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Inspired Functional Ingredients to Innovate and Differentiate Your Brand

Products by Ecovatec Solutions Inc.



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Egg Yolk Isolate Emulsifier EMULSOVA™



Emulsova™



Phospholipids (PL)

- Emulsova™ contains phospholipids, hydrolyzed egg proteins, triglycerides
- It is patented and an excellent emulsifier – better than egg yolk powder, egg yolk PL-30 powder or paste, and soy lecithin powder.
- Extremely soluble in water, extremely stable, almost colourless, odourless, shelf stable, and available in powder form.
- Emulsova™ quickly incorporates into liquids with very little agitation and stays miscible.
- Does not need to be heated to be incorporated into ingredients.
- Can be used in liposomal technology/microencapsulation

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Micellular Technology

- Emulsova™ is so efficient because it naturally exists in spheres.
- This is because phospholipids are both water loving and fat loving and will form a barrier around water or oil depending on whether the mixture is an oil in water or water in oil emulsion.
- The long fatty acids in the phospholipid make it good at encapsulating large amounts of oil
- Emulsions stabilized by peptides, which surround the phospholipids

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An external laboratory tested the emulsification properties of several emulsifiers.

The results will be discussed in the next slides.

Tested Emulsifiers:

- EcovaPure™ PL-20H (now **Emulsova™**)
- EcovaPure™ PL-20 (discontinued)
- PL30J, PL30C (solvent extracted phospholipid products from other manufacturers)
- Magic Flavors™ Egg Yolk Powder (MFEYP) (enzyme modified egg yolk)
- Soy Lecithin Powder (SLP)

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INTRODUCTION

Phospholipase A2 modified standard egg yolk generates lysophosphatidic acid-rich emulsifier. Lysophosphatidic acid (LPA) of any chain length is pro-inflammatory. We hypothesized that non-enzymatically modified or enzymatically modified lysophosphatidic acid-free egg yolk containing higher ratio of phospholipids to proteins will provide better rheological, physicochemical, and microstructural properties than lysophosphatidic acid-rich emulsifier.

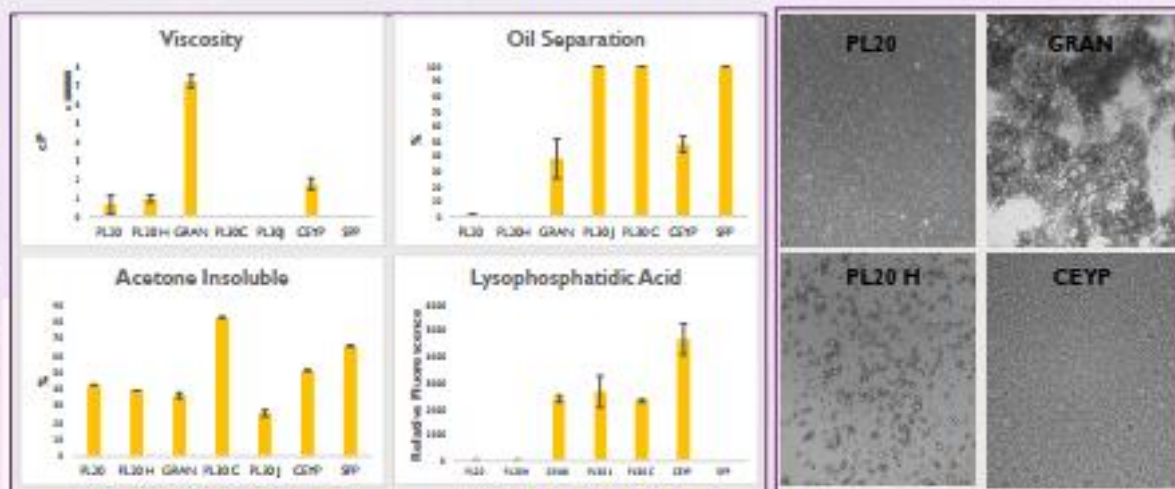
AIM

To evaluate the rheological, physicochemical and microstructural properties of non-enzymatically modified (PL20) or enzymatically-modified (PL20H) lysophosphatidic acid-free egg yolk containing higher ratio of phospholipids to proteins. PL20, PL20H, GRAN (egg yolk granules), PL30J and PL30C (solvent extracted, 30% phospholipid egg yolk products from two different processors), Commercially Available Enzyme Modified egg yolk Powder (CEYP) and Soy Phospholipid Powder (SPP) were compared.

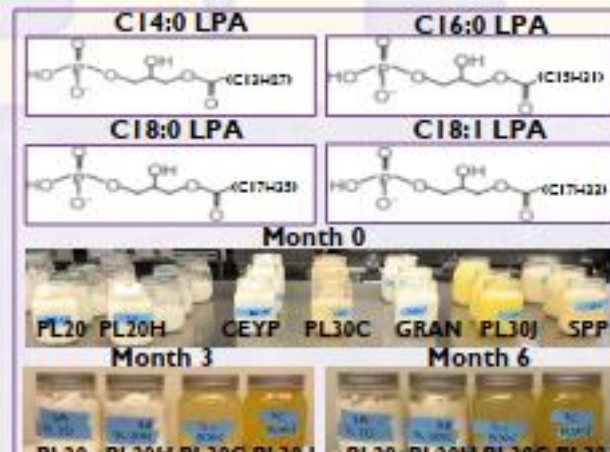
METHODS

Emulsions were prepared with 79.0% vegetable oil, 10.1% water, 7.3% white vinegar, 1.8% emulsifier, and 1.3% salt using a food processor and tested for heat stability using convective and radiation heat transfer. Viscosity, color, acetone insoluble, acid value, peroxide value, LPA, droplet sizes, and stability were analyzed.

RESULTS



Sample	Color				Heat Stability 10 seconds	Peroxide value mEq/kg
	L	a*	b*	Gender Scale		
PL20	9.1 ± 0.01	2.94 ± 0.05	25.2 ± 0.01	4	✓	0.022 ± 0.002
PL20H	9.4 ± 0.01	3.35 ± 0.02	29.5 ± 0.01	4	✓	0.031 ± 0.002
GRAN	75.6 ± 0.03	8.92 ± 0.05	51.5 ± 0.25	12	✓	0.021 ± 0.000
PL30-C	89.6 ± 0.08	4.45 ± 0.02	38.4 ± 0.10	3	X	0.022 ± 0.003
PL30-J	53.5 ± 0.92	19.8 ± 0.08	63.8 ± 0.81	17	X	0.034 ± 0.003
CEYP	90.5 ± 0.05	1.88 ± 0.02	33.7 ± 0.01	4	✓	0.023 ± 0.003
SPP	80.8 ± 0.01	4.00 ± 0.01	33.0 ± 0.05	6	X	0.023 ± 0.004



RESULTS AND CONCLUSION

Viscosity, color, acetone insoluble, acid value, peroxide value, droplet sizes, and stability were analyzed. PL20H and PL20 showed 0% and 1% oil separation, respectively followed by GRAN (39% ± 2) and CEYP (48% ± 5). PL30C, PL30J and SPP showed more than 50% oil separation. PL20H > PL20 > GRAN > CEYP withstood 10 s of microwave heating while PL30J, PL30C and SPP collapsed. GRAN viscosity (722,667 ± 37,717 cP) > CEYP (172,750 ± 31,556 cP) > PL20H (96,683 ± 1,553 cP) > PL20 (68,800 ± 4,752 cP). PL20, PL20H, and CEYP had the lightest color (4 ± 0.0) followed by PL30C (5 ± 0.1), SPP (6 ± 0.0), GRAN (12 ± 0.2) and PL30J (17 ± 0.8). PL30C had the highest percentage of acetone insolubles (82% ± 0.3) followed by SPP (65% ± 0.22), CEYP (50% ± 0.03), PL20 (42% ± 0.30), PL20H (39% ± 0.10), and GRAN (35% ± 1.64) and PL30J (25% ± 1.67). Acid values were < 36 for all samples. Peroxide values showed minimal oxidation in all samples (< 0.1030 mEq/kg). CEYP had the smallest droplet sizes followed by PL20H, PL20, and LPA was not detected in PL20, PL20 H and SPP. GRAN, PL20H had better rheological and physicochemical properties than PL20, GRAN, CEYP, PL30C, PL30J or SPP.

ACKNOWLEDGEMENTS

Ecovatec Solutions for providing PL20 and PL20H samples.

REFERENCES

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Dawson, K., & Fulek, G. (2009). *Lipids*, 136-137.
Duth, C. E., & Granger, W. (1981). *Journal of the Science of Food and Agriculture*, 10(5), 415-424.
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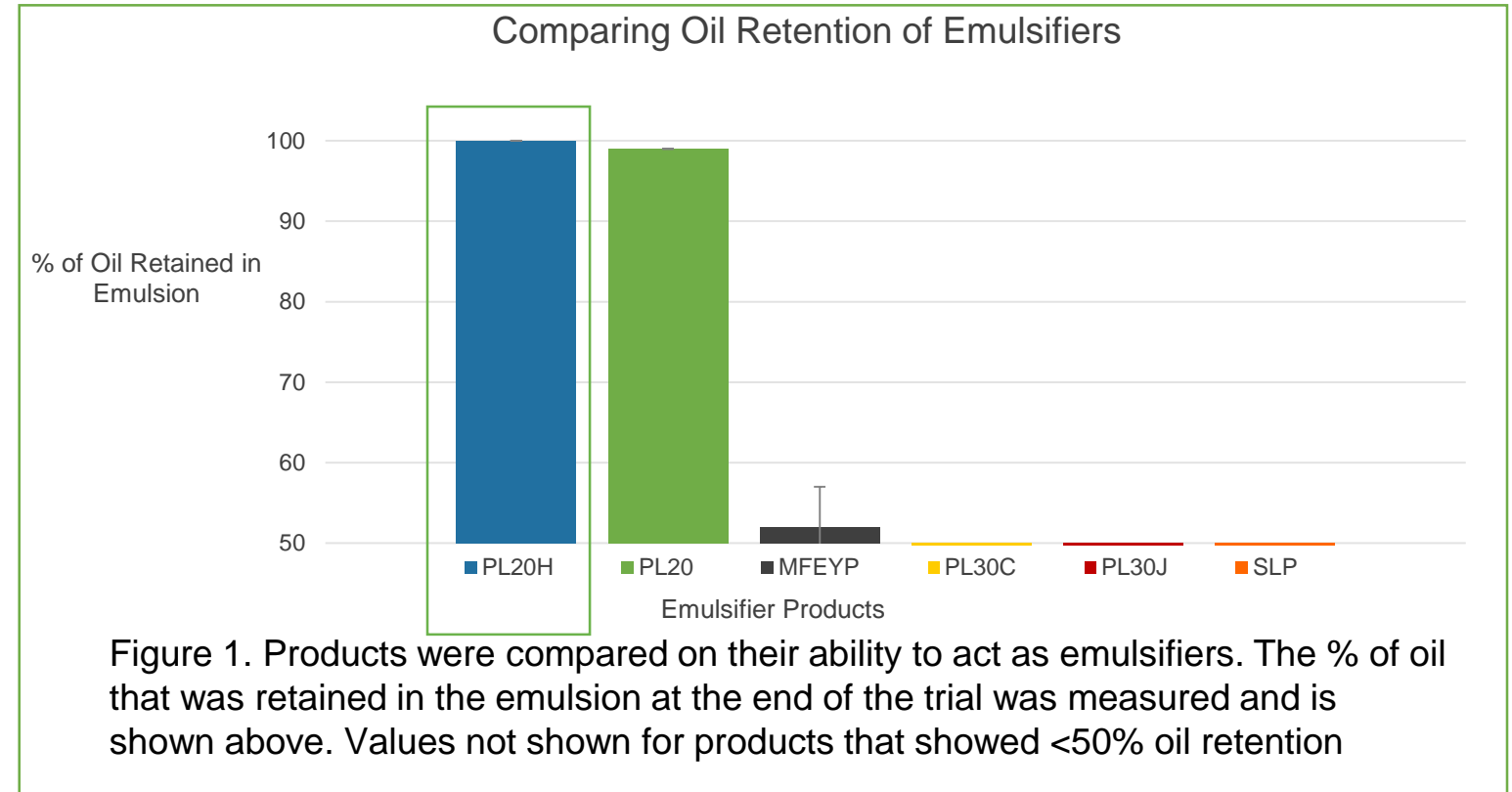
The Ecovatec Advantage:

- Performance
- Value
- Flavor/Quality
- Labelling
- Health

Performance:

Compared to other emulsifiers on the market, Emulsova™ provides an all around **superior performance**.

The improved stability of the emulsion results in less breaking of products with heating or in very high ratio oil and water emulsions leading to a higher quality finished product.

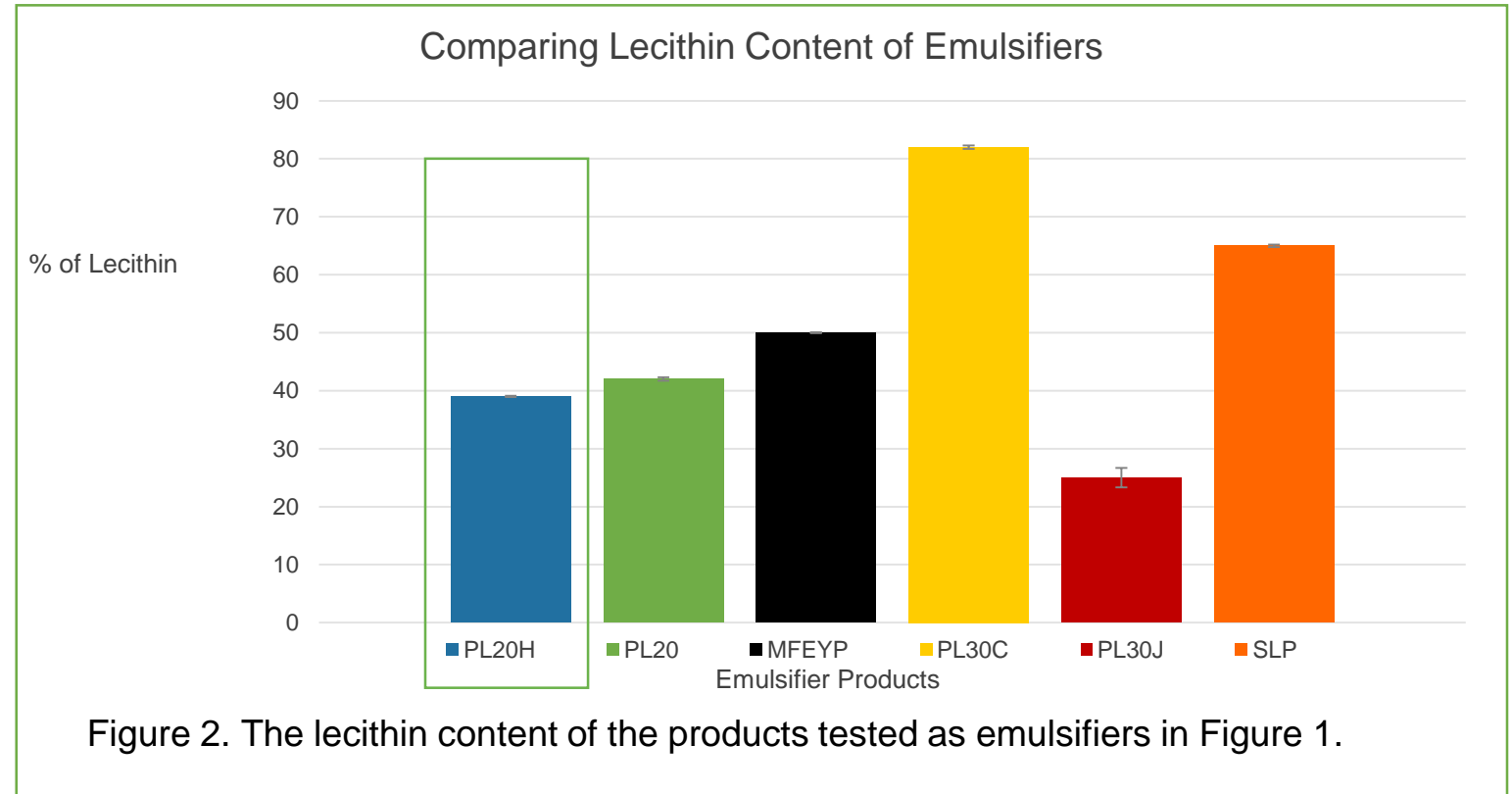


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Value:

Being a high efficiency emulsifier, typically much lower amounts of emulsifier can be used with the same effect as the standard lowest cost emulsifiers. Also, easy storage, handling and measuring means less waste and less time when using this product versus some other commonly used emulsifiers.



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Flavour/Quality:

Compared to many other commercial emulsifiers this product has a very **mild taste** and **light color** so as not to impart any negative attributes to the final product. In addition, the high effectiveness allows for a smaller quantity to be added further reducing any potential negative flavor impact in low flavored products.

Sample	Color				Heat Stability 10 seconds	Peroxide value mEq/kg
	L	a*	b*	Gardner Scale		
PL20	91.1 ± 0.01	2.34 ± 0.05	25.2 ± 0.02	4	✓	.1022 ± 0.002
PL20 H	91.6 ± 0.01	3.33 ± 0.02	29.5 ± 0.05	4	✓	.1021 ± 0.002
GRAN	75.6 ± 0.03	0.92 ± 0.05	51.5 ± 0.25	12	✓	.1021 ± 0.000
PL30-C	89.6 ± 0.00	4.43 ± 0.02	28.4 ± 0.10	5	×	.1022 ± 0.003
PL30-J	53.5 ± 0.92	19.8 ± 0.09	63.8 ± 0.85	17	×	.1024 ± 0.003
CEYP	90.5 ± 0.05	1.88 ± 0.02	23.7 ± 0.02	4	✓	.1023 ± 0.003
SLP	83.8 ± 0.01	4.02 ± 0.01	32.0 ± 0.05	6	×	.1023 ± 0.004

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Labelling:

- Being a natural egg yolk extraction this allows for its use in clean labelling applications.
- Health Canada has approved Emulsova™ as a food ingredient. It can be listed as “egg yolk isolate emulsifier”.
- Depending upon the application, if egg yolk is already incorporated within an existing label then need for substantive changes to the label is unlikely.
- GMO free, unlike the high percentage of soy products.

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Health:

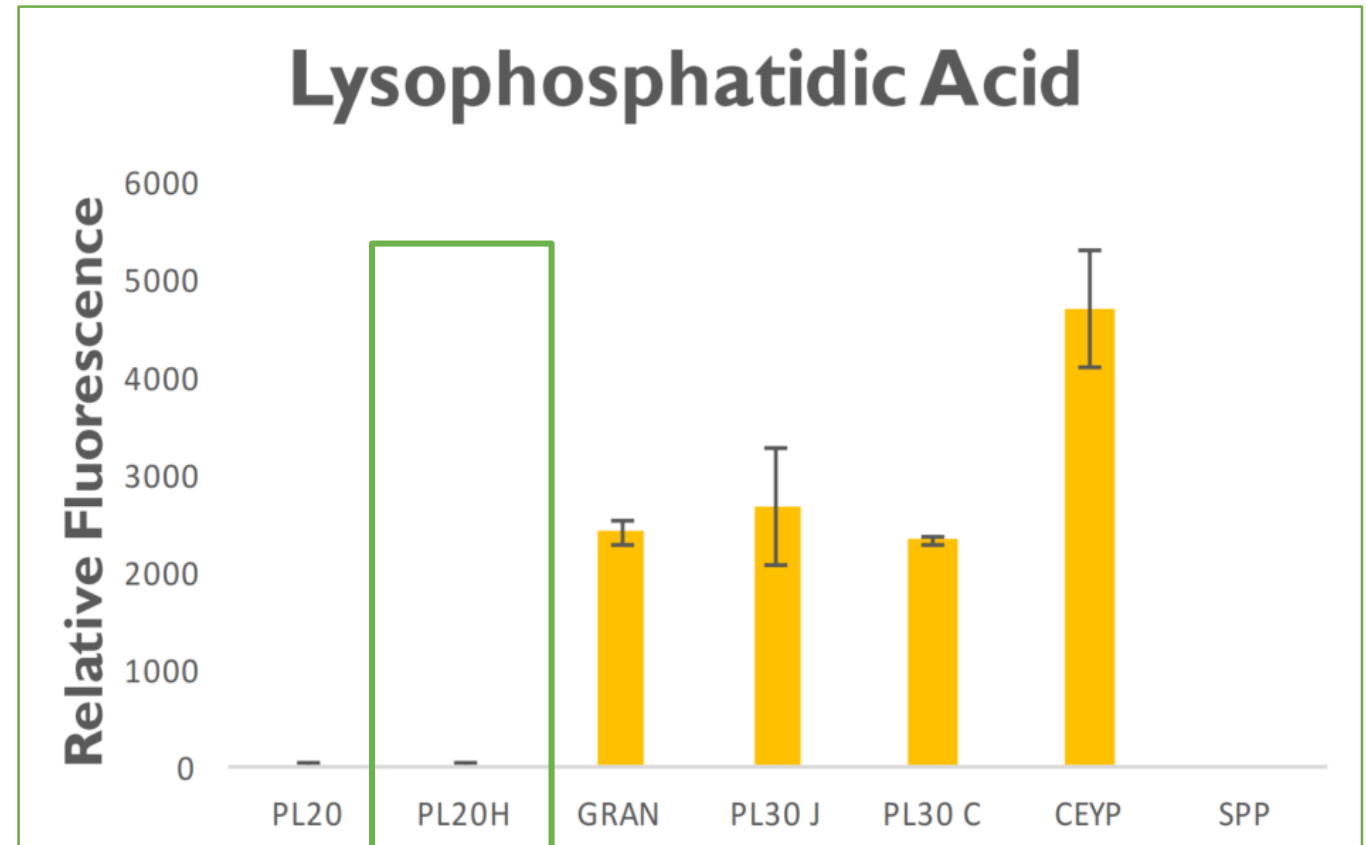
- Emulsova™ is **naturally high** in the phospholipid **phosphatidylcholine** which is recognized as a healthy component of any diet and has various health benefits (see our PL-50 product)
- Our product is **not** modified with phospholipase A, which is used to modify other enzymatically modified egg products. Phospholipase A leaves the finished product with high quantities of lysophosphatidic acid (LPA). LPA is linked to:
 - Inflammation
 - Cancers (such as colorectal cancer)
 - Neurotrauma
 - Atherosclerosis
- **GMO free**, unlike the high percentage of soy products.

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Health:

- No LPA!



Emulsova™ Applications

The Food Development Center (Manitoba, Canada), has tested Emulsova™ in the following applications:

- Ice Cream
- Salad Dressing
- Cakes

Bread and sauce application testing are ongoing by various potential customers.

Emulsova™ Applications



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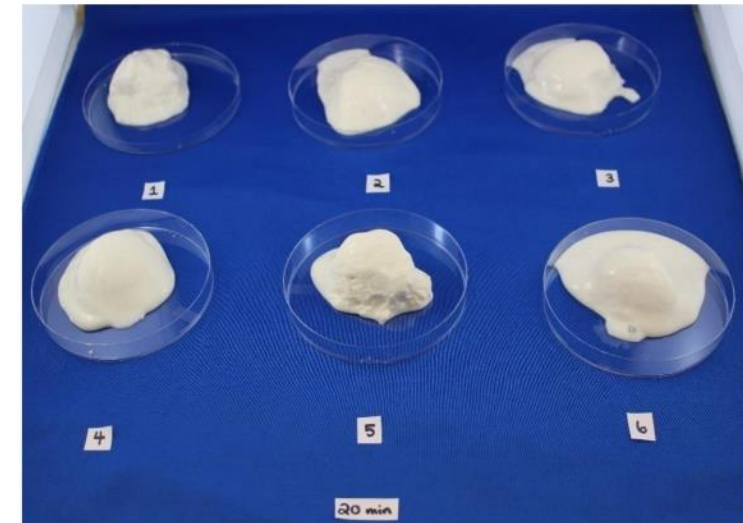
Ice Cream:

Compared to other emulsifiers tested, Emulsova™ had slower melting time and acceptable overrun levels.

The taste was described as “a clean, sweet, vanilla dairy flavour” with a “rich, fully body and creamy consistency”.

The slow melting time was attributed to the peptides creating a network to trap the air and fat. Further experiments could determine if additional stabilizers could be left out of the recipe due to this stabilizing quality of Emulsova™.

ID #	Type	Manufacturer	PL (%)	Usage (%)	Overrun (%)
1	Monoglycerides	Kerry Ingred.		0.25%	83.6
2	Egg yolk powder	Magic Flavours	19	0.40%	78.7
3	Soy lecithin	Druids Grove		0.40%	64.0
4	PL20 egg	Ecovatec	20	0.40%	75.1
5	Emulsova™	Ecovatec	20	0.40%	71.6
6	PL30	China	30	0.40%	62.0



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Cakes:

Compared to other emulsifiers tested, Emulsova™ performed as well as the control cake emulsifiers in all categories:

- Specific gravity
- Volume
- Symmetry
- Sensory quality

The control emulsifiers were:

- Sodium Stearoyl Lactylate (SSL);
- Emulsifier Blend (whey, propylene glycol, mono & di-esters of fat and fatty acids, mono and diglycerides, sodium caseinate, sodium stearyl lactylate, disodium phosphate, ascorbic acid, and citric acid)



Ingredients	%	g
Butter, unsalted, softened	11.31	113.1
Emulsifier	0.28	2.8
Flour, cake & pastry	22.82	228.2
Sugar, white, fine	29.75	297.5
Skim milk powder, instant	2.18	21.8
Baking powder, double acting	0.99	9.9
Salt, table	0.79	7.9
Water, tap, cold	8.93	89.3
Water, tap, room temp	8.93	89.3
Eggs, room temp	13.72	137.2
Vanilla extract, pure	0.30	3.0

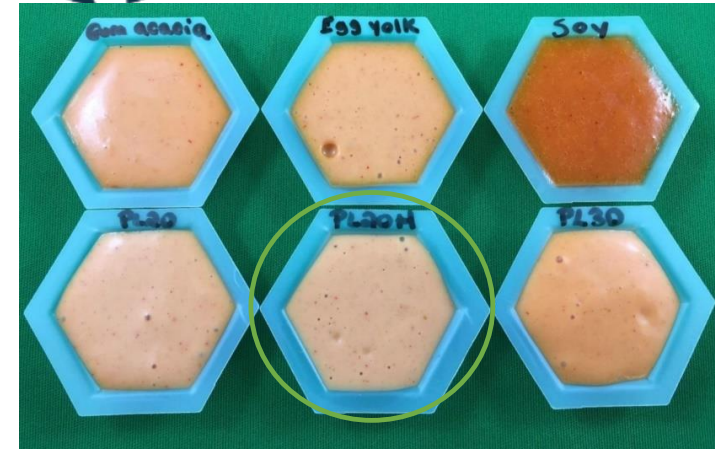
Emulsova™ Applications



Dressings:

Compared to other emulsifiers tested, Emulsova™ performed as well as the control emulsifier, modified gum acacia, in:

- Shelf life (emulsion stability over time)
- Droplet Size
- Sensory Quality (creamy, opaque peach color, moderately bodied, balanced flavor, less vinegar notes, slightly sweeter taste than control)



Ingredients	%	g
Paprika	0.30	1.50
Onion powder	0.20	1.00
Garlic powder	0.20	1.00
Sugar, white, granulated, fine	11.80	59.00
Water, tap	30.80	154.00
Emulsifier	0.25	1.25
Xanthan gum ^a	0.25	1.25
Tomato paste	6.00	30.00
Salt	1.00	5.00
Oil, soybean	39.15	195.75
Vinegar, white, 10%	10.00	50.00

^apre-hydrated Ticaxan Rapid-3 Powder (TIC GUMS)

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Summary:

- Excellent clean-label, non-GMO, food emulsifier approved by Health Canada
- Tested and approved for use in ice cream, cakes, and dressings
- Being investigated for bread and sauces



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