# VEGAN MAYO

# Eggless Mayonnaise Holds Greater Appeal for Producers

A traditional oil in water emulsion like mayonnaise appeals to professional and home cooks alike.

#### by Nesha Zalesny

n argument can be made that mayonnaise is one of the "mother sauces" of traditional French cuisine. Mayonnaise is the base ingredient for a host of other sauces and dips. It can also add additional moisture to basic cakes and makes the bread of a grilled cheese sandwich nice and crispy. It is the secret ingredient for many home cooks. At its simplest, mayonnaise is oil, vinegar, and egg yolk. There may or may not be mustard flour or prepared mustard in the recipe for flavor and stability.

One of the biggest trends in the food industry is the plant-based movement. There are many reasons for this, including environmental concerns and the ethical treatment of animals. A fairly recent development for the sauces

and dressings industry has been an increase in avian flu and a decrease in egg availability. This has led to an increase in egg prices beyond the inflation that nearly every market faces. Eggless or vegan mayo is probably looking more attractive to both producers and consumers. The key ingredients in vegan mayo are combinations of hydrocolloids which stabilize the emulsion.

#### **Functionality of Ingredients**

Mayonnaise is a classic oil in water emulsion. Table 1 shows a basic mayonnaise formulation.

Of course, oil and water-based ingredients like vinegar or lemon juice do not remain homogenous; they are immiscible. While mustard flour itself will help stabilize emulsions, there is not enough in

Table 1: Basic Mayonnaise Formulation				
Ingredient	Grams	%		
Egg yolk, at room temperature	20	8.89		
Lemon juice	10	4.44		
Dijon mustard (prepared)	5	2.22		
Salt	2	0.89		
Water	8	3.56		
Neutral liquid oil such as safflower or canola (cold)	180	80.00		
Total	225	100.00		

it. If this formulation were mixed without the egg yolk, the oil and water would separate almost immediately. This simple recipe is made stable by way of the egg yolk. Egg yolk contains phospholipids, lipoproteins, and lecithin which are excellent emulsifiers. These naturally occurring molecules are fat-like in shape, but they have a water-loving (hydrophilic) polar region and a fat-loving (hydrophobic) non-polar region. As mayonnaise is made, cool oil is drizzled into the egg yolk while mixing. As mixing starts, the phospholipid, lipoproteins, and lecithin from the egg yolk interact with the water and the oil.

the recipe to completely stabilize

Commercially produced mayonnaise benefits from advanced mixing equipment such as colloid mills which ensure small oil droplet size and enhance stability. The oil droplets become very small (0.5-100 microns) with sound mixing, and each oil droplet is coated with a small layer of phospholipid. The hydrophobic portion interacts with the oil, and the hydrophilic portion forms a tail-like structure outside of the oil droplet, which interacts with the water. This portion repulses other oil droplets and prevents them from coalescing into larger droplets that then float to the surface of the water.

### Alternatives to Egg Yolk

Removing the egg yolk to create a vegan mayo takes out these naturally occurring emulsifiers, which must be substituted with other ingredients for the mayo to be stable. This includes protein sources as well as chemical emulsifiers. One option is using soy proteins, emulsifiers, and hydrocolloids to stabilize the emulsion. For these systems, emulsifiers such as lecithin provide hydrophilic and hydrophobic molecules that interact with water and oil.

Thickening ingredients such as xanthan gum or starch are also added. These hydrocolloids are not traditional emulsifiers that interact with both water and fat. Rather, hydrocolloids like xanthan gum or starch help to stabilize the emulsion by thickening the water phase. Thickening the water keeps the oil droplets from easily coalescing into larger droplets. It is a physical method, not a chemical method. For this reason, hydrocolloids are considered secondary emulsifiers, not primary emulsifiers. Xanthan gum is a primary choice for mayo as it is typically a low pH system.

Aquafaba or chickpea protein is an option for manufacturers looking to avoid soy protein, which is considered to be a significant allergen and must be labeled appropriately.



An example of non-vegan mayonnaise. This contains egg yolk which forms the emulsion. Modified starch, citrus fiber, guar gum, and xanthan gum assist with emulsion stability and improve mouthfeel in a reduced-fat system.

Table 2: Reduced-Fat	Vegan May	o Formulation
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Ingredient	Grams	%
Vinegar	21	10.50
Water	65	32.50
Neutral edible liquid oil	92	46.00
Salt	4	2.00
Sugar	5.5	2.75
Mustard	4	2.00
Soy protein	1	0.50
Starch	1	0.50
Citrus fiber	6	3.00
Xanthan gum	0.5	0.25
Total	200	100.00

Aquafaba is the liquid leftover after cooking chickpeas. It is a mixture of protein and starch, which has some unique properties beneficial for egg replacement. It can be used to make meringue cookies traditionally created with egg whites. Mayo made with aquafaba also benefits from adding hydrocolloids such as xanthan gum or



 Just Mayo contains modified food starches along with pea protein that act as secondary emulsion stabilizers, giving this product a creamy mouthfeel. starch to act as secondary emulsifiers. Acacia gum (Senegal type) is also added to stabilize these emulsions. Acacia gum has a higher protein fraction, which is thought to adhere to oil droplets that stabilize them. Acacia gum is often used to stabilize beverage emulsions because it helps form tiny oil droplets.

Another good option is citrus fiber. Most citrus fiber comprises the cellulose, hemicellulose, and pectin latent in the peel or pulp of the citrus fruit. This type of fiber is more globular than hydrocolloids, which tend to be long chains of polysaccharides, like a cotton ball compared to a string. Citrus fiber has many surface areas, which entraps oil, acting as an emulsifier. Citrus fiber is currently being successfully used in reduced fat mayonnaises. The formulation in Table 2 is a reduced-fat vegan mayo utilizing citrus fiber, starch, and xanthan gum to stabilize the emulsion. This formulation also contains a small amount of soy protein, which could easily be replaced with another protein source such as chickpea.

The dry ingredients are blended for this recipe, then added to the available water while under shear. The cold oil is drizzled into the mixing water. The emulsion forms almost instantly. This system benefits from being run through a colloid mill to create a fine oil droplet size.

## Plant-Based Legal Hurdles

As with many plant-based foods, the nomenclature is often problematic. Countries in the EU do not allow plant-based beverages to be called "milk." The same can be said for mayo or mayonnaise. Mayonnaise has a standard of identity mandated by the Food and Drug Administration (FDA) in the US.

Anything labeled "mayonnaise" must contain:

- At least 65% oil
- At least 2.5% vinegar and/or lemon or lime juice
- Egg yolk containing ingredients, such as liquid egg yolks or frozen egg yolk
- Salt

The FDA also allows for one or more of the following optional ingredients:

- Nutritive carbohydrate sweeteners
- Any spice except saffron or turmeric
- Monosodium glutamate (MSG)
- Sequestrants such as calcium disodium ethylenediamine tetraacetic acid (EDTA) to preserve color or flavor
- Crystallization inhibitors, such as lecithin

This standard of identity is the primary reason products like Kraft Miracle Whip are called dressings, salad creams, or sandwich spreads, not mayonnaise. While many consumers prefer these products, they often contain additional ingredients, hydrocolloids such as starch or xanthan gum, and a higher sweetener content. They also tend to have slightly less fat than traditional mayonnaise.

Companies that introduced vegan mayo were on the frontlines of legal battles. In 2014, one of the first manufacturers of vegan mayo was sued by a mayonnaise company. The battle lasted for a year (short for many legal actions). The original suit claimed that vegan mayo did not conform to the standard of identity for mayonnaise, and use of the term "mayo" was misleading. In 2015, a Califor-



Modified potato starch, citrus fiber and mustard flour are used to stabilize the oil in water emulsion

nia court ruled that the company could keep the term "mayo" but had to make clear that the product did not contain eggs. Manufacturers of these products need to be aware of legislation in their respective countries and create their labels accordingly.

Eggs are incredibly functional in various foods, but current supply issues are making egg replacement a necessity for many manufacturers. Unfortunately, as with most ingredients, there is no drop-in solution. Instead, formulators will need to use several ingredients to simulate the functionality of the egg. This may include a primary emulsifier such as lecithin, plus secondary emulsifiers such as acacia gum, xanthan gum, or starch. Mayonnaise is a great base for a variety of dressings and sauces. Having vegan or eggless varieties will appeal to a broader consumer base looking for products that fit their lifestyles and dietary needs.

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