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RHEOLOGICAL BEHAVIOR AND SENSORY EVALUATION OF COMMERCIAL MAYONNAISE

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Abstract

The aim of this paper was to evaluate the sensory parameters at two brands of commercial mayonnaises, traditional and light, using ANOVA: Single Factor and t-Test: Paired Two Sample for Means, as well as, determine the rheological behavior using a rotational viscosimeter BROOKFIELD, DV-E.

The sensory texture and flavour profiles were developed and determined in agre element with the respective international standards, using a group of selected and trained assessors. From the rheological behavior, the data confirm that is capable of distinguishing rather well between mayonnaises made with a different formulation..The results showed preference for standard mayonnaise independent of brand. Even with the increase demand for lights products, the consumer still give evidence of preferring standard mayonnaise with the normal tenor of fat.

All samples had shear-thinning characteristics due to the flow behavior index were less than a progressive decrease in shear stress occurred with the addition of carbohydrate in the continuous phase.Traditional mayonnaise showed higher values to shear stress and apparent viscosity when compared with the light ones.

Key words: mayonnaise, sensory analysis, rheological.

INTRODUCTION

Mayonnaise belongs to the food products widely consumed in Europe. It is an emulsion of vegetable oil and water, where egg yolk acts as an emulsifier (Yang and Lai, 2003; Chirciu and al., 2018) and salt, vinegar, sugar, and other substances. The composition of mayonnaises is very close to that of various dressings (Friberg and al., 2003; Ford and al., 2004). Mayonnaise has a semisolid structure with pronounced viscoelastic properties, growing liquid at moderate shear.

The elastic character prevails over the viscous character at the same frequency.The complex viscosity decreases with increasing frequency.

A number of factors influence the mayonnaise emulsion. These factors that have been discussed are: the egg yolk, the relative volume of the phases, the emulsifying effect of mustard, the method of mixing, water hardness, and viscosity.

Numerous research efforts have shown these factors to be of great significance in the formation and stability of a high quality mayonnaise.

One of the important characteristic of viscoelastic behavior is the dependence of the material properties on time, in addition to temperature and moisture content (Abdelrahim, K.A and al., 1994; Girard and al, 2002).

The rheological properties are very important in order to design food processing operations: mixing, pumping, heating, cooling (Dail and al, 1990; McClements, 2005; McClements, 2016; Karas and al., 2002) and in aspects such as the product acceptance by the consumer (Harrison and Cunningham,1985; Pons, 1994) and the optimization of process variables.

Hydrocolloids are in most cases water-soluble large molecules, which enhance properties such as viscosity dramatically.

This makes thei rapplication in food and cooking obvious.

A wide range of food products is composed of oil-in-water (O/W) emulsions, such as salad dressings, mayonnaise, and sauces.

It is well known that emulsions are thermodynamically unstable systems and two kinds of additives are ofen added to them in order to avoid phase separation: emulsifers and/or stabilizers.

Emulsifers are mainly surface-active substances which can be adsorbed onto the droplet surface lowering the surface tension and preventing droplet aggregation (Paraskevopoulou and al., 2005).

Stabilizers are substances used to increase the viscosity of the aqueous phase and enhance the emulsion stabi lity by ret arding droplet movement (Rao and al, 1992; Depree and al., 2001; Liu and al., 2007; Morna, 2013; Morna, 2014).

The objective of the current project was sensory evaluate two brands of commercial mayonnaises, traditional and light, through ANOVA: Single Factor and t-Test: Paired Two Sample for Means, as well as, determine the rheological behavior using a rotational viscosimeter BROOKFIELD, DV-E.

MATERIAL AND METHOD

The experiment is based on input material provided by two brands of commercial mayonnaises, traditional and light, adding up 4 samples.

The compositions of the brands are:

- Brand M_1 traditional (M_1T): water, sunflower oil, vinegar, modified maize starch, pasteurized eggs, sugar, salt, lemon juice, lactic acid, xanthan gum, sorbic acid, disodium calcium EDTA, BHT and BHA.
- Brand M_1 light (M_1L): water, soybean oil, vinegar, modified corn starch, pasteurized eggs, sugar, salt, lemon juice, lactico acid, xanthan gum, sorbic acid, calcium disodium EDTA, flavors, BHT and BHA

- Brand M_1 traditional (M_2T): water, sunflower oil, modified corn starch, pasteurized eggs, sugar, vinegar, salt, potassium sorbate, lactico acid, citric acid, xanthan and guar gum, (sorbic acid, calcium disodium EDTA), BHT, BHA, color added beta-carotene and flavors.
- Brand M_2 light (M_2L**):** water, soybean oil, modified corn starch, pasteurized eggs, sugar, vinegar, salt, lemon juice, potassium sorbate, lactico acid, xanthan and guar gum, EDTA, BHT, BHA, color added beta-carotene and flavors.

It can be seen that there is no difference between brands chosen compositions.

The sensory analysis was carried out in a standard test room (STAS 1754-83) under the conditions specified by the respective international standard (STAS 1754-83) (Paraschivescu, 2005; Weenen, 2003).

The sensory analysis was carried out in a sensory laboratory. Sensory evaluation was performed by a trained sensory panel consisting of 15 trained assessors.

Panellists were trained in 2h sessions prior to evaluation to be familiar with attributes and scaling procedures of food samples.

The samples were tempered at 10 ℃±1 ℃ before tasting.

Each assessor was served representative mayonnaise samples of 5g placed on white plastic glass and labelled with a three-digit temperature conditions were standard, during day time, and under regular room temperature (20 ℃).

The following list of specific attributes and sensory descriptors was defined: appearance: color (intensity of yellow color); texture:consistency (thin to thick), homogeneity (homogenous to heterogeneous); smell (weak to strong): olive, rancid; taste (weak to strong): salty, sour, bitter, chili, rancid; overall acceptability: bad to very good.

The analysis was performed by scoring attributes on a structural scale from 0 to 9 points, where higher score means more expressed attribute.

Each attribute had its own individual scale.

After a statisticalevaluation, the results were graphically presented, and sensory profiles were demonstrated.

Sensory characteristics: appearance, texture, smells, and taste were evaluated on a nine-point hedonic scale, with 1 being “dislike extremely” and 9 being “like extremely”.

ANOVA: Single Factor and t-Test: Paired Two Sample for Means ($p \leq 0.05$) was used to establish the significance of differences in sensory evaluation of mayonnaise samples.

Rheological measurements were carried out for all the sauces using a rotational viscosimeter BROOKFIELD, DV-E. The rheological parameters were determined at 25 ℃.

RESULTS AND DISCUSSION

The descriptive analysis of mayonnaise samples showed that there were no significant differences in the sensory characteristics including stability, homogeneity, yellow color, brightness, consistency or oiliness of the mayonnaise.

Table 1 shows the data obtained with the ANOVA Single Factor.

Table 1

Sensory evaluation of mayonnaise samples

	Samples			
Characteristics	M_1T	**M_1L**	**M_2T**	**M_2L**
Homogeneity	8.44 ±0.88	**7.88 ±1.26**	**8.22 ±0.83**	**7.33 ±1.32**
Yellow color	8.44 ±1.01	**8.22 ±0.83**	**8.33 ±1.11**	**5 ±2.73**
Brightness	8.33 ±0.86	**8.22 ±1.39**	**8.11 ±0.92**	**8.77 ±0.44**
Stability	7.88 ±1.36	**5.55 ±2.00**	**7.77 ±0.83**	**8.77 ±0.44**
Consistency	8.22 ±0.83	**7.22 ±1.09**	**8.11 ±1.16**	**8.88 ±0.33**
Oiliness	8.33 ±1.11	**8.22 ±1.09**	**7.88 ±1.36**	**8.88 ±0.33**

*Means ± SD in the same column with different letters are not significantly different ($p \leq 0.05$) by ANOVA. Brand M_1 Traditional (M_1T), Brand M_1 Light (M_1L), Brand M_2 Traditional (M_2T), Brand M_2 Ligh (M_2L).

Brand M_2 (Traditional and Light), were better evaluated to characteristic brightness, however that was only statistic difference between Brand M_1 and M_2 lights.

Color of Brand M_1 traditional had higher scores approaching to the color specific for mayonnaises.

Brand M_2 light had significantly difference from the others one and presented brighter color.

There was a significant statistical difference between the stability and Yellow color between Brand M_1 and M_2 lights.

Yellow color of Brand M_2 light mayonnaise was evaluated as too pale and dense, mainly due to thickening agents.

Consistency was chosen as better to Brand M_2 light in comparison with the other samples, followed by Brand M_1 traditional, Brand M_2 traditional and Brand M_1 light.

Even with the increase demand for lights products, the consumer still give evidence of preferring standard mayonnaise with the normal tenor of

fat, how it was demonstrated by higher values obtained for Brands M_1 and M_2 traditional.

The rheological measurements of the samples were carried out with a concentric cylinder Brookfield, DV-E.

Apparent viscosity curves presented the same results (Fig. 1).

This suggests to the food industry that very little or no changes in consistency of lights emulsions can result from carbohydrate addition to the continuous phase.

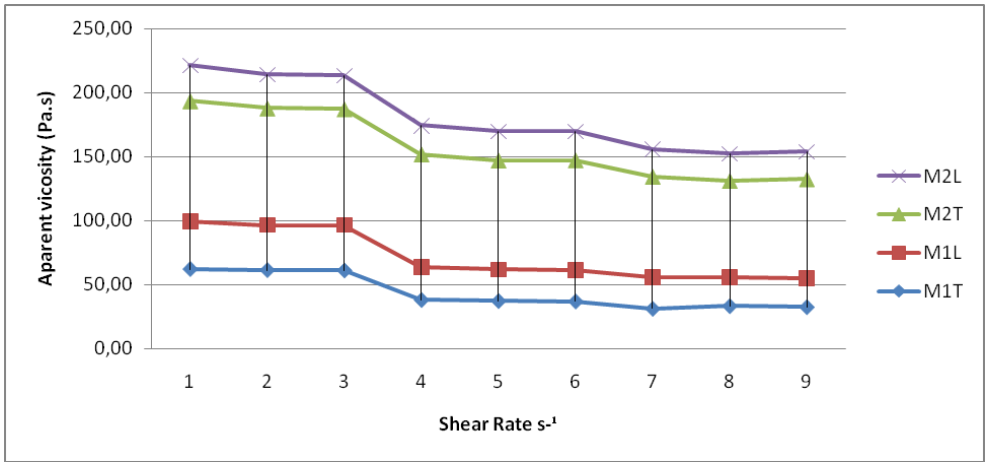

Fig. 1. Apparent Viscosity of the commercial mayonnaise at 25 ℃
Brand M_1 Traditional (M_1T), Brand M_1 Light (M_1L), Brand M_2 Traditional (M_2T), Brand M_2 Ligh (M_2L)

The difference in apparent viscosity between the standard mayonnaise and those with fat reduced is related to the same reason which affect the shear stress values, since that the apparent viscosity is a ratio between shear stress and shear rate. With an increase in shear rate occurs a decrease in apparent viscosity of all samples.

CONCLUSIONS

The focus of this study was to investigate the sensory analysis of commercial mayonnaises manufactured in Romania.

The results showed preference for standard mayonnaise independent of brand.

From the results of descriptive analysis of mayonnaise it can be noted that the assessors did not perceive the difference between the textures of the samples, nevertheless, from the rheological properties the traditional mayonnaise presented the higher values to apparent viscosity and shear stress versus shear rate when compared with the light ones.

Regarding to color the results detected difference between the samples and Brand M_1 traditional had higher scores approaching to the color specific for mayonnaises. Brand M_2 light had significantly difference from the others one and presented brighter color.

Concerning to flavor the standard mayonnaise predominated with the best flavor to both brands.

According to test of preference, Brand M_1 traditional was preferred, followed by Brand M_2 traditional, Brand M_2 light and the last was the Brand M_1 light.

From the rheological behavior, the data confirm that is capable of distinguishing rather well between mayonnaises made with a different formulation.

All samples had shear-thinning characteristics due to the flow behavior index were less than a progressive decrease in shear stress occurred with the addition of carbohydrate in the continuous phase. Standard mayonnaise showed higher values to shear stress and apparent viscosity when compared with the light ones. A partial substitution of oil on the basic formula by other ingredients, like gums and starches, perform a decrease in the apparent viscosity and yield stress of the product.

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