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To study the physico chemical properties of flavoured mayonnaise

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Abstract
This study aimed to evaluate the addition of skim milk powder and oil was the main ingredient and these mayonnaise are eggless mayonnaise or fat reduced mayonnaise. In skim milk powder protein, carbohydrate and mineral (mainly calcium) are present. Isoflavones, saponins and phytosterols these are the phytochemical present in soybean oil. Saponins enhance immune function and bind to cholesterol to limit its absorption in the intestine. Phytosterols and other components of soy have been reported to lower cholesterol. Isoflavones may reduced the risk of hormone dependent cancers such as breast and prostate cancer. In selected flavoured mayonnaise sample content the physico chemical properties of colour 7.8, hardness 27.5, density 4.46, refractive index 1.4746, specific gravity 0.926, total solid 65.7, carbohydrate 49.54, fat 38.64, protein 34.51, moisture 35.3, acidity 0.42, ash 0.32, pH 3.54, acid value 0.56 and peroxide value 6.5.

Keywords: physico chemical properties, flavoured mayonnaise, skim milk powder protein, Isoflavones

Introduction
The word mayonnaise was not used for a dressing before the start of the 19th century. Mayonnaise belongs to the food products widely consumed in Europe. It has been in existence origin France. It is first produced commercially in early 1900s, 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 (Depree and savage, 2001) [4].

Mayonnaise the oil-in-water emulsion where oil is the discontinuous phase and water is the continuous phase obtained by emulsifying edisble vegetable oil in an aqueous phase (Pradhanganga and Adhikari, 2015).

Iranian national standard has specified three types of mayonnaise regarding the fat content 1) ordinary mayonnaise with min. 66% fat, 2) reduced fat mayonnaise with min. 25% fat reductions compared to the ordinary one, 3) low-fat mayonnaise with 50% fat reduction as compared to the ordinary counterpart. Among the most evident examples are dressing for which well known variants "reduced - fat", "light low - fat" and "fat - free" have been developed (Sabaghian *et al*., 2014).

Mayonnaise is an oil-in-water emulsion containing 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 1µm to 20µm or more. This emulsion is formed by mixing the eggs, vinegar and spices, and then slowly feeding the oil, resulting in a closed-packed foam of oil droplets or coarse emulsion. Dissimilarly, if the aqueous and oil phases are mixed at once the result is a water-in-oil emulsion, whose viscosity is similar to the oil from which it was made (Depree and Savage, 2001) [4]. Vegetable oils, the main ingredient in mayonnaise, have an important function in an emulsion; they contribute to the taste, the appearance, the texture and the oxidative stability of the emulsion in a very specific way (Moslavac *et al*., 2012) [10].

The main role in mayonnaise production is composition ratio of oil phase and the addition of various emulsifier, stabilizer and thickener. Texture depends on oil, the more oil is used then the better texture is resulted. Oil has important function in characteristic of rheology. Fat as one of the main ingredients, has positive influence on the rheological properties and sensory characteristic of final product. High fat intake as associated with increased risk of obesity, some types of cancer, cardiovascular diseases, and hypertension. The production of low fat mayonnaise is normally associated with some technical problems such as poor texture, flavour, appearance stability, and mouth feel (Amin *et al*., 2014) [3].

Skim milk powder acts as binder for improving the functional properties and maintaining the nutritional value of low value binder's used. Stabilizer can be used 1g/kg or in combination.

Stabilizer 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).

Materials and methods

Material's

Grinder, Hot air oven, Soxhlet apparatus, Atomic absorption spectroscopy, Microjeldhal apparatus, Muffle furnace and titration unit.

Method's

Moisture content

Moisture content will be measured using a drying-oven. (AOAC, 1995).

Carbohydrates content

Total carbohydrate will be determined using A.O.A.C. (1990) [1] Method.

Protein Content

Total nitrogen content will be measured using the standard Kjeldahl methods. (AOAC, 1990) [1].

Fat Content

The fat content will be determined by Soxhlet apparatus. (A.O.A.C., 1990) [1].

Ash Content

Total Ash content will be determined according to the method described in (AOAC, 1990) [1].

Mineral content

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

Specific Gravity

Specific gravity determined by specific gravity bottle.

Result and discussion

Physical properties of flavoured mayonnaise

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

Table 1: Physical properties of flavoured mayonnaise

Physical property					
Formulation	**Colour**	**Hardness (g)**	**Density (kg/m^3)**	**Refractive index (Abbes, 27 ◦C)**	**Specific gravity (mg/ml)**
T_0	8.5	10.27	5.37	1.4738	0.917
T_1	7.9	28.86	4.50	1.4731	0.916
T_2	7.8	27.5	4.46	1.4746	0.926
T_3	7.8	27.5	4.53	1.4739	0.925
SE (±)	0.025	0.047	0.019	0.042	0.017
CD at 5%	0.076	0.142	0.059	0.127	0.053

*Each value represents the average of three determination

T_0- 35% SMP +75% Oil + 0% Cardamom flavour
T_1- 35% SMP +75% Oil + 0% Cardamom falvor
T_2- 35% SMP +75% Oil + 1% Cardamom flavour
T_3- 35% SMP +75% Oil + 1.5 Cardamom flavour

The results obtained in table 8 showed that physical properties of flavoured mayonnaise. The hardness of control sample was found to be 10.27g, which was considerably lower compared to other formulations. The maximum hardness was recoeded by T_1 (28.86 g) followed by T_2 and T_3.

Colour of flavoured mayonnaise in T_0 sample was yellow creamish becuase of the usage of 75% of soyabean oil and in T_1, T_2, T_3 formulation content higher skim milk powder that the colour was creamish white. Refractive index of flavored mayonnaise was lower in T_1 were 1.4731(Abbes, 27 ◦C) and specific gravity of flavoured mayonnaise T_2 was higher 0.926 (mg/ml) respectively.

Oils have own refractive index so their refractive index were considered to identify oils and fats, discover any adulteration, and perceive their impurities. Refractive index is directly dependent on oil fatty acids such that the more unsaturated oil or the higher iodine value, the higher refractive index. The present result was more or less similar with Talkit *et al.,* (2012) [13].

Chemical properties of flavoured mayonnaise

The chemical properties of flavoured mayonnaise viz., moisture, fat, carbohydrate, protein, ash, acidity and pH were analysed. The results obtained given in table 2.

Table 2: Chemical properties of flavoured mayonnaise

Chemical properties g/100g							
Formulation	**Moisture**	**Fat**	**Carbohydrate**	**Protein**	**Ash**	**Acidity**	**pH**
T_0	14.1	72.55	19.75	31.74	0.29	0.57	3.91
T_1	33.8	38.81	20.13	31.02	0.34	0.62	3.86
T_2	35.3	38.64	20.54	31.51	0.32	0.70	3.81
T_3	34.6	39.15	20.74	31.89	0.31	0.76	3.78
SE (±)	0.351	0.026	0.200	0.293	0.014	0.391	0.315
CD at 5%	0.9671	0.0783	0.5871	0.8561	0.0415	1.178	0.924

*Each value represents the average of three determinations

T_0- 35% SMP +75% Oil + 0% Cardamom flavor
T_1- 35% SMP +75% Oil + 0.5% Cardamom flavour
T_2- 35% SMP +75% Oil + 1% Cardamom flavor
T_3- 35% SMP +75% Oil + 1.5% Cardamom flavour

From the present investigation it was observed that the chemical properties of flavored mayonnaise. The highest moisture was observed for T_2 35.3 (g/100g). Amin *et al*., (2014) [3] reported that the higher moisture content of the low fat mayonnaise which consequently diluted the colour of the

sample producing of creamish white colour, which was more preferred by the panelists than the yellow colour of the full fat mayonnaise resulted from the high concentration of oil.

Akoh and Min, (2002) water is considered a key component when replacing fat using a carbohydrate based fat replacer. Water forms a gel like structure with the xanthan gum, which enhance texture of T_1, T_2, T_3 because of low fat mayonnaise. Ford *et al.,* (2004) [6] repoted that fat content emulsified product could be reduced by replacing the fat droplets with biopolymers such as gums and starch. The fat content lower in T_1, T_2, T_3 becuase of used the lower soyabean oil, less or more similar result to Evanuarini *et al.,* (2015) [5]. Carbohydrates observed for highest in the T_2 sample 49.54 (g/100g), the protein content for lower in sample T_1 were 34.74 (g/100g).

The ash content observed lower in sample T_0 were 0.31 and higher in T_1 were 0.34 (g/100g) more or less simlar result to Johary *et al.,* (2015) [7] and Aghadaei *et al.,* (2014), acidity of the flavoured mayonnaise observed in the formulation lower in T_0 sample and higher in T_3 were 0.43,0.43 (g/100g), pH of flavoured mayonnaise higher in T_0 and lower T_3 were 3.81, 3.67 (g/100g) respectively more or less similar result to Pradhanganga and Adhikari, (2015) and Aizpurua and Filho, (2005).

Mineral composition of flavoured mayonnaise

Efforts were made to analyze the mineral content of flavoured mayonnaise. Table-3 shows the composition of the minerals, i.e., Ca, Mg, Fe and Zn.

Table 3: Mineral content of flavoured mayonnaise

mg/100g mineral				
Formulation	**Calcium**	**Magnesium**	**Iron**	**Zinc**
T_0	1300	150	1.35	2.60
T_1	1250	130	1.25	2.35
T_2	1260	125	1.23	2.30
T_3	1265	130	1.23	2.35
SE (±)	0.026	0.200	0.293	0.014
CD at 5%	0.0783	0.5871	0.8561	0.0415

*Each value represents the average of three determinations

T_0- 35% SMP +75% Oil + 0% Cardamom flavour T_1- 35% SMP +75% Oil + 0.5% Cardamom flavour

T_2- 35% SMP +75% Oil + 1% Cardamom flavour T_1- 35% SMP +75% Oil + 1.5% Cardamom flavour

The mineral of flavoured mayonnaise possessed Calcium in T_0 1300 mg/100g which was a control sample, T_1 has 1250 mg/100g of calcium which was lowest among all prepared formulations, the calcium content of T_2 and T_3 were at moderate level against control sample. The Magnesium content was found higher in T_0 sample which was 150mg/100g and lowest in T_2 125mg/100g. The iron content of flavoured mayonnaise in control was observed to be highest among all 1.35mg/100g followed by T_1 1.25 mg/100g. The zinc content of flavoured mayonnaise for T_0, T_1, T_2 and T_3 were given to 2.60, 2.35, 2.30 and 2.35 (mg/100g) respectively.

Summery and conclusion

The physico chemical properties of flavoured mayonnaise that content highest moisture was observed for $T_2$35.3 (g/100g). Carbohydrates observed for highest in the T_2 sample 49.54 (g/100g), the protein content for lower in sample T_1 were 34.74 (g/100g). The ash content observed lower in sample T_0 were 0.31 and higher in T_1 were 0.34 (g/100g). Acidity of the flavoured mayonnaise observed in the formulation lower in T_0 sample and higher in T_3 were 0.43, 0.43 (g/100g), pH of flavoured mayonnaise higher in T_0 and lower T_3 were 3.81, 3.67 (g/100g).

The mineral of flavoured mayonnaise possessed Calcium in T_0 1300 mg/100g which was a control sample, T_1 has 1250 mg/100g of calcium which was lowest among all prepared formulations, the calcium content of T_2 and T_3 were at moderate level against control sample.

The peroxide value detect the degree of unsaturation in oil. Peroxide value of flavoured mayonnaise for T_0, T_2, T_3 and T_4 were 7.3, 6.1, 6.5 and 6.3(meqO_2/kg oil) respectively. Saponification value of flavoured mayonnaise observed for T_0, T_2, T_3 and T_4 were 0.65, 0.77, 0.75 and 0.77(KOH/g of oil) respectively.

Acid value of control sample i.e. higher fat content mayonnaise than the lower fat content mayonnaise of T_0, T_1, T_2, T_3, reading observed were 0.58, 0.51, 0.56 and 0.53(mg KOH/g of oil). Iodine value observed to be 144.5, 141.7, 143.2 and 141.21(g of I_2/100g of oil) for T_0, T_2, T_3 and T_4sample respectively.

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