Effect of citrus fiber replacement to oil and egg on some physico-chemical and organoleptic properties of muffin

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Introduction: Cake is one of the most important and widely used cereals and a product of wheat flour. Usually, high-calorie in a variety of cakes is attributed to oils, eggs and sugar in their formulation. Nowadays, the risk of cardiovascular diseases is increasing in most parts of the world and the demand for using the low fat and low cholesterol foods is increasing due to the relationship between excess fat and various diseases. Therefore, it seems that the partial or complete removal of oil and egg and replacing them with other substances in the formulation of the cake is very important. In recent years, the use of dietary fiber of different sources in food products is increasing due its beneficial effects on human health. Among agricultural products, the residues from the processing of oranges are rich in fiber that can be used as a dietary fiber in the food industry. Fiber is a general term for many different types of carbohydrates that is obtained from plant cell walls and is not decomposed by digestive enzymes in the human body. Formulating the food with citrus fiber could be very beneficial since the existence of a variety of fiber compounds in the peel of citrus with neutral pH that the property may leads it to be widely used in a variety of foods. Others advantage is that it lead to improve the cooking performance, increase the water binding capacity, the oil absorption and improve the final texture of product with lower costs.

Materials and methods: In this study, the use of citrus fiber was studied in order to improve the structure and nutritional properties of muffin with a new formulation. In this regard, the orange fiber at three levels (0.5%, 1% and 2%) and with 25% of decrease in oil and egg was used in the muffin production process. In this study, the raw materials, including null flour, sugar, liquid oil, eggs, milk, salt, vanilla, baking powder and orange fiber were prepared from France ID Food Company. Two-step mixing method was used to prepare the dough. The cakes were placed at 180 ° C for 30 minutes. In all tests, the control treatment with code T, treatment containing 0.5% of orange fiber with code T1, treatment containing 1% of orange fiber with code T2 and treatment containing 2% of orange fiber with code T3 were determined. First, the chemical tests including moisture, ash, fiber and pH were conducted on the wheat flour. Then, viscosity determination was carried out using a Brookfield viscometer. Also the density measurement performed on the muffin cake dough. Afterwards, the production of different treatments, the chemical tests including moisture, ash, fiber and pH as well as the staling tests were performed by two sensory and instrumental methods by Instron device and also the organoleptic characteristics (volume, crack, balance of shape, taste and aroma, chewiness, apparent texture, uniformity of pores in the cake center and the color of cake center and the outer shell) were conducted by using five senses on the produced Muffin Cake according to the standard method.

Results and discussion: For statistical analysis of data from physicochemical and sensory tests, completely randomized design and data from staling test from factorial experiment in a completely randomized block design was used and the mean comparisons were conducted by Duncan's multiple range test at probability level of 1% (α=1%) and by using SPSS software, version 16. Considering the results of viscosity and density of the muffin cake dough, the highest amount of viscosity and density belonged to the treatment containing 2% of orange fiber (T3) and control (without orange fiber). The highest percentages of moisture, ash and fiber were calculated for the treatment T3 and the lowest amounts were calculated for control. Also, the highest and the lowest amounts of pH were observed in the treatments of control and T3, respectively. Also, considering the results of staling test by both sensory and instrumental methods and in the intervals of 24, 48 and 72 hours after baking and in all time periods of treatment T3 had the highest score of freshness (delay in staling) and the treatment containing 1% of orange fiber (T2), containing 0.5% of orange fiber (T1) and control (T) had the lowest score of freshness.

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respectively. The control sample had the highest amount of staling in all days and the amount of staling increased in all treatments over time. It is noteworthy that at all time intervals, the control sample had the highest rate of staling and the staling rate increased for all treatments over time. Considering the results of sensory test, T1 was introduced as the best treatment and in most of the organoleptic characteristics such as taste, flavor, uniformity of pores, chewiness, and overall acceptance had no significant difference with the control sample and was the nearest sample to the control and had the highest score and the highest level of consumer acceptance.

**Conclusion:** The results showed that adding different levels of orange fiber has a significant effects on physicochemical and organoleptic properties of the muffin cake and replacing 25% of oil and egg used in muffin cake with 0.5% of orange fiber is possible and has enough acceptances.

**Keywords:** Cake, Muffin, Fiber, Citrus fiber.