SOON SOON OILMILLS
APPLICATION BULLETIN

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Application of Soon Soon Virgin Camelina Oil In Omega 3 Eggs Production

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Introduction

It is generally accepted that omega-3 polyunsaturated fatty acids (PUFA) provide important health benefits to human such as lowering the risk of heart disease. The three major omega-3 PUFA are α-linolenic acids (18:3 n-3, ALA), eicosapentaenoic acid (20:5 n-3, EPA) and docosahexaenoic acid (22:6 n-3, DHA). National Heart Foundation of Australia has recommended one should consume at least 500mg of DHA + EPA (from marine oil or microalgae) or 2.0g of ALA (vege oils e.g. linseed, camelina) per day, heart disease patients have to double the requirement. Many people could not get enough of omega-3 from daily food intake, unless they are taking omega-3 supplement. The simplest way to increase the omega-3 intake in human is to enrich their food with omega-3. The best choice is to enrich the egg which is the cheapest protein source available.

The common omega 3 sources such as fish oil, extruded flaxseed, canola oil and microalgae are added to the layer feeds to produce enriched omega 3 egg. Flaxseed meal contains high anti-nutritional factors that might affect farm performance and the quality is not stable upon long storage periods as it is easily oxidized. Microalgae and fish oil are expensive; the latter might create fishy taint in the egg, thus it is not suitable to use for omega eggs production. We are introducing Virgin Camelina Oil as a new omega 3 source which is economical to use is omega egg production and most importantly it is a very stable upon long storage period due to its high tocopherols content.

Virgin Camelina oil is produced from the seeds of Camelina Sativa using a special expeller process without the use of hexane and any other chemicals. Camelina oil is Non-GMO and has been used as cooking oil for centuries in Europe. Despite having a high omega 3 fatty acids level of about 33%, it is a stable oil due to its high Vit E and antioxidants levels. Below are the highlights of this Virgin Camelina Oil:

- **About 33% of omega 3** – is a great source of Omega 3 for layers to produce high omega eggs. Can be used to replace fish oil 1 to 1 in feed formulation.
- **Stable oil** - Virgin Camelina oil is very stable under normal storage conditions as it contains high levels of Vit E and other natural antioxidants. Typical value of tocopherol is about 800ppm.
- **High in plant sterols about 3500ppm** - Can reduce the incidence of fatty liver in animals
- **100% safe** - This product is produced without the use of any chemicals.
- **High quality** - this oil has low acidity, low levels of oxidation, is low in moisture, impurities and unsaponifiable matter. It is stable under normal storage conditions.

Table 1: Product Specification

		Virgin
Free Fatty Acid	% max	3.0
Moisture and Impurities	% max	0.5
Iodine Value (Wij's)		135 – 165
Unsaponifiable Matter	% max	2.0

Benefits of using Virgin Camelina Oil in Omega 3 eggs production

- **Economic** – the cheapest omega 3 source
- **Easy handling** – quality is stable under good storage condition (indoor, away from sunlight)
- **Improves animal health** – omega 3 has anti-inflammatory effects and plant sterols can reduce the risk of fatty liver & heart disease
- **Highly digestible** – high in unsaturated fatty acids, highly digestible and high metabolisable energy (ME)
- **Simple application** – has energy level that similar with soybean oil, can use to replace added oil used in the formulation without the needs to reformulate
- **Partial ALA converted to DHA** – about 30% of the total omega 3 deposited in the egg yolk is in the form of DHA

Table 2: Price comparison of different Omega 3 sources

Omega 3 sources	Camelina oil	Extruded flaxseed meal	Fish oil
Total omega 3, %	34.0	~20.5	27.0 – 34.0 (average : 30.5)
Raw material price per kg	RM5.40/kg (USD1.35)	RM5.40/kg (USD1.35)	RM6.80/kg (USD1.70)
Price per kg of omega 3	**RM15.88 (USD3.97)**	**RM26.34 (USD6.59)**	**RM22.30 (USD5.58)**
Tocopherol/ Vitamin E, ppm	800	370	40-70
Plant sterols, ppm	3500	197 – 214	NIL

Remarks: Currency exchange rate at USD1 = RM4.00 on June 2018

How to use Virgin Camelina Oil in omega 3 eggs production?

Information:

- Omega 3 (ALA) in 1g of Virgin Camelina Oil is about 340mg.
- The layers should consume the high omega 3 feeds for at least 10 days to stabilize the omega 3 content in the eggs.
- Average deposition rate of ALA into egg yolk is about 60%.

Guideline for Virgin Camelina Oil usage calculation:

Targeted Omega 3 level = A mg/100g eggs
Virgin Camelina Oil usage in feed formula = [(A/60%) / 340] %
= Y%

Example: Targeting 250mg/100g eggs
Virgin Camelina Oil % in feed = [(250/0.60) / 340] %
= 1.22%

Remarks :

- The above calculation is just an indicative figure for you to start with.
- You are advised to verify the omega 3 content in eggs produced with certified laboratory to confirm it meet your target before market it.

Table 3: Data Compilation from commercial farms

	Layer age	Camelina Oil	Omega 3 in feed	Omega 3 /100g egg	DHA/100g egg	Deposition rate	n6:n3
Unit	**Week**	**%**	**%**	**mg**	**mg**	**%**	**ratio**
Farm 1	**26**	1.50	0.510	334	101	65	5:1
	28	1.20	0.414	281	99	68	6:1
Farm 2	**25**	1.50	0.681	316	101	46	5:1
	28	1.50	0.700	368	128	53	6:1
Farm 3	**73**	1.20	0.458	261	86	57	7:1
	50			296	90	65	7:1
	61	1.20	0.549	252	88	46	7:1
	48			245	83	45	7:1
	42	1.20	0.431	389	137	90	5:1
	42			398	107	92	5:1
Farm 4	**60**	1.20	0.304	275	108	91	6:1
Farm 5	**23**	1.50	0.616	256	111	42	5:1
Farm 6	**28**	1.20	0.407	251	95	62	6:1
Average						**63**	

Summary

1) The used of **1.2% of camelina oil** can produce omega eggs with omega 3 levels at minimum of **250mg Omega 3/100g of eggs.**
2) You can increase the total Omega 3 content in the eggs by increasing the dosage of Camelina oil used in the feed formulation.
   Example by using **1.5% of Camelina oil** can increase the omega 3 in eggs to **>360mg/100g of eggs.**
3) About **1/3** of the total Omega 3 in the eggs is in **DHA (LC-PUFA) form.**
4) Feedback from the layer farm that switched from using extruded flaxseed to Camelina oil in Omega 3 egg production**, had observed a reduction in overall layers mortality by 1%,** thus giving them a better margin by improving farm performance.

Table 4
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Virgin Camelina Oil
Fatty Acids Composition

C16:0	Palmitic acid	%	5.14
C 16:1	Palmitoleic acid	%	0.12
C 18:0	Stearic acid	%	2.42
C 18:1	Oleic acid	%	18.71
C18:2	Linoleic acid	%	18.64
C18:3	Linolenic acid	%	34.08
C20:0	Arachidic acid	%	1.47
C20:1	Paullinic acid	%	12.57
C20:2	Eicosadienoic acid	%	1.66
C22:0	Behenic acid	%	0.30
C22:1	Erucic acid	%	3.51
C22:2	Docosadienoic acid	%	0.11
C24:0	Lignoceric acid	%	0.17
C24:1	Nervonic acid	%	0.83
Total	Omega 3	%	34.08
Total	Omega 6	%	18.64
Total	Omega 9	%	35.62