Studies on rheological properties of flavoured mayonnaise

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Abstract

The present study investigated the rheological properties of flavoured mayonnaise texture profile analysis and viscosity. Mayonnaise is semi-solid oil-in-water emulsion with starch in its formulations when fat-reduced. Mayonnaise is probably one of the most widely used sauces worldwide. The oil content of traditionally mayonnaise is more than 65%. Fat has a role in creating viscosity, color and texture but might cause many diseases and disorders in human. In the rheological properties of flavoured mayonnaise it carried out the Hardness (gm), Adhesiveness (10^{-3} Nm), Firmness (N), Cohesiveness and Viscosity.

Keywords: Rheological properties, flavoured mayonnaise, discontinuous phase

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 resistant to microbial spoilage (Depree and savage, 2001) [2].

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 (Pradhanga and Adhikari, 2015) [7].

The rheology of emulsions, i.e. mayonnaise–salad creams, is influenced by several structural parameters: inter particle interactions (more important in concentrated emulsions) particle size, shape. The emulsions stability also depends upon structural parameters and is related to the rheological properties of these products. Structural parameters are influenced by the processing parameters (temperature, residence time and rotational speed), in addition to the oil and/or emulsifier concentration (Franco et al., 1995) [6].

Rheological and textural properties of mayonnaise are very complex, as the structure is semi-solid with pronounced viscoelastic properties, but it grows liquid under applied shear; even if the shear is only moderate. The rheological behaviour of mayonnaise is very important for the sensory properties contributing to its perceived texture as well as the quality evaluation and control. Many investigations have been conducted on the rheology of mayonnaise. Mayonnaise flow properties were investigated by static viscosity measurement with a viscometer (Peter et al., 2007) [8].

Texture of mayonnaise depends on oil, the more oil is used then the better texture is resulted. Oil has important function in characteristic of rheology. Low fat mayonnaise can be produced by decreasing dispersed phase and increase aqueous phase. Using fat replacer is recommended to decrease fat content (Evanuurini et al., 2015) [3].

The main rheological characteristic of salad cream and mayonnaise is the presence of a yield stress. Another important parameter is emulsion stability, with respect to creaming and coalescence. In order to enhance the stability, various polysaccharide stabilizers such as xanthan gum, or alginites are used in the preparation of mayonnaise and salad creams (Hennock et al., 1984) [2].

Materials and Methods

Materials

Texture Profile Analyser, Brookfield Viscometer
Method’s
Texture Profile Analyser
Texture of selected mayonnaise was measured using TA XT2 texture analyser (stable micro system) within 24 hours after preparation. Textural determinations were made by using cutting probe.

Viscosity
Viscosity was determined for various compositions of casting solutions using the Brookfield viscometer MV-E at different speed and 25°C with a spindle number S-64 and it were expressed in terms of centipoise.

Result and Discussion
Textural properties of mayonnaise are very complex as the structure is semi solid with pronounced viscoelastic properties but it grows liquid under applied shear, even if the shear is only moderate. Texture of flavoured mayonnaise depends on oil, the more oil is used then the better texture is resulted.

<table>
<thead>
<tr>
<th>Formulation</th>
<th>Hardness (g)</th>
<th>Adhesiveness (10^-5 Nm)</th>
<th>Firmness (N)</th>
<th>Cohesiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0</td>
<td>10.27</td>
<td>1.89</td>
<td>0.53</td>
<td>0.96</td>
</tr>
<tr>
<td>T2</td>
<td>28.86</td>
<td>2.15</td>
<td>1.08</td>
<td>2.65</td>
</tr>
<tr>
<td>SE (±)</td>
<td>0.413</td>
<td>0.029</td>
<td>0.100</td>
<td>0.450</td>
</tr>
<tr>
<td>CD at 5%</td>
<td>1.261</td>
<td>0.087</td>
<td>0.302</td>
<td>1.356</td>
</tr>
</tbody>
</table>

*Each value represents the average of three determinations
T0- 35% SMP +40% Oil + 0% Cardamom flavour T2- 35% SMP +40% Oil + 1% Cardamom flavour

Fig 1: Texture profile analysis (TPA) of flavoured mayonnaise

It could be revealed that adding xanthan gum to the low fat mayonnaise i.e. T2 formulation is very important to have a product with good textural characteristics and high emulsion stability due to increase in viscosity. Texture profile analysis of low fat mayonnaise products had higher firmness, adhesiveness, hardness and cohesiveness.

Viscosity of flavoured mayonnaise at different temperature
The effect of viscosity of flavoured mayonnaise at refrigerated and room temperature were studied upto 30 days storage period. Results on changes in viscosity of flavoured mayonnaise are given in table 2.
Table 2: Effect on viscosity of flavoured mayonnaise at different temperature

<table>
<thead>
<tr>
<th>Storage Days</th>
<th>Room temperature (28 °C)</th>
<th>Refrigerated temperature (4 °C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$T_0$ (centipoise)</td>
<td>$T_2$ (centipoise)</td>
</tr>
<tr>
<td>Fresh</td>
<td>2200</td>
<td>2300</td>
</tr>
<tr>
<td>7</td>
<td>2200</td>
<td>2300</td>
</tr>
<tr>
<td>14</td>
<td>2230</td>
<td>2320</td>
</tr>
<tr>
<td>21</td>
<td>2250</td>
<td>2330</td>
</tr>
<tr>
<td>30</td>
<td>2260</td>
<td>2350</td>
</tr>
</tbody>
</table>

*Each value represents the average of three determinations

Fresh flavoured mayonnaise sample had viscosity at room temperature and refrigerated temperature for $T_0$ sample was 2200 and for $T_2$ sample was 2300 respectively. In 7th day it was observed that flavoured mayonnaise sample was increasing viscosity day by day at room temperature and refrigerated temperature i.e. for $T_0$ 2200 and 2300 where as for $T_2$ sample was found to be 2200 and 2390 respectively. In 14th day storage period of flavoured mayonnaise sample the viscosity at room temperature and refrigerated temperature was observed 2230 and 2320 for $T_0$ sample respectively. Whereas for $T_2$ sample were 2230 and 2400 respectively. In 21th day storage of the viscosity of the flavoured mayonnaise at room temperature and refrigerated temperature was observed 2250 and 2330 for $T_0$ sample and for $T_2$ sample was found to be 2250 and 2450 respectively at the 21st days of storage. at 28th day of storage period the viscosity of the flavoured mayonnaise at room temperature and refrigerated temperature was found to be 2260 and 2350 respectively for $T_0$ sample and for $T_2$ sample were 2255, 2460 respectively. Results are more or less varied than Evanuarini et al., (2015) [3].

The viscosity of flavoured mayonnaise was shown to be increased slightly with increase in storage period upto 30 days in both the storage condition.

References