



E-ISSN: 2278-4136  
P-ISSN: 2349-8234  
[www.phytojournal.com](http://www.phytojournal.com)  
JPP 2020; 9(5): 304-307  
Received: 20-04-2020  
Accepted: 26-06-2020

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## Development and quality evaluation of Low Fat mayonnaise

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### Abstract

This study was conducted to evaluate the addition of skim milk powder and sunflower oil use in preparation of mayonnaise. It is veg mayonnaise and Low fat mayonnaise was prepared from sun flower oil with the percent of 54- 64% skim milk powder and 30-50% oil. Low fat mayonnaise made from 54% skim milk powder and 30% oil was best for mayonnaise production. The low fat mayonnaise formulated with different concentration of thickener that is maltodextrin. The best low fat mayonnaise content 54% skim milk powder, 30% oil, water 50%, sugar 3%, salt 1.5%, citric acid 1%, cinnamon flavored 2%, yellow Muster powder 0.4%, maltodextrin 0.18% and EDTA 0.2%.

**Keywords:** Skim milk powder, sunflower oil, mayonnaise, quality evaluation

### 1. Introduction

In 19<sup>th</sup> century mayonnaise was not used for dressing perpus in word. Firstly in Europe to consumed the mayonnaise products origin of mayonnaise in France. It is first manufactured commercially in early 1900s century, becoming popular in America from 1917 to 1927 and recently in Japan where sales increased by 21% in the years from 1987 to 1990. Because of its low pH and high fat content, mayonnaise is relatively resistance to microbial spoilage. Mayonnaise the oil-in-water emulsion where oil is the discontinuous phase and water is the continuous phase obtained by emulsifying edible vegetable oil in an aqueous phase (Pradhanganga and Adhikari, 2015).

Mayonnaise is an oil-in-water emulsion despite containing between 70-80% fat. Oil in water emulsions consist of finely dispersed droplets of oil in a continuous phase of water or a dilute aqueous solution. Droplet size range is from less than 1 $\mu$ m to 20 $\mu$ m or more. This emulsion is formed by mixing the eggs, vinegar and spices, and then slowly feeding the oil, resulting in closed-packed foam of Mayonnaise is an oil-in-water emulsion despite containing between 70-80% fat. There has been longstanding consumer demand for more nutritious natural food products, including foods that can provide additional health benefits beyond basic nutrition (McClements and Demetriades 1998) [14].

One of the most widely consumed products worldwide is mayonnaise for use in condiments or sauces (Harrison and Cunningham 1985) [10]. Mayonnaise is a semi-solid product since it is an oil-in-water emulsion with oil representing around 70–80% of the total composition by weight (McClements 2005) [13]. Mayonnaise is prepared by mixing several food ingredients such as egg yolk, vinegar, oil and spices such as mustard (Liu *et al.*, 2007) [11].

Over the past decades, the number of studies, pertaining the low-fat edible products, has increased with considerable regard to diseases such as obesity, cardiovascular diseases, and cancer (Chang *et al.*, 2017) [6]. Fat, as a substantial constituent of foods, has long been noted as the main source of energy and the satiety. Gradually, other benefits of edible products as fat-soluble vitamin carriers and major sources of essential fatty acids were likewise recognized (Emadzadeh & Ghorani, 2015) [8]. However, on account of lifestyle changes and the lack of any balance between the intake and expenditure of energy, obesity has incremented globally (Aganovic, Bindrich, & Heinz, 2018) [3]. Considering the over-consumption of fat as a deciding factor in obesity, the production of low-fat foodstuffs has stimulated many research interests (Ma & Boye, 2013) [12]. In this regard, no-fat and low fat sausages, cream, yoghurt, and mayonnaise have been developed (Sun *et al.*, 2018) [15]. Regarding this, mayonnaise manufacturers now tend to produce low-fat mayonnaise, because oil is commonly the most expensive ingredient of mayonnaise (Depree & Savage, 2001) [7].

The main role in mayonnaise production is composition ratio of oil phase and the addition of various emulsifier, stabilizer and thickener. Texture of mayonnaise depends on oil content; the excess quantity of oil is used to create the better texture of mayonnaise. Oil has important function in to maintain the mayonnaise texture. Fat as one of the main ingredients to create the

better texture of mayonnaise and sensory characteristic of final product. High fat consumed as associated with more risk of obesity, types of cancer, cardiovascular diseases, and hypertension. The production of low fat mayonnaise is normally associated with some technical problems such as poor texture; flavor, appearance stability, and mouth feel (Amin *et al.*, 2014) [5].

Roll skim milk powder to binder for improving the functional properties and increasing the nutritional value of low fat mayonnaise. Stabilizer can be used 1g/kg or in combination. Stabilizers used mainly are guar gum, xanthan gum and pectin etc used singly or in combination Water is used to make 100% in the mayonnaise formulation (Pradhanganga and Adhikari, 2015).

We prepared the low fat mayonnaise in combination with skim milk powder, oil, sugar, salt, maltodextrin, EDTA, citric acid, yellow mustard powder and cinnamon flavor and this mayonnaise was eggless mayonnaise. Texture of mayonnaise depends on oil the more oil is used then the better texture is resulted. Oil is important function to create the better texture of mayonnaise. Low fat mayonnaise can be produced by decreasing dispersed phase and increase aqueous phase. Using fat replacer is recommended to decrease fat content and to maintain the texture (Evanuarini, *et al.* 2015) [9].

## 2. Material and Methods

### 2.1 Materials

To use of instrument for testing purpose and to name of the instrument hot air oven, macrojeldhal apparatus, Muffle furnace and grinder titration unit.

### 2.2 Method's

**2.2.2 Moisture content:** Use of hot air oven to measured moisture content (AOAC, 1995) [2].

### 2.2.3 Carbohydrates content

To determine the total carbohydrate by using the A.O.A.C. (1990) [1].

### 2.2.4 Protein content

To use of standard Kjeldahl methods will be measured total nitrogen content (AOAC, 1990) [1].

### 2.2.5 Fat content

Use of soxhlet apparatus will be determined the fat content. (AOAC, 1990) [1].

### 2.2.6 Ash content

Ash content to determine according to the method described

in (AOAC, 1990) [1].

### 2.2.7 Mineral content

Mineral content to determine according to the method described in (AOAC, 1990) [1].

## 3. Result and Discussion

### 3.1 Physical properties of low fat mayonnaise

The physical properties of low fat mayonnaise such as density, colour, refractive index, hardness and specific gravity were studied. Physical characteristics of low fat mayonnaise results are given in table-1.

**Table 1:** Physical properties of low fat mayonnaise

Formulation	Physical property				
	Color	Hardness (g)	Density (kg/m <sup>3</sup> )	Refractive index (Abbes, 27 °C)	Specific gravity (mg/ml)
T <sub>0</sub>	8.2	10.26	5.32	1.4722	0.912
T <sub>1</sub>	7.4	28.85	4.48	1.4730	0.914
T <sub>2</sub>	7.5	26.4	4.44	1.4742	0.924
T <sub>3</sub>	7.7	26.2	4.52	1.4729	0.925
T <sub>4</sub>	7.4	26.4	4.50	1.4740	0.920
SE (±)	0.024	0.044	0.020	0.040	0.015
CD at 5%	0.074	0.140	0.058	0.126	0.051

T<sub>0</sub>- 54% SMP +30% Oil + 0% cinnamon flavor

T<sub>1</sub>- 54% SMP +30% Oil + 1.0% cinnamon flavor

T<sub>2</sub>- 54% SMP +30% Oil + 1.0% zinger flavor

T<sub>3</sub>- 54% SMP +30% Oil + 2.0 cinnamon flavor

T<sub>4</sub>- 54% SMP +30% Oil + 2.0 zinger flavor

To showed the physical property of low fat mayonnaise. The hardness of control sample was found to be 10.26g, and the increasing the hardness was found in T<sub>1</sub> sample lower the hardness of T<sub>3</sub> sample as compare the other 3 sample. Color of low fat mayonnaise In control sample was yellow creamish because to use of more oil and T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> sample color was creamish white because to use of more skim milk powder. Refractive index of low fat mayonnaise was lower in T<sub>4</sub> was 1.4729 (Abbes, *et al.* 1997) (27 °c) and specific gravity of low fat mayonnaise T<sub>3</sub> was higher 0.925 (mg/ml) respectively. Refractive index was depending upon the oil content. To use of more unsaturated oil in higher iodine value and higher refractive index. Refractive index was more in T<sub>2</sub> sample-1.4742 and lower in T<sub>3</sub> sample-1.4729.

### 3.2 Chemical property of low fat mayonnaise

The chemical property of low fat mayonnaise at carbohydrate, protein, fat, moisture content, ash content, acidity and pH were analyzed. The result was obtained in given table 2.

**Table 2:** Chemical properties of low fat mayonnaise

Formulation	Chemical properties g/100g						
	Moisture	Fat	Carbohydrate	Protein	Ash	Acidity	PH
T <sub>0</sub>	15.1	38.55	17.35	28.71	0.29	0.57	3.90
T <sub>1</sub>	20.8	28.78	20.14	30.02	0.34	0.62	3.85
T <sub>2</sub>	20.3	28.33	20.53	30.51	0.32	0.70	3.80
T <sub>3</sub>	20.6	28.15	20.1	30.89	0.31	0.76	3.79
T <sub>4</sub>	20.5	28.72	20.35	30.10	0.33	0.72	3.81
SE (±)	0.352	0.025	0.201	0.292	0.015	0.392	0.314
CD at 5%	0.966	0.0782	0.5872	0.8560	0.0416	1.177	0.923

Each value represents the average of four determinations

T<sub>0</sub>- 35% SMP +40% Oil + 0% Cinnamon flavor

T<sub>1</sub>- 54% SMP +30% Oil + 1.0% Cinnamon flavor

T<sub>2</sub>- 54% SMP +30% Oil + 1.0% zinger flavor

T<sub>3</sub>- 54% SMP +30% Oil + 2.0% Cinnamon flavor

T<sub>4</sub>- 54% SMP +30% Oil + 2.0% zinger flavor.

To investigate the present samples were observed that the chemical property of low fat mayonnaise. The more moisture was found in T<sub>3</sub> 20.6 (g/100g). Color of mayonnaise was white creamish to present the more moisture content. The more oil used to prepare the high fat mayonnaise and color of mayonnaise was yellow.

In low fat mayonnaise to use the fat replacer component because to reduce the fat content. Maltodextrine was a fat replacer component to reduce the fat content and to maintain the texture of low fat mayonnaise. The more fat content was present in T<sub>1</sub> sample-28.78 as compare to other samples. The low fat content was present in T<sub>3</sub> sample-28.15 as compare to other 3 samples.

The low ash content was found in control sample-0.29 as compare to the other four sample. T<sub>3</sub> sample was found in low ash content-0.31 as compare to the other three samples. To analysis of all samples were obtained to low acidity in T<sub>1</sub> sample and more acidity present in T<sub>3</sub> sample. In control sample to low acidity as compared to other four samples. Low fat mayonnaise was analyzed to identify the pH of mayonnaise. The higher pH of control sample-3.90 as compared to the other samples. The low pH of T<sub>3</sub> sample-3.79 and high pH of T<sub>1</sub> sample-3.85

**Table 3:** Mineral content of low fat mayonnaise

mg/100g mineral				
Formulation	Calcium	Magnesium	Iron	Zinc
T <sub>0</sub>	1301	151	1.34	2.62
T <sub>1</sub>	1252	128	1.27	2.33
T <sub>2</sub>	1258	126	1.25	2.32
T <sub>3</sub>	1266	131	1.28	2.36
T <sub>4</sub>	1261	129	1.26	2.33
SE (±)	0.027	0.201	0.292	0.013
CD at 5%	0.0782	0.5872	0.8560	0.0416

\*Each value represents the average of four determinations

T<sub>0</sub>- 35% SMP +40% Oil + 0% Cinnamon flavor

T<sub>1</sub>- 54% SMP +30% Oil + 1.0% Cinnamon flavor

T<sub>2</sub>- 54% SMP +30% Oil + 1.0% zinger flavor

T<sub>3</sub>- 54% SMP +30% Oil + 2.0% Cinnamon flavor

T<sub>4</sub>- 54% SMP +30% Oil + 2.0% zinger flavor

Mineral contain of low fat mayonnaise possessed calcium in control sample-1301 mg/100gm. The more calcium present in T<sub>3</sub> sample and low calcium present in T<sub>1</sub> sample. Calcium was present in Sample T<sub>2</sub> and T<sub>3</sub> at moderate. The more magnesium contain present in control sample-151 as compare to other samples. Magnesium contain was more in T<sub>3</sub> sample-131 and lower in T<sub>2</sub> sample-126. Iron contain was present of low fat mayonnaise in control sample-1.34.iron contain was more present in T<sub>3</sub> sample-1.28 and less in T<sub>2</sub> sample-1.25.The zinc contain of low fat mayonnaise for control sample, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> & T<sub>4</sub> were given to 2.62, 2.33, 2.32, 2.36, 2.33 mg/100gm respectively.

#### 4. Summary and Conclusions

The chemical and physical property of low fat mayonnaise that highest moisture presents in T<sub>3</sub>-20.6 (g/100g). Carbohydrate was found for highest in the T<sub>2</sub> sample 20.53 (g/100g), lower contain of protein in T<sub>1</sub> sample was 30.02 (g/100g). To the analysis of all samples to found the lower ash contain in T<sub>3</sub>- 0.31 and control sample T<sub>0</sub> -0.29. Higher ash contain were found in sample T<sub>1</sub> -0.34 (g/100g). Acidity of low fat mayonnaise observed in the formulation lower in T<sub>0</sub> and T<sub>1</sub> samples 0.57, 0.62. Higher acidity present in sample T<sub>3</sub> -0.76. pH of low fat mayonnaise higher in T<sub>0</sub> and T<sub>1</sub> sample 3.90, 3.85. Lower pH in the sample is T<sub>3</sub>.

The mineral contain of low fat mayonnaise possessed Calcium in T<sub>0</sub> 1301 mg/100g which was a control sample, T<sub>1</sub> has 1252 mg/100g of calcium which was lowest among all prepared formulations, the calcium content of T<sub>2</sub> and T<sub>3</sub> were at moderate level as compare to the control sample.

The peroxide value detects the degree of unsaturated in oil. Peroxide value of low fat mayonnaise for T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> were 7.2, 6.2, 6.4 and 6.4 (meqO<sub>2</sub>/kg oil) respectively. Saponification value of low fat mayonnaise analysis for T<sub>0</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> were 0.65, 0.76, 0.74 and 0.76 (KOH/g of oil) respectively.

higher fat content mayonnaise was obtained the higher acid value and lower fat content mayonnaise was obtained the lower acid value of T<sub>0</sub>, T<sub>1</sub>, T<sub>3</sub>, T<sub>4</sub>, observed the reading to 0.57, 0.52, 0.55, 0.52 and 0.51 (mg KOH/g of oil).To observed Iodine value to be 143.6, 142.6, 142.1, 141.5 and 141.22 (g of I<sub>2</sub>/100g of oil) for T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> sample respectively.

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