
  - Rapeseed (canola): ~0.2 - 0.3%

Key Considerations & Best Practices for Sampling

A representative sample

- Ensure the sample is representative for the entire batch under analysis.
- Take multiple incremental samples across batch/tank and at different times; pool into one aggregate sample.
- Avoiding discussions with the customer or the laboratory regarding analytical results.

Typical lecithin Certificate of Analysis paramete

Hexane-Insoluble (HI) or Toluene-insoluble (TI) matter [%] **Legal:**
Max 0,3%

The parameter reflects the presence of impurities such as residual fibers, husk particles, filter aids, dust, or equipment-derived (metal) or seal fragments.

US FDA & AOCS (HI%) method
European DGF (TI%) method, ISO 28198 is also widely applied for TI% analysis.

Differences between hexane and toluene are negligible when using the same filter pore size.

HI & TI method describe different filter sizes. TI: G-3; pore size: 16–40 µm; HI: 40-60 µm pore si

MU: HI ±0,14% TI ±0,05%

- Sample not properly dissolved
- Pores clogged in crucible/filter
- Too fast over filter after dissolving, needs to settle first
- Repeated filter usage (& filter cleaning method)
- Possible use of vacuum and filter surface (cm^2)

Typical lecithin Certificate of Analysis paramete

Viscosity **Usually: 5,000 mPa.s – 18,000 mPa.s at 25°C**

Lecithin has a has a thick, syrupy consistency.

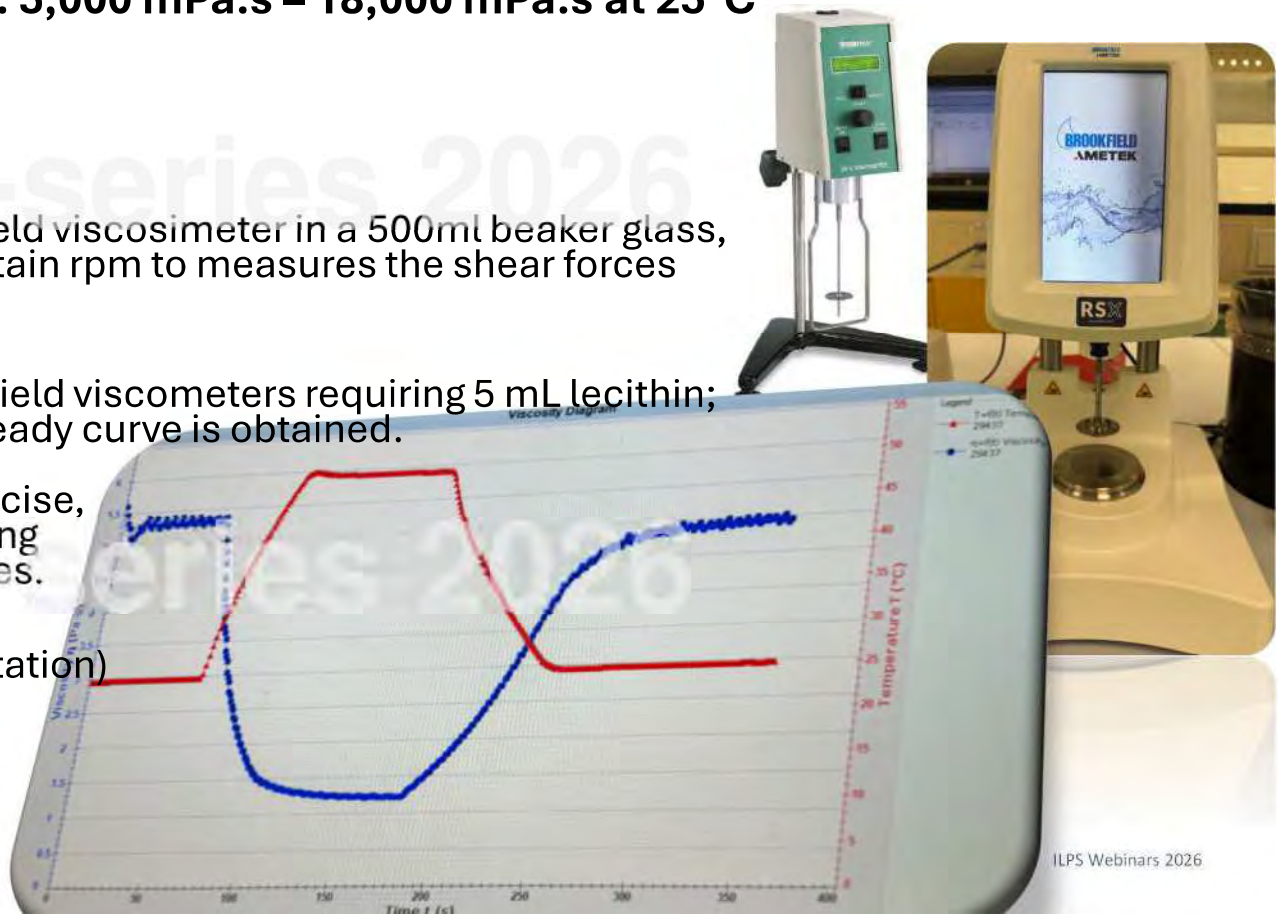
Viscosity is measured at 25°C.
The conventional method is done by a Brookfield viscosimeter in a 500ml beaker glass, placed in a water bath using a spindle at a certain rpm to measures the shear forces (torque).

Advanced laboratories employ modern Brookfield viscometers requiring 5 mL lecithin; Viscosity is automatically measured until a steady curve is obtained.

This method requires less lecithin, is more precise, eliminate pseudo-plastic effects, shear-thinning non-Newton & thrixotophy behaviour influences.

MU: ± 625 mPa.s (using advanced instrumentation)

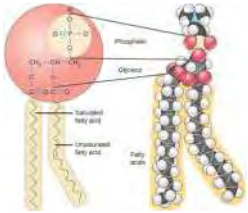
- Homogeneity of the sample
- Temperature during measurement
- Spindel type & position incl. rpm



Lecithin parameters

Phospholipids

Phospholipids

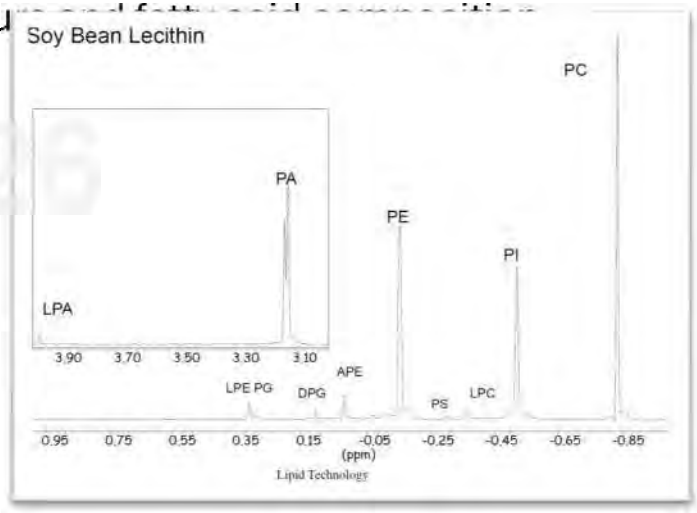


Analysis via HPLC or ^{31}P-NMR Spectroscopy.

HPLC is suitable for standard and simple lecithin, but is inadequate for complex or modified lecithin's. Phospholipids in Lecithins are separated in HPLC, with components eluting at different rates depending on their affinity.

^{31}P-NMR, based on the detection of the phosphorus nuclei present in phospholipid molecules, is a universal, selective, and quantitative analysis, offering additional information on structure and fatty acid composition.

	HPLC Chromography	^{31}P-NMR
Detection	Separation on Phys. –Chem properties + UV/LS/MS	Phosphorus atoms in the molecules, allowing individual phospholipids to be distinguished, including their structure, chirality, and fatty acid composition.
Accuracy	Simple mixtures	Complex/modified lecithin
Quantification	Requires standards	Internal standard (triphenyl phosphate) sufficient
Structural Info	Limited	Full 3D structure & stereochemistry
Applicability	Issues with hydrolysed/ acetylated/animal lecithin. Or modifications required	Universal, all sources/modifications
Sample Damage	Possible	Non-destructive, no contamination
Other		Requires specialized equipment and expertise. Higher resolution sometimes necessitates complex data analysis



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Functionality of lecithin

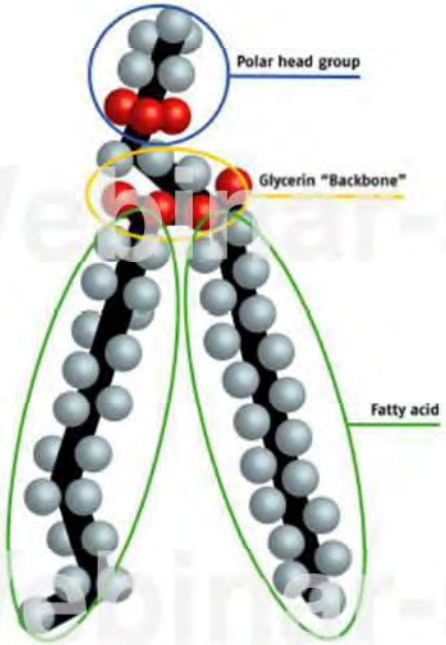
"Techno"-Functional Properties, Structure & Modifications of Lecithin

Bridging Molecular Science and Industrial Application

Malin Pedersen
Waldemar Buxmann

Phospholipid: The main active agent of lecithin. Amphipathic molecule

Molecular Structure & Amphiphilicity



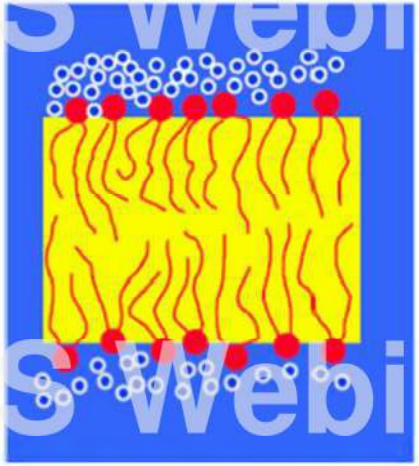
Hydrophilic phosphate head & hydrophobic tails

Amphiphilic character enables interfacial activity

Fatty acid composition determines polarity and melting

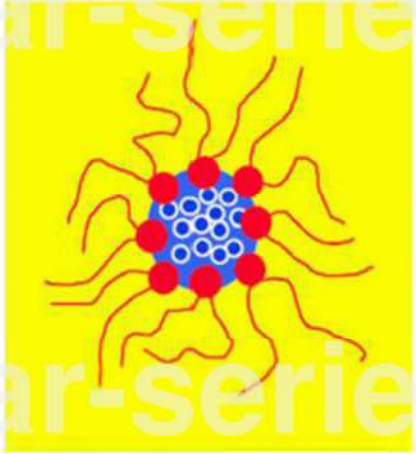
Functionality of lecithin at water/oil phases

Lyso-phospholipids form hexagonal phase to stabilize oil droplet



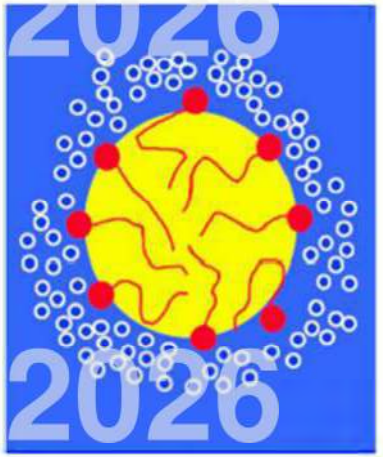
Lamellar phase

PE forms reversed hexagonal phase



Reversed hexagonal phase

PC forms lamellar phase at interface between oil and water

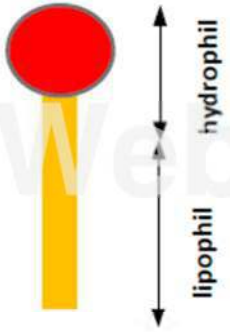


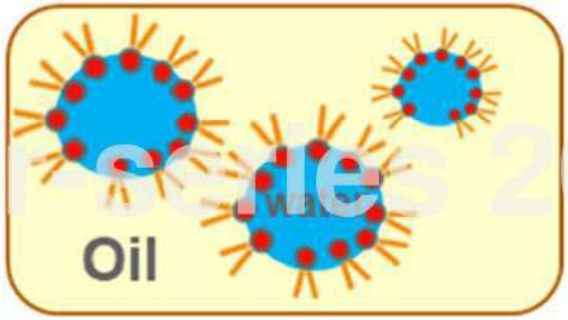
Hexagonal

Source: Nieuwenhuyzen, Szihaj, 1998

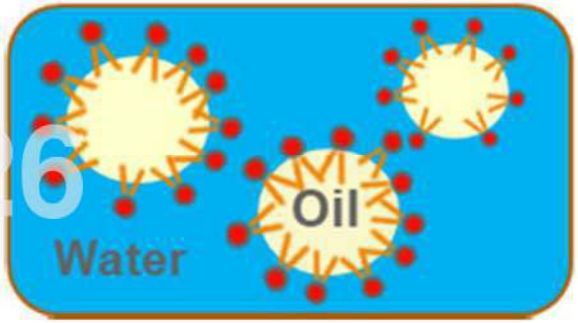
Functionality of lecithin – emulsifying properties

- The amphiphilic structure of lecithin enables it to act as an emulsifier in oil-in-water (o/w) and water-in-oil (w/o) emulsions
- Mechanisms of action:
  - Facilitate the formation of the emulsion during energy input (mixing, homogenisation)
  - The phospholipids with both hydrophilic and lipophilic parts, concentrate at the interface between oil and water
  - Reduce interfacial tension between the two phases
  - Prolong the emulsion stability





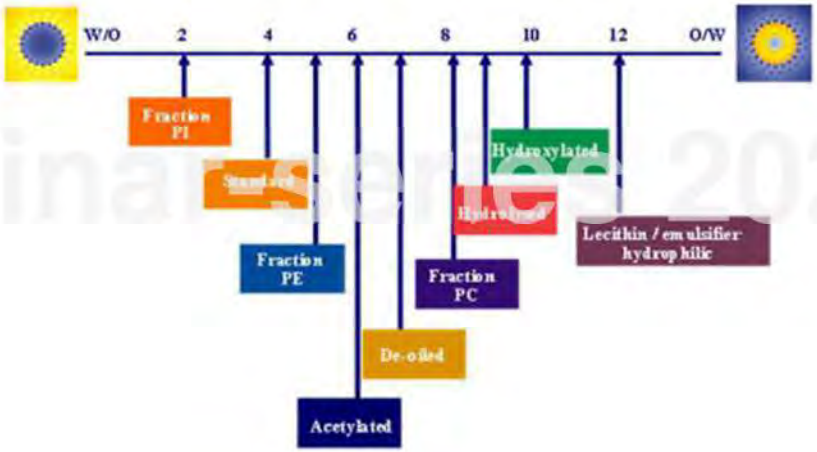
Water in Oil - W/O Emulsion
Example: Margarine



Oil in water - O/W emulsion
Example: Milk

Modifications of lecithin

Physical modifications	Enzymatic modifications	Chemical modifications
• De-oiling • Fractionation	• Enzymatic hydrolyzation • Head group exchange	• Hydroxylation • Acetylation • Hydrogenation



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ILPS Webinar: Module 4

Lecithin Application in Food, Feed, & Nutrition

Thursday, March 12th

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Lecithin is more than an Emulsifier

Emulsification

Keeps oil and water combined.

Instantization

Improves dispersibility of difficult to disperse powders such as cocoa powder, dairy proteins, and hydro colloid. Also acts as an anti-dusting agent for powdered applications.

Release Agent

Prevents sticking at food contact surfaces in applications like pan sprays, cheese slices, and sugar syrup coated snacks and bars.

Mixing and blending

Decreases time and increases efficiency of mixing of unlike ingredients such as sugar and shortening by providing lubricity as well as viscosity reduction at the contact surfaces of the incompatible solids.

Lubricity

Aids in sheeting and extrusion of products such as crackers, potato chips, cereal, and pasta.

Viscosity modification

Reduces viscosity by coating particles to reduce particle–matrix friction such as in chocolates.

Antidusting

Reduces static electricity by wetting dusty particles. They can be used alone or in conjunction with vegetable oils. Oils can be selected for the degree of shelf-life required.

Source: PHOSPHOLIPIDS | Properties and Occurrence by B.F. Szuhaj, in Encyclopedia of Food Sciences and Nutrition (Second Edition), 2003

Lecithin and The world of chocolate: Viscosity & Yield

Importance of Lecithin as Viscosity modifier

Reduces viscosity (improves flow)

Lecithin acts as an emulsifier, reducing friction between solid particles (cocoa, sugar, milk). This allows the chocolate to flow more easily without adding extra cocoa butter.

Optimizes fat usage

By lowering viscosity, lecithin reduces the need for additional cocoa butter, helping control costs while maintaining the desired processing and molding properties.

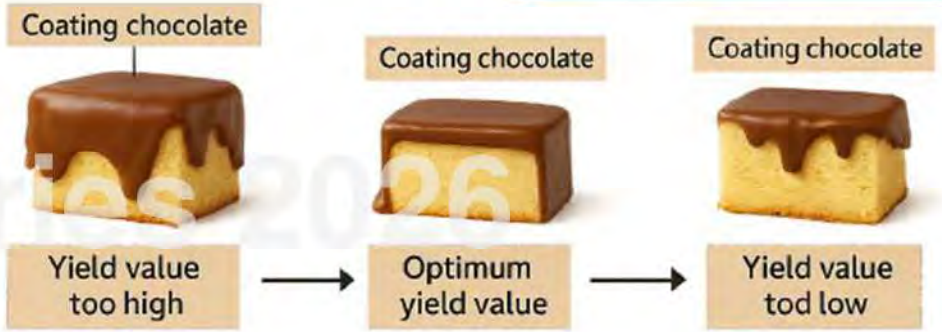
Improves processing and consistency

Proper lecithin levels make chocolate easier to mix, pump, enrobe, and mold, while ensuring a more uniform texture and stable rheological behavior during production.

Influence of the yield value on the coating process

Yield value is the force required to initiate the flow of chocolate

The yield value defines the flowing properties in coating plants thus influe-cokochigquality of choco lates regarding evenness , thickness and completeness.



Lecithin as a Cocoa Butter Substitute

Why Lecithin Can Replace Part of Cocoa Butter

Lecithin significantly reduces chocolate viscosity, allowing the same processing flow with less cocoa butter.Acts on particle–matrix lubrication, reducing yield value and improving coatings and molding behavior.Small additions (0.3–0.5%) can replace 3–5× their weight in cocoa butter depending on the recipe.

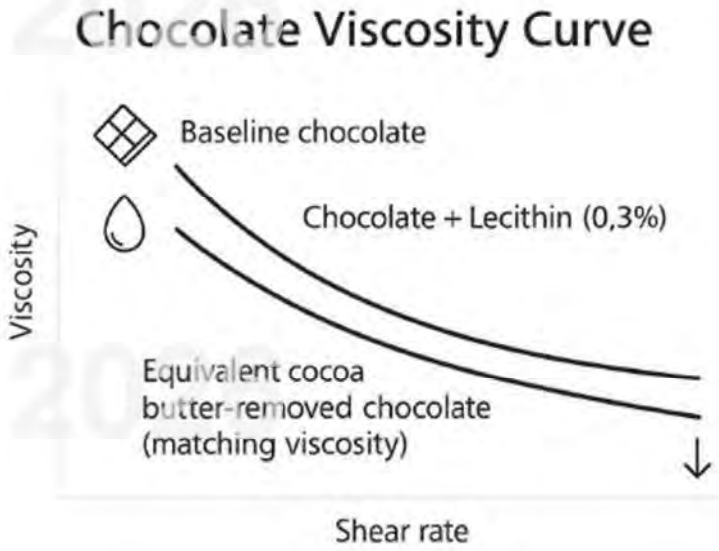
Function and Impact

Function	Impact
Viscosity reduction	Allows cocoa butter reduction without compromising flow
Improved particle wetting	Better dispersion of sugar & cocoa solids → lower fat requirement
Enhanced coating performan-ce	More uniform coverage at lower fat content
Cost efficiency	High impact on fat phase → direct ingredient cost savings

Typical Cocoa Butter Savings:

1 kg of lecithin can replace 3–4 kg of cocoa butter (formulation-dependent).

Even 0.1% dosage adjustments show measurable viscosity improvements.



Piglet Digestive Challenges & Lecithin Nutrition

Piglet's Digestive Tract

- Weaning is the most critical phase in a piglet's life, especially when done early.
- Piglets face stress from separation and dietary changes.
- Transitioning from sow milk to solid feed is difficult due to:
  - Immature gastrointestinal system
  - Low enzyme activity
  - Underdeveloped gut immunity
- This immaturity leads to poor digestion and increased risk of malabsorption and diarrhea.

ILPS Webinar: Module 5

Legal Aspects & GMO

Thursday, March 19th

Some legislation areas to consider regarding lecithin

What is lecithin according to legislation?

- Definition: Lecithins are mixtures or fractions of phosphatides obtained from animal or vegetable foodstuffs.
- Plant and Animal Sources: Soybeans, sunflower, rapeseed, egg yolk, etc.
- Regulatory Framework:
  - EU regulations: Annex II and Annex III to Regulation (EC) No 1333/2008
  - US regulations: GRAS status, FDA regulations
  - International standards: Food Chemicals Codex, FAO/WHO
- Safety and Purity Standards: EU specifications: Mild bleaching with hydrogen peroxide, purity criteria, impurities restrictions and restrictions on heavy metal limits
- FDA regulations: Extracting and bleaching processes
- Purity standards: Loss on drying, toluene-insoluble matter, acid value, peroxide value

- *EU Regulation No 231/2012: laying down **specifications** for food additives listed in Annexes II and III to Regulation (EC) No 1333/2008*
- *US: 21 CFR (namely §184.1400 / §184.1063 / §172.814)*

GMO Introduction

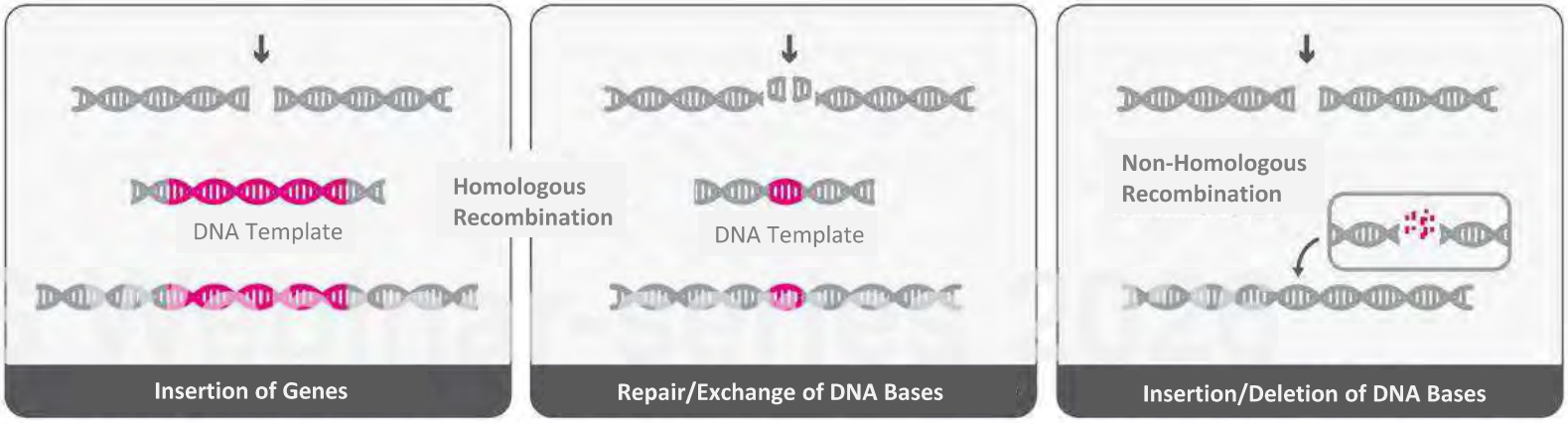
Countries Approving GM Crop Cultivation

- Soybeans
- Maize
- Cotton
- Canola
- Sugar beets
- Alfalfa
- Pineapple
- Safflower
- Petunia
- Creeping bentgrass
- Eucalyptus
- Dry edible beans
- Brown mustard
- Indian mustard
- Banana
- Blue carnations
- Blue petal roses
- Blue chrysanthemum
- Papaya
- Squash
- Potato
- Apples
- Eggplant
- Sugarcane
- Wheat
- Rice
- Cowpea
- Tomato
- Sweet pepper
- Poplar

Source: International Service for the Acquisition of Agri-biotech Applications (ISAAA) Science Speaks: 31.10.2024

New Genomic Techniques

New Genomic Techniques (NGT) aka Precision Breeding



www.transgen.de

GMO	GMO	?
NGT2	**NGT2**	**NGT1**

ILPS Webinar: Module 6

Food Safety & Nutrition

ILPS Webinar-series 2026

Thursday, 26 March 2026
11:00 CET

Agenda

1. Why “Food Safety” is so important?
2. Different key contaminants for lecithins
3. How to mitigate and limit the food safety risks?
4. A bit of nutrition
5. Discussion, Q&A

Little Quiz

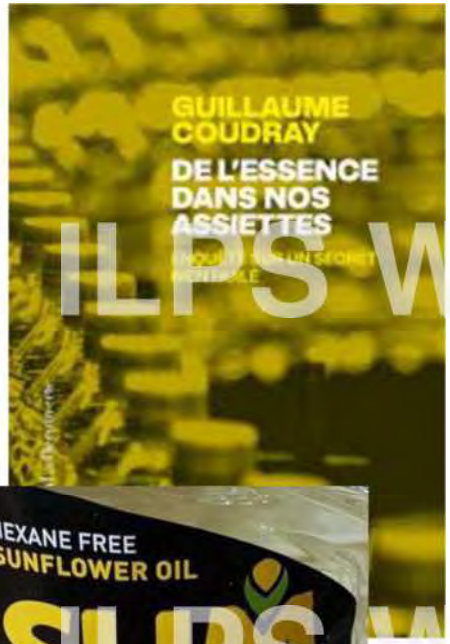
How many chocolate bars can we make with a truck full of lecithin?

25 MT of lecithin

6,250,000 kg of chocolate

78,125,000 chocolate bars!!!

Hexane (2/3)



Hexane war in France

ecoXTRACT

ABOUT US | OUR SOLVENTS | OUR TECHNOLOGY | OUR EXPERTISE | OUR NEWS & EVENTS

Our plant-based solvent range, Ecomeo, is composed of pure 2-methyloxolane (also called 2-methyltetrahydrofuran, 2-MeOx or 2-MeTHF).

L'ensemble des huiles alimentaires testées dans le cadre du rapport de Greenpeace France :

Huiles Isio 4
Lesieur

Résidus allant jusqu'à **0,08 mg/kg** **de *n*-hexane**

Huiles Simply
Carrefour

Résidus allant jusqu'à **0,07 mg/kg** **de *n*-hexane**

Huiles
Cœur de Tournesol
Lesieur

Résultat allant jusqu'à **0,05 mg/kg** **de *n*-hexane**

Huiles Fleur de Colza
Lesieur

Résidus allant jusqu'à **0,05 mg/kg** **de *n*-hexane**

Écologie – Agro-industrie

Un carburant, l'hexane, caché dans nos aliments : « Les produits végétariens sont particulièrement touchés »

De nombreuses huiles alimentaires contiennent un dérivé du pétrole, l'hexane, aux effets néfastes sur la santé. Le journaliste Guillaume Coudray révèle comment la recherche du profit a peu à peu contaminé l'alimentation de toute la planète.

par Sophie Chapelle
19 septembre 2025 à 11h23 · 10 min

Ochratoxin A (1/2)

- Mycotoxins (fungi toxins)
- Non-polar compounds; hence, they are insoluble in water.
- Ochratoxin A (OTA) is the most important ochratoxin in terms of quantity and toxicity
- Bioaccumulates
- Hot, humid climate - Temperature, humidity, soil and storage conditions
- Highest mycotoxin levels:
  - damaged of broken kernels
- OTA tends to accumulate during lecithin processing, as levels in the raw oilseeds are significantly lower than in the final lecithin product.

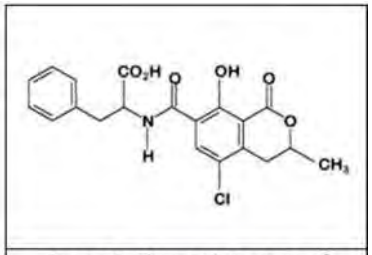


Image 1: *Chemical structure of* Ochratoxin A
Cas: 303-47-9

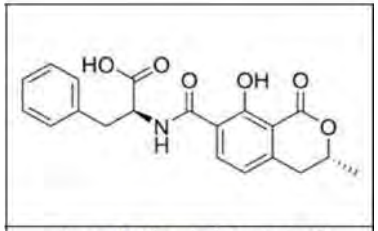


Image 2: *Chemical structure of* Ochratoxin B
Cas: 4825-86-9

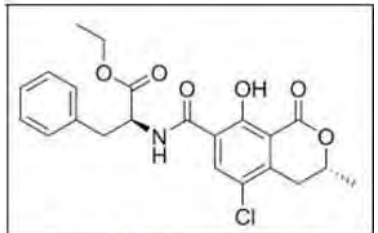


Image 2: *Chemical structure of* Ochratoxin C
Cas: 4865-85-4

Nutritional values of lecithin

	Fluid Lecithin	De-oiled lecithin
Energy	3626 kJ/ 866 kcal	3584 kJ/ 856 kcal
Fat	94 g	92 g
- of which saturated	See table for different origin	See table for different origin
- of which monounsaturated		
- of which polyunsaturated		
Carbohydrate	5g	7g
- of which sugars	2g	3g
Protein	0 g	0 g
Salt	0 g	0 g

Values mentioned above are for nutritional purpose and might differ from the specification or Certificate of Analysis issued per delivered batch.

The energy values are calculated according to Regulation (EC) No 1169/2011: Carbohydrate: x 17 kJ/g (4 kcal/g), Protein: x 17 kJ/g (4 kcal/g) and Fat: x 37 kJ/g (9 kcal/g).

Based on the work of the European Lecithin Manufacturer Association - ELMA