# MAXAPAL® A2

## A phospholipase A2 for the improvement of functionalities of egg-yolk based emulsions

### PRODUCT DESCRIPTION

MAXAPAL® A2 is a liquid, purified phospholipase A2 enzyme (phosphatide-2-acyl-hydrolase E.C.3.1.1.4), produced by microbial fermentation of a selected strain of *Aspergillus niger*.
MAXAPAL® A2 is Kosher and Halal certified and is the non-animal alternative to similar enzymes extracted from porcine pancreas.

### ENZYME BENEFITS IN EGG YOLK AND WHOLE EGGS

#### 1) improvement of emulsifying properties

Egg yolk contains approximately 9 % phospholipids (Phosphatidyl-choline, Phosphatidyl-ethanolamine). Phospholipids have an amphiphilic character as they contain a hydrophobic part due to the presence of a diglyceride with two apolar fatty acids and a hydrophilic part with polar phosphate and amine groups.

Due to their amphiphilic character, phospholipids are a major family of emulsifiers used in food products. For that reason, egg yolk is used in many food products based on water-oil emulsions (mayonnaise, dressings and sauces).

The emulsifying properties of phospholipids can be improved by enhancing the amphiphilic character through the specific cleavage of a fatty acid from the diglyceride moiety. Hydrolysis by MAXAPAL® A2 results in the specific release of the fatty acid linked to C-2 of the glycerol moiety, thereby converting the phospholipid into a stable lysophospholipid with strongly improved emulsifying properties.

A conversion of at least **85%** of the egg yolk phospholipids is considered as sufficient to give full improvement of emulsifying properties.

#### 2) benefits of the treated egg products

Egg yolk or whole egg treated with MAXAPAL® A2 can be used for the formulation of processed food (mayonnaise, dressings, desserts, confectionaries, fine bakery, special mixes …) with improved consistency, creamier mouthfeel and considerably improved heat stability.

Emulsions like mayonnaise and sauces made with MAXAPAL® A2 treated egg yolk are heat stable up to 80°C (176 F), as opposed to 60°C (140 F) for untreated egg yolk.
As a consequence of this the dressings and sauces can be pasteurised and kept ‘Au Bain Marie’ for a





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prolonged period of time. This gives also greater formulation flexibility (reduction of emulsifiers or thickeners….), better product quality and allows for pasteurization.
Modified egg yolk with MAXAPAL® A2 can be used to improve a sugar-butter-egg premix to be used in fine bakery (see our dedicated ADS on this particular application).

### APPLICATION AND DOSE RATE

### 1) general application

The enzyme dose to be applied is a function of phospholipid concentration as well as process conditions such as temperature, pH and contact time. Adequate trials should be performed prior any industrial use to determine the enzyme dose and optimal conditions.

The recommended dosage is 100 CPU per gram of phospholipids (0.1% w/w on egg yolk). As the objective of the enzyme treatment is to reach at least **85 %** of phospholipid conversion, with this dose the optimal temperature/time combinations are:

| | **Dose recommendation** | **Temperature** | **Contact time recommendation** |
|---|---|---|---|
| Egg yolks | 1000 ml /Ton | 4°C (40°F) | **At least 26 hours** |
| | 1000 ml /Ton | 15-20°C (60 -70°F) | 10 to 15 hours |
| | 1000 ml /Ton | 50-55°C ( 120 – 130°F) | 3 to 4 hours |
| Whole eggs | 500 ml/Ton | 15-20°C (60 -70°F) | 8 to 10 hours |

A pH adjustment is not needed as the natural pH of egg yolk and whole eggs is favourable to MAXAPAL® A2 activity. Although the enzyme needs some calcium for its activity, addition of calcium salts is not needed as egg contains sufficient calcium ions.





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When phospholipids conversion is completed, MAXAPAL® A2 action stops due to the absence of substrate.
The addition of NaCl or sugar up to 20 % (w/w) does not affect the conversion level.

**2) monitoring of conversion**

The conversion of phospholipids into their lyso-derivatives can be monitored using the DSM X-press A2 test kit . Please contact us for more details about this test.
$^{31}$P-NMR analyses can also be performed *a posteriori* on enzyme-treated products to quantify the phospholipid conversion. Upon request, DSM can indicate the name of service laboratories which can perform the $^{31}$P-NMR analyses.

**3) recommendations for some specific applications**

- Once enzyme modified egg yolk is applied in a mayonnaise or dressing with a pH lower than 5.0, non converted phospholipids, still present from the modified egg yolk, remain as such, even during long shelf life.
- Egg yolk treated with MAXAPAL® A2 can be stored under normally used conditions both in liquid or dried form.
- Addition of maltodextrin with a dextrose equivalent of about 18 is advised before spray-drying to avoid product clotting.

**TECHNICAL SERVICE**
Please contact your local DSM Food Specialties technical sales representative to receive additional information on meeting your needs.





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