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Extended Abstract

Optimization of Sesame Oil Organogel Production and Its Effect on Physicochemical and Qualitative Properties of Sohan

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Abstract

This study aimed to optimize organogel production parameters using different amounts of beeswax and mono-di-glyceride and its application in Sohan formulation. Organogel production was performed with different levels of wax (0, 1.67, 5, 8.33 and 10%) and mono-di-glyceride (0, 1.67, 5, 8.33 and 10%). The numerical optimization of the process variables based on maximum organogel firmness, melting point, viscosity of Sohan dough and the lowest amount of released oil from Sohan were determined using the response surface methodology (RSM). Increasing the use of wax and mono-di-glyceride increased the organogel firmness and the viscosity of Sohan dough. On the other hand, increased use of wax and mono-di-glyceride significantly (P<0.05) reduced the amount of oil released from Sohan. The optimum conditions for the organogel production to the preparation of Sohan with desirable physical and chemical quality were 8.82% mono-glyceride and 7.03% wax. The comparison of the predicted sample with the experimental sample showed that there was no significant difference (P<0.05) between the predicted and experimental samples, which indicates the proper fit of the predicted model for Sohan production based on organogel. The comparison of Sohan quality characteristics with the control sample showed that antioxidant activity, moisture content and sensory properties of Sohan samples prepared with optimal organogelol formulation were better than control samples and its ash and oil released was less than the control sample. Therefore, it is possible to replace suitable organogel with fat at optimum levels in the formulation of products such as Sohan without disruptive effect on the quality characteristics of the product.

Keywords: Mono-di-glyceride, Optimization, Organogel, Sohan, Wax

Introduction

Sohan is one of the traditional energetic and nutritious Iranian sweets that have high quantity of fat in formulation (about 30%) (Maghsoudloo, 2003). Solid, crystalline triglycerides with significant amounts of saturated and trans fatty acids are usually necessary for textural requirements of product (Pernetti, van Malssen, Flöter, & Bot, 2007). Vegetable oils do not have the physical properties needed for industrial production of this product because they are rich in unsaturated fatty acids and are not crystalline form. In lipid modification processes

such hydrogenation, the basic structure of oil and fat can change in order to achieve desired plastic characteristics. However, in this process nutritional characteristics of oil are diminished due to saturation of double bond and creation of trans form of fatty acids. Organogels are semi solid systems based on the gelation of organic solutions by organic gelators (compounds with low molecular weight or soluble macro molecules that are capable of creating a three-dimensional network). The limitation of migration and oil mobility, possibility of replacing them with saturated and trans fatty acids, stabilizing emulsions, and the ability to control the release of nutrients in solutions are several characteristics of organogels (Samateh, Sagiri, & John, 2018; Schaink, Van Malssen, Morgado-Alves, Kalnin, & Van der Linden, 2007).

The purpose of the present study was to produce organogel using different amounts of wax and mono-diglyceride and investigate the effect of substitute of saturated solid fat content of Sohan formulation with oleogen on quality of batter and product and select the best formulation.

Materials and methods

Organogel production was performed using different levels of wax (0, 1.67, 5, 8.33 and 10%) and mono-di-glyceride (0, 1.67, 5, 8.33 and 10%) according to the method described by Jang, Bae, Hwang, Lee, & Lee (2015). Firmness and melting point of 13 prepared organogel were measured and they were used in production of Sohan (Valoppi *et al*., 2017). Viscosity of Sohan's batter and quantity of released oil from product were measured as the most important qualitative properties of middle and final product (Shariati, Azadmard-Damirchi, & Shirani Rad, 2018; Valoppi *et al*., 2017). The numerical optimization of the process variables based on maximum organogel firmness, melting point, viscosity of batter and the lowest amount of released oil from Sohan were determined using the response surface methodology (RSM). The physicochemical and sensorial properties of the best produced sample with organogel and control were evaluated and compared using a randomized complete design.

Results and discussion

Developed models showed increasing wax and mono-di-glyceride content of organogel enhanced the organogel firmness and viscosity of Sohan's batter. On the other hand, the quantity of wax and mono-di-glyceride significantly (P<0.05) affected the amount of oil released from Sohan. With considering the quantity of dependent variables, the optimum amounts of independent variables in production of suitable organogel to prepare Sohan were 8.82% mono-glyceride and 7.03% wax. The validation of models showed there were no significant difference (P<0.05) between predicted and experimental results. Comparison of physicochemical characteristics of produced Sohan using organogel and control sample showed new product follow standard criteria and was superior to control in antioxidant activity, moisture content and sensory properties.

Conclusions

Gel like structure of organogel due to Hydrogen bonding and Van der aals forces of gelator is effective on trapping oil and creation of suitable structure in products. Type and quantity of gellators are important parameters in quality of organogel and textural properties of foods that is necessary to determine individually for each special product. The selected organogel in the present research was replaced with fat content of the product without disruptive effect on quality characteristics of it.

References

Jang, A., Bae, W., Hwang, H.-S., Lee, H. G., & Lee, S. (2015). Evaluation of canola oil oleogels with candelilla wax as an alternative to shortening in baked goods. *Food chemistry, 187*, 525-529. doi:https://doi.org/10.1016/j.foodchem.2015.04.110

Maghsoudloo, Y. (2003). *Suhan processing technology*: Tehran: Agricultural Sciences Publishing House.

Pernetti, M., van Malssen, K. F., Flöter, E., & Bot, A. (2007). Structuring of edible oils by alternatives to crystalline fat. *Current Opinion in Colloid & Interface Science, 12*(4-5), 221-231. doi:https://doi.org/10.1016/j.cocis.2007.07.002

Samateh, M., Sagiri, S. S., & John, G. (2018). Molecular Oleogels: Green Approach in Structuring Vegetable Oils *Edible Oleogels* (pp. 415-438): Elsevier.

Schaink, H., Van Malssen, K., Morgado-Alves, S., Kalnin, D., & Van der Linden, E. (2007). Crystal network for edible oil organogels: possibilities and limitations of the fatty acid and fatty alcohol systems. *Food Research International, 40*(9), 1185-1193. doi:https://doi.org/10.1016/j.foodres.2007.06.013

Shariati, F., Azadmard-Damirchi, S., & Shirani Rad, A. H. (2018). Oleogel production from canola oil with mixture of ethyl cellulose and polyglycerol polyricinoleate. *Food Science and Technology, 15*(81), 77-86.

Valoppi, F., Calligaris, S., Barba, L., Šegatin, N., Poklar Ulrih, N., & Nicoli, M. C. (2017). Influence of oil type on formation, structure, thermal, and physical properties of monoglyceride-based organogel. *European Journal of Lipid Science and Technology, 119*(2), 1500549. doi:https://doi.org/10.1002/ejlt.201500549

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