Available online at www.scholarsresearchlibrary.com

Scholars Research Library

Annals of Biological Research, 2013, 4 (7):70-72
(http://scholarsresearchlibrary.com/archive.html)

Annals of Biological Research
Scholars Research Library
ISSN 0976-1233
CODEN (USA): ABRNBW

Effect of different concentration of honey on rheological properties of sesame paste (Ardeh)

Sepideh Gharehyakheh[1*], Hamid Tavakolipour[1] and Maryam Amiri[2]

[1]*Department of Food Engineering Islamic Azad University, Sabzevar Branch, Sabzevar, Khorasan Razavi, Iran*
[2]*Islamic Azad University, Qazvin Branch, Faculty of Industrial and Mechanical, Department of Food Science and Industries, Qazvin, Iran*

ABSTRACT

Rheological properties are one of the most important factors which are required in the design of a different industrial process in food emulsion. Arden is oil-in-water emulsion that is one of the traditional foods stuff in Iran which is prepared by grinding the roasted sesame seeds. In this research Ardeh was mixed with 3 different concentrations (36%, 39 and 42%) of honey. The experiments performed to characterize the temperature and shear dependency of the flow behavior of samples. The result of this test was the changes of shear stress versus shear rate. The results of this study revealed that all of the prepared samples were shown shear thinning behavior.

Keywords: Sesame paste, Shear thinning, Rheological properties, Honey.

INTRODUCTION

Some different kind of foods is fluids. In the food industry, properties of flow behavior is very important not only in transportation of food and operations involving the processing but also in terms of explaining a set of properties that used as suitable quality indexes that can be objectively measured. A better understanding of the characterization that affected the quality of food pastes will enable food producer to better control and design the properties of final products. So, a good understanding of the rheological properties is one of the most important factors required in the design of a different industrial process in food production [1]. Most of food stuff that encounter in industrial processes is non-Newtonian in nature. It means its consistence changed in different condition. There is a growing interesting attached to understanding the flow behavior of this fluids in food processing industries. Food emulsions display a wide diversity of rheological behavior, ranging from very low viscosity Newtonian fluid, such as fruit beverages, to high viscosity fluid, such as dressing and paste, to plastic behavior, such as margarine and butter. This wide range of diversity is the result of the different processing conditions used to produce each unique sort of food stuff and different kind of its ingredients [2]. The most important emulsions in food industry are oil-in-water and water-in-oil types [3], there are much food stuff in the form of an emulsion, such as beverages, salad dressings, desert like sesame paste [4]. Ardeh is oil-in-water emulsion that is one of the traditional foods stuff in the Middle East such as Iran which is prepared by grinding the roasted sesame seeds, and is known by different names for examples Tahineh (in Arabic countries) Tahin (in Turkey). Usually, Ardeh consumption with bread for breakfast and consumer acceptance of this product depends on its ability to spread on bread, and is related to flow properties. Therefore rheological properties of this product are important. Different study about rheological behavior of sesame paste was done. The rheological behavior of tehineh as a function of time of shearing and temperature were studied

by Abu-Jdayil *et al* [1]. Habibi-Najafi and Alaei, (2006) studied about flow properties of date syrup/sesame paste blend [5]. Abu and dayil, (2004) determined the flow properties of halwa tehineh (sweetened sesame paste) [1]. Akbulut *et al*, (2012), studied about rheological behavior of tahin (Sesame Pastes) blended with honey [6]. In all this study sesame paste blended with sweetener agent for examples with honey, because this product has blend flavor and aroma .On the other hand consumer prefer sesame paste with sweet taste. In Iran, usually, Ardeh consumed with sweetener agent like fruit marmalade, grape juice, sugar or honey. Thus, the aims of this work were to measurement the effect of different concentration of honey on rheological properties of Iranian sesame paste (Ardeh)

MATERIALS AND METHODS

Materials

Ardeh was obtained from a local company and mixed with 3 different concentrations (36%, 39% and 42 %) of honey. In all the samples the weight of Ardeh was 450 gram.

Methods

Flow properties of samples were determined with a Haake-VT 500 viscometer (bob diameter 20.2 mm, bob length 61.4 mm). Samples were allowed to rest for about ten minutes before to measuring their rheological properties. The experiments performed to characterize the temperature and shear dependency of the flow behavior of samples. The result of this test was reported as the changes of shear stress versus shear rate. Sample with different concentration of honeys were loaded into the gap of the cylinder viscometer and then left to reach the suitable temperature. The apparent viscosities of samples were measured in different temperature include 20, 35, 50 and 65°C, by continuously increasing of the shear rate (Forward measurements). The shear rate was varied from about 0.39 to 221 1/s [6].

RESULTS AND DISCUSSION

The relationship between shear stress and shear rate of different prepared samples of Ardeh with added honey was plotted as in Fig. 1. As shown from this figures, all samples under examination were non-Newtonian fluids, it means, the slope of the shear stress versus shear rate curve will not be constant as we change the shear rate. If the viscosity decreases with increasing shear rate, the fluid named shear-thinning. Samples in all the applied temperature were sensible to shear, a characteristic of pseudoplastic fluid. In some case, with applying shear rate, pseudoplastic fluid may show three different regions as below: 1, lower Newtonian region that viscosity is constant with increase shear rate, this viscosity named limiting viscosity at zero shear rate. 2, a middle region that viscosity is changing with shear rate. 3, upper Newtonian region witch called limiting viscosity at infinite shear rate, that viscosity is constant with increase shear rate [7]. This phenomena was observed in this curve, at 20 ° C (Fig.1, A), and low shear rate (between 3.08 1/s to 16.31 1/s) in all the prepared samples slop of curve was about constant (limiting viscosity at zero shear rate was appeared) and At 35 ° C (Fig.1, B), and high shear rate (between 222 1/s to 168 1/s) with 42% honey slop of curve was constant(limiting viscosity at infinite shear rate). Therefore, many shear-thinning fluids will show Newtonian behavior at both low and high shear rates. The middle region is important for producer in industry for suitable control and design of equipment. The lower Newtonian region refer to the problem that related to low shear rate, for example sedimentation of suspended particles in fluid [7], this problem was frequently observed in storage period of Ardeh. The flow behavior of the samples was changed by the formulation used. In all applied temperature the highest curve related to Ardeh blend with 42% honey it means this sample at constant shear stress has lowest deformation, so highest apparent viscosity refer to this product. For example at 50 ° C and in constant shear stress (100 pa) , the level of shear rate for Ardeh with 42% honey was about 801/s, but for Ardeh with 36% and 39% was about 200 1/s , also at 65 ° C for reached to about 200 1/s of deformation , required shear stress for Ardeh with 42% honey was about 300 pa but for Ardeh with 36% and 39% was very lower (about100 pa). It means for same deformation Ardeh with 42% honey required 3 time higher energy in compare to other samples. According to this curve, it can be stated that apparent viscosity of the samples increased when more honey was added in the formulation. Because honey has high content of different monosaccharide such as fructose, glucose, and this component can absorbed free water of system so, by increasing the concentration of honey higher water binding capacity was occurs and therefore consistency will be increased. There was decreased in the apparent viscosity of the samples with the increase temperature. For example at 20 ° C, and applied constant shear stress (100 pa) the level of deformation for Ardeh with 42% honey was about 40 1/s and when temperate increased and reached to 35 ° C, this flow was increased and reached to about 140 1/s. This result were consistent with the results obtained by Habibi-Najafi and Alaei in (2006) [5], Akbulut *et al*, (2012) [4] and Abu-Jdayil, (2004) [1]. All of this studies

were approved that sesame pastes alone or with sweating agent to be shear thinning at all temperatures measured, it means apparent viscosity decreased with the increasing the shear rate, also apparent viscosity decreased with temperature.

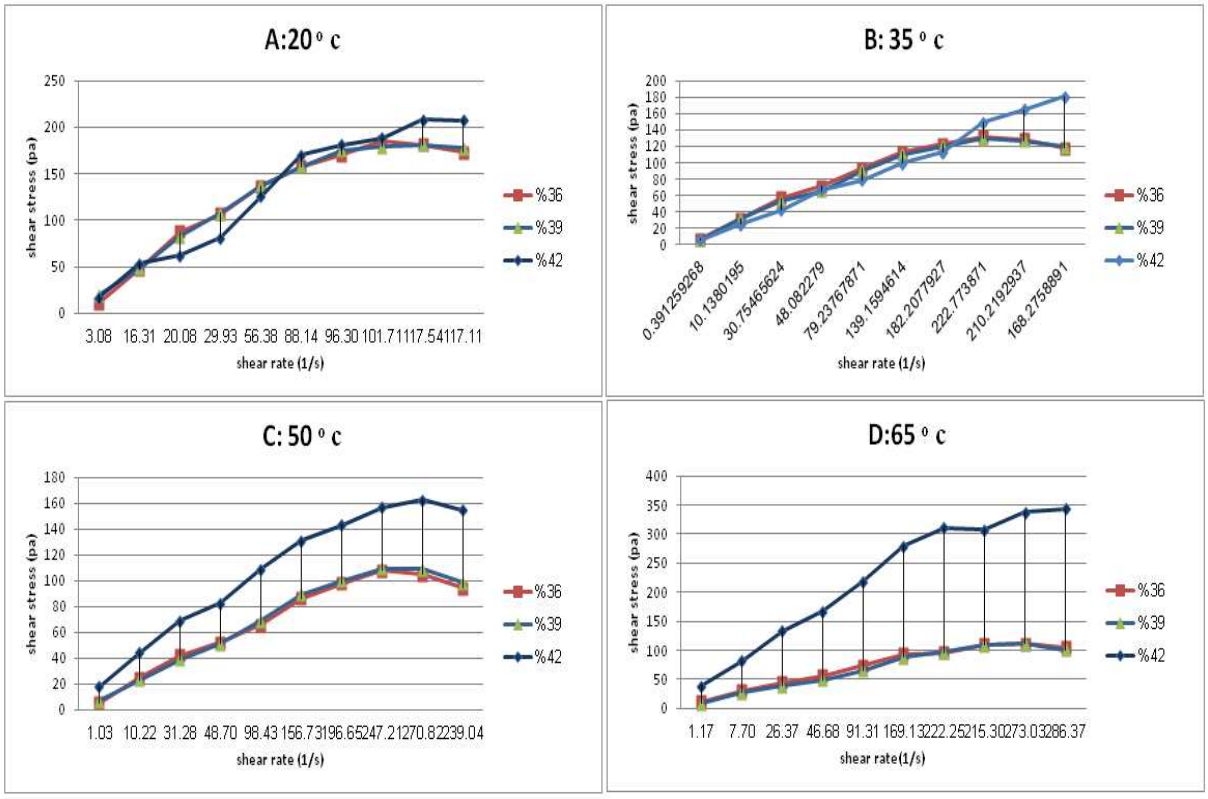

Fig. 1: (A-D): Effect of different temperature (20, 30, 50, 65 °C) and shear rate on shear stress of Ardeh with different concentration of honey (36, 39, 42%)

CONCLUSION

Rheological parameters, is considered as an important physical properties related to the final quality of fluid. Many of different equipment in process like heat transfer rate, direction of feed and type of evaporator are all affected by the viscosity of product. The present research showed that honey can be used to improve viscosity of Ardeh whereas the consistency decreased with increasing temperature, due to the importance of rheological properties in industry these kind of result should be considered.

REFERENCES

[1] B. Abu-Jdayil, *Eur Food Res Technol* ., **2004**, 219, 265–272.
[2]D. J. McClements, *New York: CRC*., **2003**, 3–15.
[3]D. J. McClements, *Boca Raton: CRC*., **1999**.
[4] M. Akbulut, M.M., Ozcan, H. Coklar , *Int J Food Sci Nutr*., **2009**, 60, 577–589.
[5]M. B. Habibi-Najafi , Z. Alaei , *World J. Dairy & Food Sci*., **2006**,1(1), 1-05.
[6] M. Akbulut , C. Saricoban , M. M. Ozcan, *Food Bioprocess Tech*., **2012**, 5,1832–1839.
[7] J.F. Steffe, *free man press*,**1992**.