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The Optimization of Characteristics of Diet Donut Enriched with Orange Pulp Powder

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Abstract

Donuts are a sweet snack that is typically fermented and dipped in fry. Therefore, its problems include absorbing a large amount of oil, which must decrease by inventing of some methods. In this study, the effect of orange pulp powder in the range of 0 to 12.5 percent and xanthan hydroquinone in the range of 0 to 1.5 percent on Donut characteristics were investigated using response surface method. The results represented that by increasing the amount of orange pulp powder as a source of soluble and insoluble dietary fiber, which contains pectin and cellulose and xanthan gum, the moisture content, ash, fiber, density, yellowness and redness of donuts crust and crumb of the product, contrast, correlation, entropy, hardness, gumminess, chewiness, total acceptance increased, however, fat absorption, lightness of donuts crust and crumb, homogeneity, softness, cohesiveness, porosity significantly decreased. The result indicated that replacing 10.73 percent of orange pulp powder and 0.04 percent of xanthan gum will reduce the absorption of oil, increase fiber and produce healthy donuts.

Keywords: Donut, Fiber, Hydrocolloid, Orange pulp

Introduction

Donuts are a sweet snack that produced by fermentation of dough and then frying in oil. So, it absorbs a lot of oil and the content of donuts fat depends on formulas and processing conditions is between 10% and 26%. Obviously, laziness and consumption of greasy foods leads to high cholesterol, hypertension, cardiovascular disease, obesity and weight balance is disturbed. The use of soluble and insoluble dietary fiber is one of the ways to reduce oil absorption. In recent years, many researches to improve the quality donuts and enrich with fiber components or other nutrients has been done. For example, the effect of carrot powder (Nouri *et al.*, 2017) and bagasse powder (Darapur *et al.*, 2018) on the characteristics of donuts can be mentioned. Hence, the orange pulp as an industrial waste is an excellent source of fiber, the purpose of this paper is to investigate the effect of adding it on the physicochemical, visual, and sensory and texture properties of fermentation donuts.

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Material and methods

Raw materials, including flour with moisture, ash and fiber content 10.78, 0.24 and 0.032, percent respectively. Active dry yeast and xanthan gum were provided, for the production of Orange pulp powder, it was produced by drying pulp after extraction juice from orange. In the study, the effect of orange pulp powder in range of 0 to 12.5% and xanthan hydrocolloid in range of 0 to 1.5% on characteristics of donuts were studied. The findings obtained using MINITAB software (Version 16) via Rotatable Central Composite Design evaluated.

Results and discussion

The important aims of this study were to decrease oil absorption and increase fiber in donuts. Figure (1), shown that increasing in Orange pulp powder content caused reduces of the amount of oil absorption in treatments. Soluble and insoluble fiber creates a layer of gel on the sample that increased the water holding capacity and inhibitor of oil absorption during frying. Also, Figure (1) shown that dietary fiber content of donuts increased with enrichment by orange pulp powder that it is rich in pectin and cellulose.

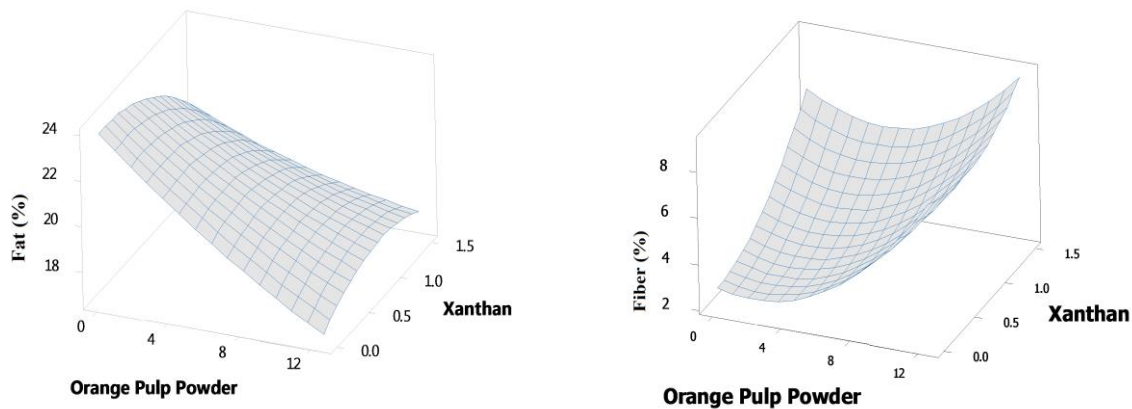


Figure 1. Response surface affecting the oil and fiber

Evaluation of Table (1) showed that texture of enrichment treatments was tougher because of the replacement of gluten flour with orange pulp powder caused formation weak gluten network. As a result, the dough does not have the ability to hold gas and the product becomes firmer and more compact.

Table 1. ANOVA and regression coefficients textural responses and enriched sample

Source	Cohesiveness (mm)	Gumminess (N)	Chewiness (N.mm)	Hardness (N)	density
Linear	3.52*	15.31**	11.06**	0.33 ^{ns}	3.35 ^{ns}
A	1.62 ^{ns}	23.84**	16.42**	0.00 ^{ns}	6.69 ^{ns}
B	0.66 ^{ns}	0.40 ^{ns}	0.54*	0.53 ^{ns}	0.95 ^{ns}
A ²	4.22 ^{ns}	3.99 ^{ns}	2.98 ^{ns}	2.47 ^{ns}	23.93**
B ²	0.49 ^{ns}	0.20 ^{ns}	0.13 ^{ns}	0.47 ^{ns}	2.43 ^{ns}
AB	0.02 ^{ns}	0.07 ^{ns}	0.41 ^{ns}	0.00 ^{ns}	0.00 ^{ns}
Model(P-value)	3.52*	35.98***	27.63***	4.80 ^{ns}	10.17**
Lack of fit	82.74**	31.08**	13.61 ^{ns}	0.00***	10.41*
R ²	71.56	96.25	95.18	77.40	87.90
R ² -adj	51.25	93.58	91.73	61.26	79.26
CV	14.77	15.32	15.05	22.77	7.4
PRESS	0.21822	0.008764	0.010366	0.299107	0.016518

A: levels of OPP, B: levels of Xanthan gum, AB: levels of interaction effect
 ns,*,**,***,**** respectively, indicating no significant, significant in (P<0.05), significant in (P<0.01), significant in (P<0.001), significant in (P<0.0001)

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Conclusion

The aim of study was to decrease oil absorption in donuts and produced healthy products. The results of this study showed that increasing orange pulp powder in fermented donut formulation increased the amount of ash, fiber, moisture, density and reduced fat absorption in the donut brain. Adding this additive also reduced the brightness index and increased the amount of yellowness and redness of the crust and crumb of donut. Surface texture features also reduced energy and correlations, and increased contrasts, homogeneity and entropy. Sensory evaluation was accompanied by reduced softness, porosity and increased chewing ability and overall acceptance. On the other hand, fortified sample had a higher gummy and tighter texture. Finally the optimum sample was determined by the level of replacement of 10.73% orange pulp powder and the 0.04 % of xanthan gum to reduce fat intake and increase fiber.

References

- Nouri, M., Nasehi, B., Samavati, V., & Abdanan Mehdizadeh, S. (2017). Optimization the effects of Persian gum and carrot pomace powder for development of low-fat donut with high fibre content. *Bioactive Carbohydrates and Dietary Fibre*, 9, 39-45. doi:<https://doi.org/10.1016/j.bcdf.2017.01.001>
- Darapour , M. (2017). *The effect of the addition of the enzyme transglutaminase features rich donuts with sugar cane bagasse*. (Unpublished master's thesis) Agriculture & Natural Resources University in Khuzestan. (in Persian)