

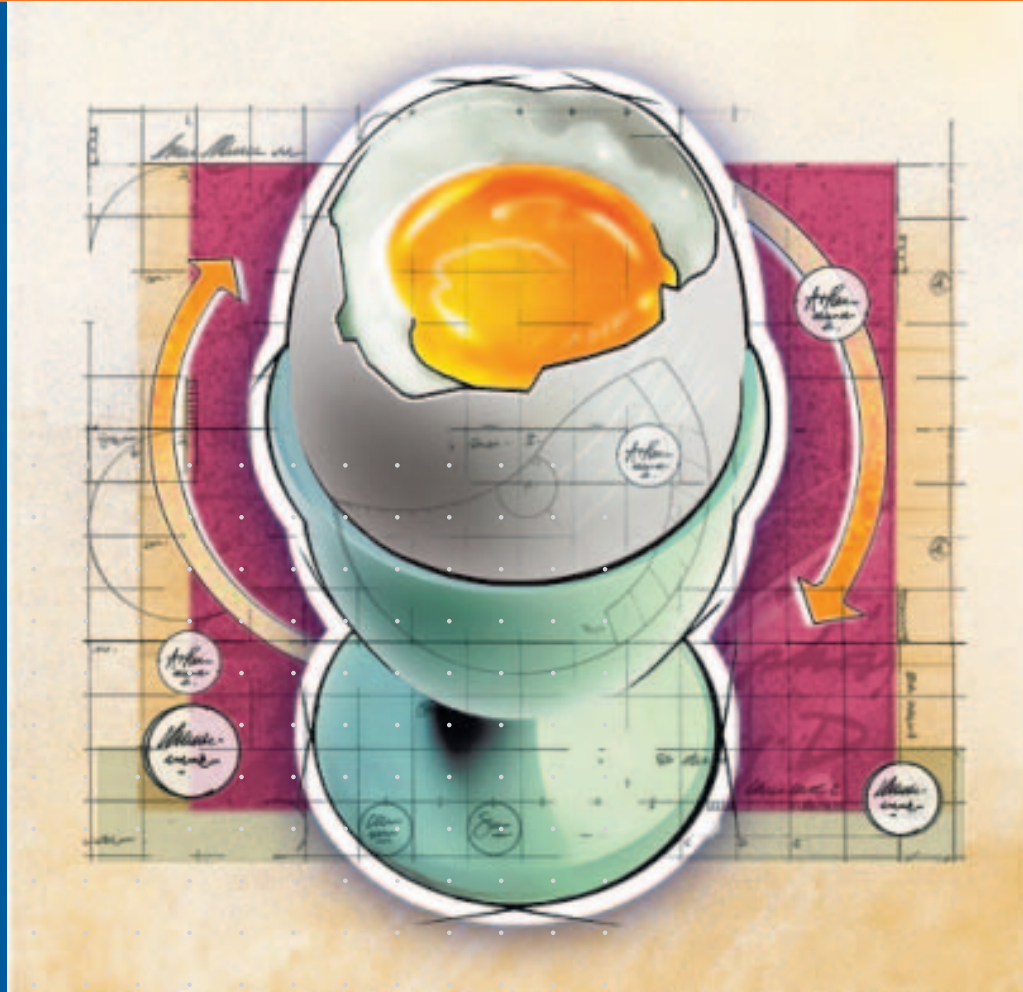
Egg Yolk Pigmentation with

CAROPHYLL® Red 10%

CAROPHYLL® Yellow 10%

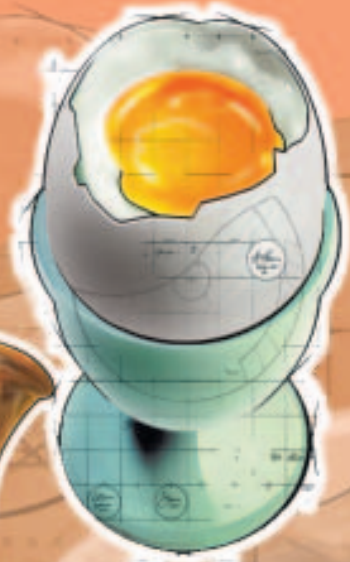
Performance and Quality for your Peace of Mind

a **DSM** Product



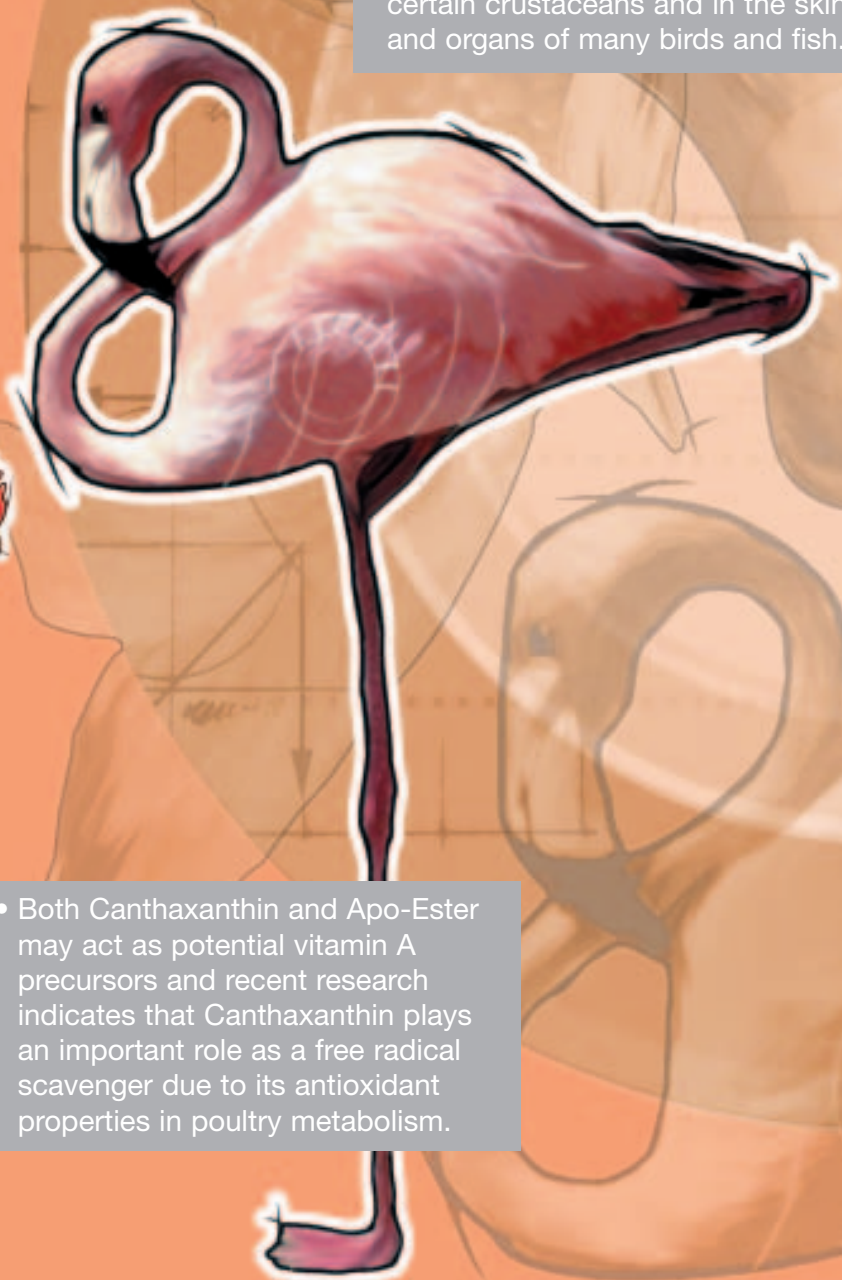
CAROPHYLL® Red 10%

CAROPHYLL® Yellow 10%



• CAROPHYLL® Red 10% contains Canthaxanthin, the red-pigmenting carotenoid found in the chantarella mushroom, in the skin pigment of certain crustaceans and in the skin and organs of many birds and fish.

• CAROPHYLL® Yellow 10% contains Apo-Ester, a yellow carotenoid that occurs in nature as a metabolite of apocarotenal and which has been isolated from many plants including grass, lucerne and green vegetables.



• Both Canthaxanthin and Apo-Ester may act as potential vitamin A precursors and recent research indicates that Canthaxanthin plays an important role as a free radical scavenger due to its antioxidant properties in poultry metabolism.

Challenges

- Carotenoids are very sensitive to air, light and temperature
- Variability of other carotenoid sources
- Stability in premix and feed
- Bioavailability, deposition in the egg yolk
- Egg yolk pigmentation, complex process influenced by many factors such as carotenoid source, nutrition, health, egg handling and storage
- Lower yolk colours than expected
- Yolk colour variability, perceived by consumers as poor egg quality
- Identify and satisfy consumer preferences
- Guarantee Safety and Traceability in the Food Chain

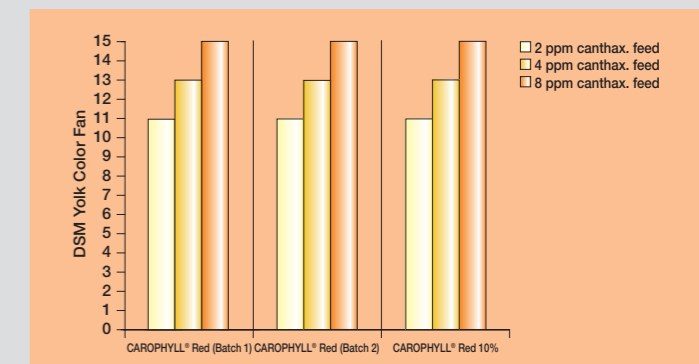
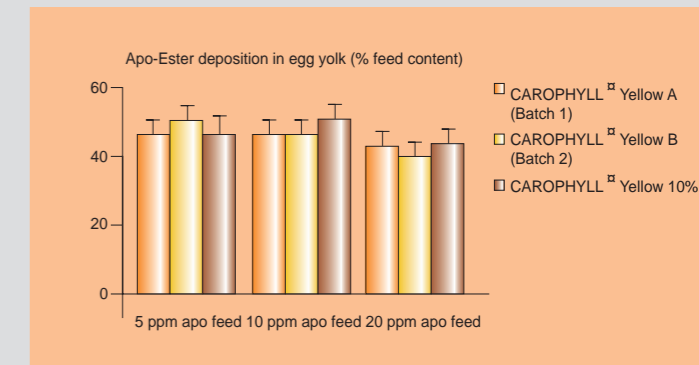
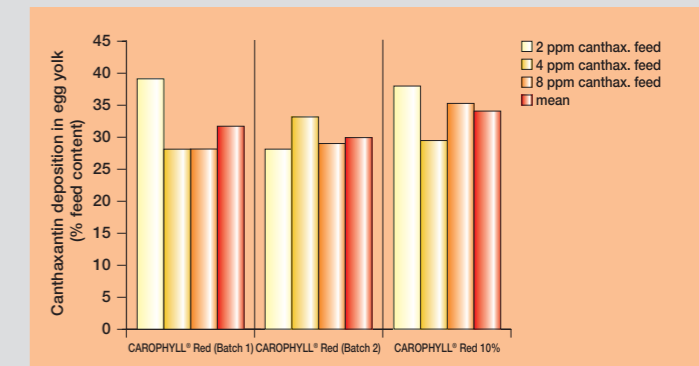
Solutions

CAROPHYLL®

- **Effective pigmentation.** Stability and homogeneity in premix and feed as well as their pigmentation ability cannot be surpassed
- **Consistent pigmentation.** Results are always repeatable and reliable in respect to pigmentation quality.
- **Improve your HACCP systems.** CAROPHYLL® Red 10% and CAROPHYLL® Yellow 10% are FAMI.QS* certified products containing an innovative state-of-the-art animal protein free formulation (patent EP 0-565-989)
- **Reliable DSM service.** Developing global tools like the DSM Yolk Color Fan and the DSM-Yolk Color Optimizer. Generating continuously consumer feedback on egg quality preferences

Bioavailability

The bioavailability and yolk colour performance of the new CAROPHYLL® Red 10% and CAROPHYLL® Yellow 10% in layers is equal to CAROPHYLL® Red and CAROPHYLL® Yellow and therefore superior to other red and yellow pigments.



CAROPHYLL® Red 10%, CAROPHYLL® Yellow 10%

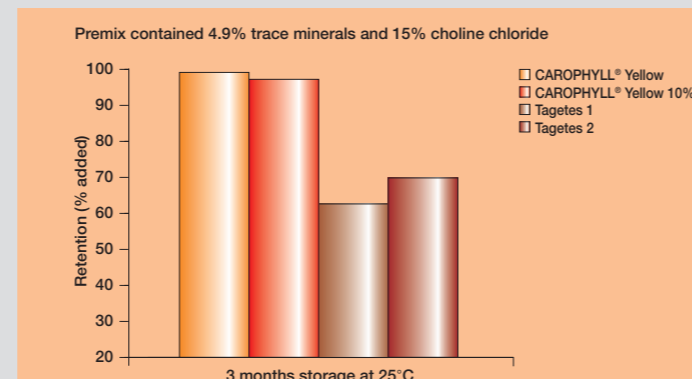
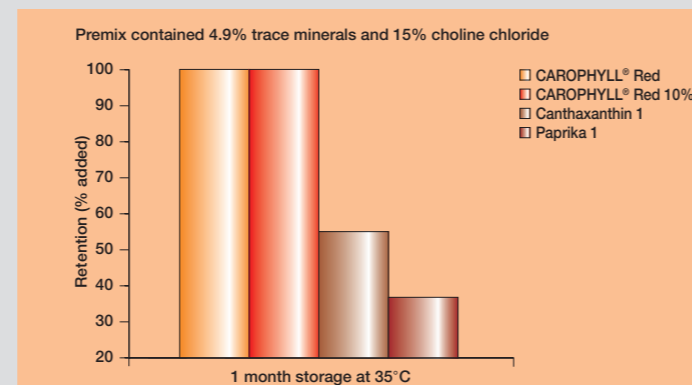
Carotenoid losses during feed manufacture or storage may result in uneven egg yolk pigmentation which will impair quality perception by the consumer.

The unique product formulation of **CAROPHYLL® Red 10%** and **CAROPHYLL® Yellow 10%** makes canthaxanthin and apo-ester more resistant to aggressive factors, achieving optimal stability by double protection: the carotenoids are stabilized with antioxidants and embedded in an innovative plant-based beadlet formulation (patent EP 0-565-989).

The high stability and bioavailability of the **CAROPHYLL®** family has been confirmed in numerous trials using straight forms, various mineral premixes and feed mixtures.

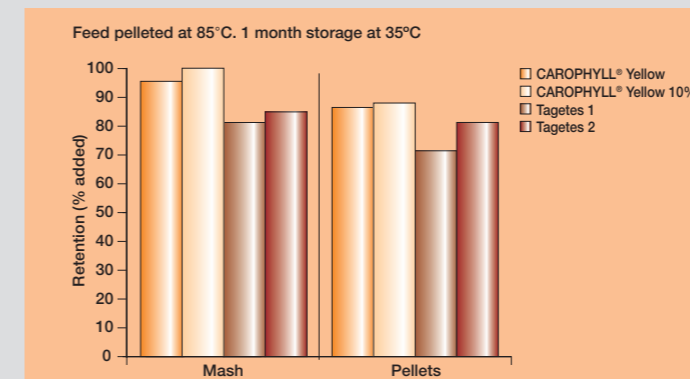
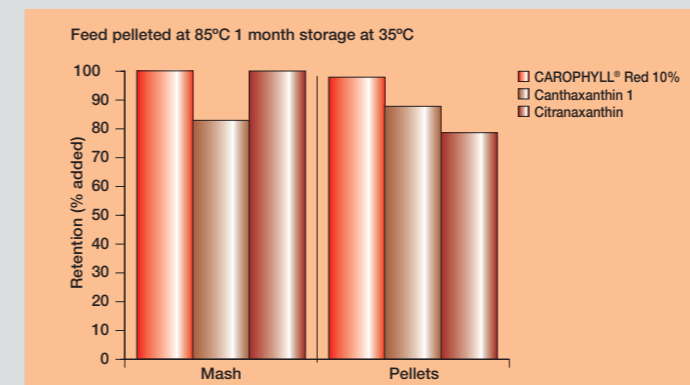
Premix

The stability of the new CAROPHYLL® Red 10% and CAROPHYLL® Yellow 10% in premix is equal to CAROPHYLL® Red and CAROPHYLL® Yellow and superior to other red and yellow pigments.



Feed

The stability of the new CAROPHYLL® Red 10% and CAROPHYLL® Yellow 10% in feed is equal to CAROPHYLL® Red and CAROPHYLL® Yellow and superior to other red and yellow pigments.



CAROPHYLL® Red 10%

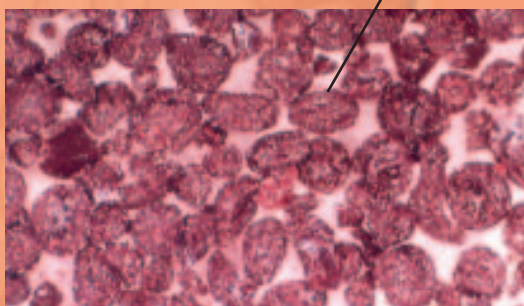
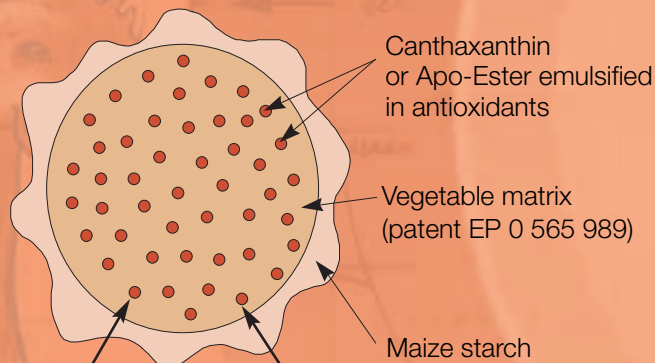
CAROPHYLL® Yellow 10%

Improve your HACCP systems

- EU Feed Hygiene Regulation 1831/2003 applicable since January 1st, 2006: **HACCP systems are enforced in the EU feed industry.**
- The **FAMI-QS quality standard (Feed Additive and pre-Mixture Quality System)** is a harmonized certification system that ensures quality control and implementation of the Hazard Analysis at Critical Control Points (HACCP) system in feed additive and premix companies.
- All **DSM Nutritional Products** carotenoid and vitamin factories as well as premix sites in the EU are **FAMI.QS certified.**
- As part of the **DSM commitment in improving its HACCP* systems**, DSM has developed its new animal gelatine free CAROPHYLL® Red 10% and CAROPHYLL® Yellow 10% where the gelatine matrix is replaced by a **patent protected (EP 0 565 989) state-of-the-art vegetable based beadlet.**
- By improving continuously its HACCP systems DSM contributes to the common objective of **Safety and Traceability in the Food Chain.**

* Hazard Analysis at Critical Control Points

Structure and composition of a CAROPHYLL® 10% beadlet



CAROPHYLL® Red 10%



CAROPHYLL® Yellow 10%

CAROPHYLL® Red 10%

CAROPHYLL® Yellow 10%

Content	min. 10% canthaxanthin	min. 10% apo-ester
Chemical formula	$C_{40}H_{52}O_2$	$C_{32}H_{44}O_2$
Molecular weight	564.82 g/mol	460.70 g/mol
Appearance	Violet-red to red-violet, free flowing particles	Brown-red, free flowing particles
Bulk/tapped density	0.69/0.81 kg/litre	0.63/0.81 kg/litre
Flow	ca. 7 sec per 100 g	ca. 7 sec per 100 g
Fineness	(US standard sieves)	(US standard sieves)
100% through sieve	No. 20	No. 20
min. 90% through sieve	No. 40	No. 40
max. 20% through sieve	No. 100	No. 100
Smell	No detectable odour	No detectable odour
Loss on drying:	max. 8%	max. 8%

CAROPHYLL® Red 10% and CAROPHYLL® Yellow 10% are products made by DSM Nutritional Products Ltd. and has been certified by SQS under the standard ISO 9001–2000; 14001–1996 (2004/20963) and under the standard FAMI-QS (2005/31598).

For more detailed information about the use of CAROPHYLL® products, please contact your local DSM office.



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