J. Food and Dairy Sci., Mansoura Univ., Vol. 9 (2): 91 - 96, 2018

Effect of Using Date Pits Powder as a Fat Replacer and Anti-Oxidative Agent on Beef Burger Quality

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ABSTRACT

Date pits powder is considered as a rich source of fiber and polyphones. So, this research was carried out to assess the quality properties of reduced- fat burger as influenced with date pits powder. The prepared burger samples contained date pits powder as fat replacer with substitution ratio of 25, 50 and 75% of animal fat. Cooking quality, lipid oxidation, and sensory evaluation were measured in burger samples. The results revealed that adding date pits powder lead to an improvement in burger nutritional value and cooking properties. In burger contained date pits powder, there was an increment in cooking yield, fat retention, and moisture retention meanwhile, shrinkage and Feder number were decreased. In addition, raw and cooked beef burger contained date pits powder as a fat replacer sample had lower L*, a* and b* values than the control. Beef burger contained date pits powder contained high percentages of polyphenols so it was more stable against lipid oxidation. Adding date pits powder to burger as a fat replacer does not cause any negative effects on its sensory properties.

Keywords: Fat replacer, burger, dietary fiber and lipid oxidation

INTRODUCTION

Consumers now have good knowledge about their food and health. Therefore, healthy meat products must have low cholesterol, fat, and calories(Pinero *et al.,* 2008). Beef Burger is considered as one of the highest popularity in Egypt and all over the world (Eldemery, 2010). It has a high acceptability and consuming rates because it is a quick and cheap meal (Colmenero, 2000). On the other side, it has some disadvantages such as its high content of fats with saturated acids (20-30%) (Selani *et al.,* 2016). Fat has a significant role in processed meat product such as emulsion stability of meats increasing, decreasing loss during cooking process, providing water holding capacity and improving organoleptic characteristics (Rather *et al.,* 2015). However, the addition of fats to meat products leads to a high content of cholesterol and saturated fatty acids (Pappa *et al.,* 2000). The increment of saturated fats intake levels causes harmful diseases such as stroke, cardiovascular disease, obesity and cancer (Gök *et al.,* 2011). Obesity is one of the most serious prevalence diseases in the world, especially as it is linked to other diseases such as heart disease and diabetes, which is cause for worry (Cobb *et al.,* 2015).

For that reasons, WHO mentioned that fats should participate with about 15% to 30% of calories daily intake. Saturated fats should not be more than 10% of daily supplemented calories (Kratz *et al.,* 2013; Missmer *et al.,* 2010; Sullivan *et al.,* 2014). According to these recommendations, several investigations have been done in order to produce healthy and low-fat meat products (Weiss *et al.,* 2010). Nevertheless, reducing fats percentages may cause some problems related to the acceptability of the product, because fat is an important component that effects on meat product properties such as flavor, sensory attributes, and texture (Youssef and Barbut, 2011). Fat substitution by adding carbohydrate-based substances, non- meat proteins, or dietary fiber has been considered a practical approach to solve these problems(Brewer, 2012).

Although the importance of dietary fiber in human nutrition, humans consuming it less than the recommended by FAO (23–38 g/day) (McGill *et al.,* 2015; Ng *et al.,* 2010). Fiber is considered as the most popular functional ingredient because it used in food processing as replacer for fats, reducing fat absorption via frying process, volume improvement, stabilizer, bulking and binder agent(Verma and Banerjee, 2010). In meat processing, fiber has successful applications in cooking yield enhancement, minimizing formula cost, and texture improvement(Choe *et al.,* 2013). Besides, a lot of clinical, biochemical and epidemiological investigations reported that fibers play a positive role in human health via minimizing levels of cholesterol, decreasing hypertension and hyperlipidemia, the gastrointestinal health improvement and preventing some types of cancers such as the colon cancer (Slavin, 2013).

Egypt is the first important countries in the world production which produced 1400072 and 175012 tons date and date pits, respectively as reported by Elbana (2015). Depending on variety and grade quality, the seeds presented about 6-15% of the total weight of the mature date (Nehdi *et al.,* 2010). Date pits contain different chemical compounds such as saturated and unsaturated fatty acids, minerals, crude fiber, total phenols and carbohydrates(Ardekani *et al.,* 2010). Date pits varieties are suitable for consumption and processing due to their low levels of anti-nutritional factors (Zahoor *et al.,* 2011).

There is not enough information about using date pits as a fat replacer in meat products; therefore, the main objective of this study was to evaluate addition effect of date pits powder at different levels as fat replacer on burger quality attributes and lipid stability.

MATERIALS AND METHODS

Materials

Date pits of "Siwy" variety were obtained from El-Salam Company, Badrashin, Giza, Egypt. The date pits were free of physical damage and injury of insects and fungi infection. Beef meat and other components used for burger preparation were obtained from local market at Kafr El-Sheikh city, Egypt.

Chemicals

All chemicals and reagents used in this study were obtained from Sigma Aldrich Chemical Co. (St.

Louis, M.O, USA). All other chemicals and solvents were of analytical grade.

Preparation of Date seeds powder:

Date pits were transferred directly to the laboratory of food technology department, faculty of agriculture, Kafrelshiekh University then it was washed with water and dried at 40ºC for 2 days in an air oven. The dried date pits were crushed using a laboratory mill, then, sieved (100 meshes) and finally, the powder was stored in sealed bags at 4± 2ºC (Bouaziz *et al.,* 2010).

Burger preparation

The beef burger was formulated to contain the following ingredients 80% red muscles beef meat, 20% kidney fat, 18% (w/w) water (ice), 1.5% (w/w) salt, ground black pepper (0.3%), red pepper (0.2%) and cumin (0.2%) according to Aleson-Carbonell *et al.* (2005).The aforementioned ingredients were used to prepare the control sample while 25, 50 and 75% of control fat content were replaced by date pits powder to prepare burger supplemented with date pits powder as a fat replacer.

Meat burgers weighed approximately 30 g each. The beef burgers were stewed using an electrical grill (Genwex GW-066) at 220°C (the space between heat source and the samples was 4 cm) for 8 min (4 min for each side of beef burgers).

Chemical analyses

Gross chemical composition of date pits and burger was analyzed according to A.O.A.C. (2010). Where, total carbohydrates were calculated by difference. Date pits powder dietary fiber content was analyzed according to A.O.A.C. (2010) .

Extraction of polyphenols

Date pits and burger samples were extracted via constant shaking one gram of sample with 50 mL of 70% aqueous methanol for 60 minutes at room temperature. After that, the mixture was centrifuged at 3000×g for 15 minutes. The amount of total polyphenols was estimated in the supernatant as mg Gallic Acid Equivalent/100gm using the method outlined by Singleton *et al.* (1999). Free radical scavenging activity was measured by using DPPH radical solution as outlined by Hara *et al.* (2018).

Burger cooking properties

Cooking yield (%), cooking loss (%), shrinkage (%), fat retention (%) and moisture retention (%) values were measured using the procedure explained according toKılınççeker and Kurt (2018). Also, Feder number value was calculated from the equation reported by Yousefi *et al.* (2018). The results were calculated from the following equations: ‘

$$\text{Cooking yield (\%)} = \frac{\text{Cooking weight}}{\text{Raw weight}} \times 100$$

$$\text{Cooking loss (\%)} = \frac{\text{Raw weight - Cooking weight}}{\text{Raw weight}} \times 100$$

$$\text{Shrinkage (\%)} = \frac{\text{Raw diameter-Cooking diameter}}{\text{Raw diameter}} \times 100$$

$$\text{Fat retention (\%)} = \frac{\text{[cooked weight (g)×\% fat in cooked samples]}}{\text{[raw weight (g) ×\% fat in raw samples]}} \times 100$$

$$\text{Water retention (\%)} = \frac{\text{[cooked weight (g) × \% moisture in cooked samples]}}{\text{[raw weight (g) ×\% moisture in raw samples]}} \times 100$$

$$\text{Feeder number} = \frac{\text{Moisture content \%}}{\text{\% organic non fat content}}$$

Where, % organic nonfat = 100 – (% fat + %ash + % moisture)

Color Evaluation

L* = lightness (0 = black, 100 = white), a* (-a* = greenness, +a* = redness) and b* (-b* = blueness, +b* = yellowness) of uncooked and cooked burger was estimated via a Hunter Lab Colorimeter (Colorflex, Hunter Associates laboratory, USA) according to García-Lomillo *et al.* (2017). Results were expressed as color differential (ΔE) between control and other samples containing date pits powder, calculated as follows:

$$\Delta E = \sqrt{(\Delta L)2+(\Delta a)2+(\Delta b)2}$$

Where,

ΔL was calculated as: ΔLsample - ΔLcontrol; Δa was calculated as: Δasample - Δacontrol; andΔb was calculated as: Δbsample - Δbcontrol.

Lipid oxidation

Thiobarbituric acid reactive substances of samples was quantified using a colorimetric method as mentioned by Kryževičūtė *et al.* (2017).

Sensory evaluation

Sensory evaluation of twenty panelist have been assessment burger samples for their sensory properties (taste, color, odour, texture, tenderness and overall acceptability) using a hedonic scale of 1-10 according to the method of Badr and El-Waseif (2017).

Statistical analysis

General linear model of SPSS (Ver. 16.0, 2007) was used to conduct ANOVA for determination of differences between means. The probability levels of $P \leq 0.01$and $P \leq 0.05$ were considered to be significant for statistical procedures. All measurements and trials were done in triplicate.

RESULTS AND DISCUSSION

Chemical composition of date pits powder

Moisture and protein content of date pits powder were 9.54±0.89 and 6.52±0.93% (Table1), respectively. The protein content in this study was agreement with those reported by Abdul *et al.* (2013) and Assirey (2015) they found that the protein content of date pits was in the range from 3.62 to 6.91%. On the other hand, data in Table (1) showed that, date pits had a low ash content (1.99±0.17%) and high content of ether extract (8.41±0.09%), crude fiber (31.89±0.96%) and dietary fiber (67.83±2.13%). These results in the same trend as the results obtained previously Abdul *et al.* (2013) and Assirey (2015). Also, data in the same table revealed that date pits had a high content of polyphenols (24.32±0.78 mg GAE/gm)) with a modest antioxidant activity (71.82±1.05%).

Table 1. Gross chemical composition of date pits powder (%on dry weight basis).

Component	Date pits powder
Moisture (%)	9.54±0.89
Protein (%)	6.52±0.93
Ash (%)	1.99±0.17
Ether extract (%)	8.41±0.09
Crude fiber (%)	31.89±0.96
Dietary Fiber (%)	67.83±2.13
Total polyphenols (mg GAE*/gm) (mgquercetin equivalent /g extract)	24.32±0.78
Antioxidant activity (%)	71.82±1.05

From the previous results, one can find that date pits could be considered as a good source of fiber and antioxidants, so it can be used as an alternative ingredient to fats in many processed foods.

Chemical composition of prepared beef burger:

Table (2) shows chemical composition of the uncooked and cooked burger formulated with date pits powder. The chemical analysis of uncooked and cooked burger showed that the percentage of moisture, protein, ash, crude fiber, total carbohydrates and phenols content were Increased by increasing the amounts of date pits powder replacement in the burger. The increment of moisture content may be due to the capability of date pits powder rich with fiber to hold more water via preparation and cooking process. Meanwhile, the increment in other constituents may be a reflection of the quantity of these constituents in date pits.

Table 2. Proximate chemical composition of burger with different concentrations of date pits powder as a fat replacer (on dry weight basis)

Component%	Treatments							
	Uncooked burger				Cooked burger			
	Control	DPP 25% of fat	DPP 50% of fat	DPP 75% of fat	Control	DPP 25% of fat	DPP 50% of fat	DPP 75% of fat
Moisture	54.84^{d}	55.27^{c}	56.46^{b}	57.13^{a}	46.39^{h}	47.52^{g}	48.86^{f}	50.03^{e}
Crude protein	17.38^{d}	17.70^{d}	18.07^{cd}	18.32^{c}	21.92^{ab}	22.21^{b}	22.54^{a}	22.87^{a}
Ether extract	20.15^{a}	15.68^{c}	10.90^{e}	7.31^{f}	18.54^{b}	14.30^{d}	10.06^{e}	6.92^{f}
Ash	1.87^{c}	1.96^{c}	2.03^{bc}	2.16^{b}	2.48^{ab}	2.61^{a}	2.66^{a}	2.75^{a}
Crude fiber	1.26^{d}	2.88^{c}	4.43b	6.01^{a}	1.52^{d}	3.15c	4.67^{b}	5.28^{a}
*Total carbohydrates	59.34^{d}	61.60^{cd}	64.57^{b}	66.20^{a}	55.54^{f}	57.73^{e}	60.07^{d}	62.18^{c}
Total polyphenols(mg/100gm)	2.79^{g}	122.03^{e}	238.41^{c}	354.19^{a}	2.02^{g}	89.15^{f}	197.43^{d}	309.22^{b}

*** Total carbohydrate was calculated by difference**

DPP means date pits powder

Values followed by the same letter in the same column are not significantly different at P ≤ 0.05.

On the other hand, According to the data in the same table, ether extract content values in uncooked and cooked burger were decreased significantly with date pits powder addition ($p \leq 0.05$) in comparison with the control sample. Maximum ether extract content percentage was noticed in control sample while, treatment contained (DPP) with percentage of 75% of animal fat showed minimum percentages. The obtained results are in harmony with those reported by Gök *et al.* (2011), Kılınççeker and Kurt (2018) and Yousefi *et al.* (2018) who stated that beef burger integrated with different types of fat replacers were highly in some constituents such as moisture, ash, protein, fiber and total carbohydrates contents and lower in fat than in the control.

Also, from the same table, one can notice that cooked burger have percentages of moisture, ether extract, total carbohydrates and total phenols lower than uncooked burger with significant differences ($p \leq 0.05$) between samples. Meanwhile, the opposite was found in case of crude protein, ash and crude fiber and this may be caused by the effect of the cooking process (Sánchez-Zapata *et al.,* 2010).

Burger cooking properties

Data in Table (3) revealed that burger samples which replaced date pits have cooking loss percentages lower than control. This increment is due to the ability of date pits fiber to hold a large amount of water. There was a significant decrement in the loss via cooking process as a function of the increment in fat substitution level with date pits. Also, the results declared that adding date pits showed a positive influence on burger cooking yield. These results are in agreement with Kassem and Emara (2010) and Namir *et al.* (2015) who stated that there was a decrement in the cooking loss values of low fat burger when the levels of high fiber substances was increased.

Preventing shrinkage considers as one of the most important factors to maintaining the quality levels of burgers because some consumers related to shrinkage and adding a high amount of water. Control beef burger sample had a high percentage of shrinkage after cooking process in a comparison with burger integrated with date pits powder. These results are in conformity with the finding stated by Namir *et al.* (2015).

Table 3. Cooking properties of burger with different concentrations of date pits powder as a fat replacer.

properties	Treatments			
	Control	DPP 25% of fat	DPP50% of fat	DPP 75% of fat
Cooking yield (%)	47.34^{d}	53.08^{c}	57.82^{b}	62.30^{a}
Cooking loss (%)	52.66^{a}	46.92^{b}	42.18^{c}	37.70^{d}
Shrinkage (%)	27.15^{a}	23.86^{b}	19.45^{c}	16.11^{d}
Fat retention(%)	43.55^{d}	48.41^{c}	53.36^{b}	58.98^{a}
Water retention(%)	40.05^{d}	45.64^{c}	50.04^{b}	54.56^{a}
Feder number	1.42^{a}	1.34^{a}	1.27^{b}	1.24^{b}

DPP means date pits powder

Values followed by the same letter in the same row are not significantly different at P ≤ 0.05.

Fat and water retention percentages were also influenced by date pits powder addition. Beef burgers integrated with date pits powder have higher percentages of fat and water retention when compared with control sample. The increment in fat and water retention could be illustrated by the high ability of date pits powder to hold water and oil. These findings were in concordance with Ammar *et al.* (2014).

Feder number is applied to assess the meat products physical characteristics. Feder number was1.42 for control samples of the burger. Feder number decreased gradually with the increment of date pits powder level. Feder number for all laboratory samples was lower than 4.0. As stated by Pearson (1970) who stated that, feder number in good products should be lower than 4.0.

Burger colour evaluation

The colour of uncooked and cooked burgers was estimated and the results were presented in Table (4). There are a significant difference in L* values (Lightness), a* values (redness) and b* values (yellowness) of all prepared burger samples.

Table 4. Colour Measurement of uncooked and cooked burgers with different concentrations of date pits powder as a fat replacer

Fat replacement %	Colour			
	L*	a*	b*	ΔE
Uncooked burger				
Control	39.04±0.17^{a}	6.88±0.22^{a}	12.63±0.10^{a}	-
Date pits powder 25% of fat	37.42±0.45^{b}	6.01±0.27^{ab}	11.23±0.28^{b}	5.341^{e}
Date pits powder 50% of fat	35. 69 ±0.26^{c}	5.65±0.12^{b}	10.22±0.11^{c}	18.544^{d}
Date pits powder 75% of fat	34. 18 ±0.12^{d}	5.12±0.23^{b}	9.61±0.19^{d}	35.838^{b}
Cooked burger				
Control	34.90 ±1.18^{d}	4.76±0.13^{c}	10.54±0.11^{c}	-
Date pits powder 25% of fat	32.68 ±0.95^{e}	4.04±0.10^{c}	9.67±0.45^{d}	6.203^{e}
Date pits powder 50% of fat	30.40 ±0.63^{f}	3.66±0.41^{d}	9.01±0.59^{d}	23.801^{c}
Date pits powder 75% of fat	29.06 ±0.72^{g}	3.37±0.35^{d}	8.43±0.27^{e}	40.490^{a}

Values followed by the same letter in the same column are not significantly different at P ≤ 0.05.

Uncooked and cooked beef burger contained date pits powder as a fat replacer sample had lower L*, a* and b* values than the control. Also, from the same table, one can notice that cooked burger have L*, a* and b* values lower than uncooked burger with significant differences (p≤0.05) between samples. Our findings agree with those of Ammar *et al.* (2014) .

Burger lipid oxidation

Thiobarbituric acid (TBA) test value is considered as one of the most popular test used to measure lipid oxidation in meat and meat products. Data presented in Table (5) revealed that date pits powder adding percentage as a fat replacer has a highly effect on burgers TBA values. Variance analysis of TBA results mentioned that, there was a significant decrement in TBA values as a function to the increment of date pits powder adding percentages.

Burger contained date pits powder with the percentage of 75% of fat had the lowest (TBA) value meanwhile, the highest value was in control. The cooked burger was highly prone to lipid oxidation than uncooked burger. It is well known that the oxidation process has increased strongly during the cooking process of meat products due to the effect of heat which increases oxidation rate. Uncooked burgers had lower (TBA) values than cooked burgers, although in this case too, the control burger sample had higher (TBA) values than cooked burger samples. These results are in a harmony with findings of López-Vargas *et al.* (2014).

Table 5. Thiobarbituric acid values of uncooked and cooked beef burgers added with date pits powder.

Fat replacement %	TBA (mgmalonaldehyde/Kg sample)
Uncooked burger	
Control	0.303^{c}
Date pits powder 25% of fat	0.211^{d}
Date pits powder 50% of fat	0.129^{e}
Date pits powder 75% of fat	0.097^{f}
Cooked burger	
Control	0.896^{a}
Date pits powder 25% of fat	0.514^{b}
Date pits powder 50% of fat	0.420^{b}
Date pits powder 75% of fat	0.302^{c}

Values followed by the same letter in the same column are not significantly different at P ≤ 0.05.

Sensory evaluation

In the present study, the sensory evaluation of cooked burgers containing date pits powder with 25%, 50% and 75% of control sample fat are shown in Table (6).

Table 6. Effect of date pits powder percentage as a fat replacer on the sensory properties of burger*.

Sensory	Treatments			
	Control	DPP 25% of fat	DPP 50% of fat	DPP 75% of fat
Taste	8.33±0.25^{d}	7.25±0.42^{c}	7.13±0.29^{b}	6.52±0.30^{a}
Colour	8.21±0.31^{d}	7.16±0.45^{c}	7.00±0.26^{b}	6.82±0.26^{a}
Odour	8.64±0.43^{d}	7.10±0.21^{c}	7.14±0.15^{b}	6.67±0.15^{a}
Texture	8.00±0.46^{a}	7.54±0.56^{b}	7.28±0.27^{c}	6.39±0.61^{d}
Tenderness	8.42±0.67^{d}	7.68±0.43^{c}	7.23±0.39^{b}	6.48±0.39^{a}
Total acceptability	8.32±0.39^{d}	7.35±0.72^{c}	7.16±0.20^{b}	6.58±0.32^{a}

DPP means date pits powder

***All data are the mean±SD of twenty replicates. Mean followed by different letters in the same row differs significantly (P≤0.05).**

From data in Table (6), one can be noticed that there are a slightly difference between control sample and that contained date pits powder with percentages of 25%, 50% and 75% of animal fat for all sensory

characteristics. While the sensory scores of burger contained date pits with ratio of 75% of fat were low compared with control sample, however they were in the acceptable limits (more than 6).

CONCLUSION

Date pits powder is considered as a rich source of fiber and polyphones so that it can be used as fat replacer and ant-oxidative agent in burger. Also, this study stated that substituting 75% of animal fat in burger with date pits powder without any negative effects on physical and cooking quality of processed burger

REFERENCES

A.O.A.C. (2010). "Association of Official of Analytical Chemists, Official Methods of Analysis. 18th Ed., Pub. By the A.O.A.C.," Arlington, Virginia, 2220 USA.

Abdul, A., Abdul, R., Che, M., Al-Kahtani, H., and Mansor, T. (2013). Date seed and date seed oil. International Food Research Journal 20, 2035-2043.

Aleson-Carbonell, L., Fernández-López, J., Pérez-Alvarez, J., and Kuri, V. (2005). Characteristics of beef burger as influenced by various types of lemon albedo. Innovative Food Science & Emerging Technologies 6, 247-255.

Ammar, A. S. M., El-Hady, E.-S. A. A., and El-Razik, M. M. A. (2014). Quality characteristics of low-fat meat balls as affected by date seed powder, wheat germ and pumpkin flour addition. Pakistan Journal of Food Sciences 24, 175-185.

Ardekani, M. R. S., Khanavi, M., Hajimahmoodi, M., Jahangiri, M., and Hadjiakhoondi, A. (2010). Comparison of antioxidant activity and total phenol contents of some date seed varieties from Iran. Iranian journal of pharmaceutical research: IJPR 9, 141.

Assirey, E. A. R. (2015). Nutritional composition of fruit of 10 date palm (Phoenix dactylifera L.) cultivars grown in Saudi Arabia. Journal of Taibah University for science 9, 75-79.

Badr, S., and El-Waseif, M. (2017). Influence of Caper (Capparis spinosa L) Seeds Powder Addition as Source of Bioactive Phytochemicals on Quality Attributes and Shelf Life Extension of Beef Burger Patties. Middle East J 6, 1243-1258.

Bouaziz, M. A., AMARA, W. B., Attia, H., Blecker, C., and Besbes, S. (2010). Effect of the addition of defatted date seeds on wheat dough performance and bread quality. Journal of texture studies 41, 511-531.

Brewer, M. S. (2012). Reducing the fat content in ground beef without sacrificing quality: A review. Meat Science 91, 385-395.

Choe, J.-H., Kim, H.-Y., Lee, J.-M., Kim, Y.-J., and Kim, C.-J. (2013). Quality of frankfurter-type sausages with added pig skin and wheat fiber mixture as fat replacers. Meat science 93, 849-854.

Cobb, L. K., Appel, L. J., Franco, M., Jones-Smith, J. C., Nur, A., and Anderson, C. A. (2015). The relationship of the local food environment with obesity: a systematic review of methods, study quality, and results. Obesity 23, 1331-1344.

Colmenero, F. J. (2000). Relevant factors in strategies for fat reduction in meat products. Trends in Food Science & Technology 11, 56-66.

Elbana, M. W. E. (2015). Chemical, technological and microbial characterization of date seeds, Food technology Dep., Fac. Of Agriculture, Kafrelshiekh Univ.

Eldemery, M. E. (2010). Effect orange albedo as a new source of dietary fiber on characteristics of beef burger. In "The 5th Arab and 2nd International Annual Scientific Conference on: Recent Trends of Developing Institutional and Academic Performance in Higher Specific Education Institutions in Egypt and Arab World. Mansoura University–Egypt", pp. 2406-2433.

García-Lomillo, J., Gonzalez-SanJose, M. L., Del Pino-García, R., Ortega-Heras, M., and Muñiz-Rodríguez, P. (2017). Antioxidant effect of seasonings derived from wine pomace on lipid oxidation in refrigerated and frozen beef patties. LWT-Food Science and Technology 77, 85-91.

Gök, V., Akkaya, L., Obuz, E., and Bulut, S. (2011). Effect of ground poppy seed as a fat replacer on meat burgers. Meat science 89, 400-404.

Hara, K., Someya, T., Sano, K., Sagane, Y., Watanabe, T., and Wijesekara, R. (2018). Antioxidant activities of traditional plants in Sri Lanka by DPPH free radical-scavenging assay. Data in Brief.

Kassem, M. G., and Emara, M. (2010). Quality and acceptability of value-added beef burger. World Journal of Dairy and Food Sciences 5, 14-20.

Kılınççeker, O., and Kurt, Ş. (2018). Effects of inulin, carrot and cellulose fibres on the properties of raw and fried chicken meatballs. South African Journal of Animal Science 48.

Kratz, M., Baars, T., and Guyenet, S. (2013). The relationship between high-fat dairy consumption and obesity, cardiovascular, and metabolic disease. European journal of nutrition 52, 1-24.

Kryževičūtė, N., Jaime, I., Diez, A. M., Rovira, J., and Venskutonis, P. R. (2017). Effect of raspberry pomace extracts isolated by high pressure extraction on the quality and shelf-life of beef burgers. International Journal of Food Science & Technology 52, 1852-1861.

López-Vargas, J. H., Fernández-López, J., Pérez-Álvarez, J. Á., and Viuda-Martos, M. (2014). Quality characteristics of pork burger added with albedo-fiber powder obtained from yellow passion fruit (Passiflora edulis var. flavicarpa) co-products. Meat science 97, 270-276.

McGill, R., Anwar, E., Orton, L., Bromley, H., Lloyd-Williams, F., O'Flaherty, M., Taylor-Robinson, D., Guzman-Castillo, M., Gillespie, D., and Moreira, P. (2015). Are interventions to promote healthy eating equally effective for all? Systematic review of socioeconomic inequalities in impact. BMC public health 15, 457.

Missmer, S. A., Chavarro, J. E., Malspeis, S., Bertone-Johnson, E. R., Hornstein, M. D., Spiegelman, D., Barbieri, R. L., Willett, W. C., and Hankinson, S. E. (2010). A prospective study of dietary fat consumption and endometriosis risk. Human Reproduction 25, 1528-1535.

Namir, M., Siliha, H., and Ramadan, M. F. (2015). Fiber pectin from tomato pomace: characteristics, functional properties and application in low-fat beef burger. Journal of Food Measurement and Characterization 9, 305-312.

Nehdi, I., Omri, S., Khalil, M., and Al-Resayes, S. (2010). Characteristics and chemical composition of date palm (Phoenix canariensis) seeds and seed oil. Industrial Crops and Products 32, 360-365.

Ng, S., Tan, C., Lai, O., Long, K., and Mirhosseini, H. (2010). Extraction and characterization of dietary fiber from coconut residue. J Food Agric Environ 8, 172-177.

Pappa, I., Bloukas, J., and Arvanitoyannis, I. (2000). Optimization of salt, olive oil and pectin level for low-fat frankfurters produced by replacing pork backfat with olive oil. Meat Science 56, 81-88.

Pearson, D. (1970). The chemical analysis of Food National College of Food Technology. University Of Reading, Weybridge Surry T and A Churchill.

Pinero, M., Parra, K., Huerta-Leidenz, N., De Moreno, L. A., Ferrer, M., Araujo, S., and Barboza, Y. (2008). Effect of oat's soluble fibre (β-glucan) as a fat replacer on physical, chemical, microbiological and sensory properties of low-fat beef patties. Meat science 80, 675-680.

Rather, S. A., Masoodi, F., Akhter, R., Gani, A., Wani, S., and Malik, A. (2015). Xanthan gum as a fat replacer in goshtaba-a traditional meat product of India: effects on quality and oxidative stability. Journal of food science and technology 52, 8104-8112.

Sánchez-Zapata, E., Muñoz, C., Fuentes, E., Fernández-López, J., Sendra, E., Sayas, E., Navarro, C., and Pérez-Alvarez, J. (2010). Effect of tiger nut fibre on quality characteristics of pork burger. Meat Science 85, 70-76.

Selani, M. M., Shirado, G. A., Margiotta, G. B., Rasera, M. L., Marabesi, A. C., Piedade, S. M., Contreras-Castillo, C. J., and Canniatti-Brazaca, S. G. (2016). Pineapple by-product and canola oil as partial fat replacers in low-fat beef burger: Effects on oxidative stability, cholesterol content and fatty acid profile. Meat science 115, 9-15.

Singleton, V. L., Orthofer, R., and Lamuela-Raventʹós, R. M. (1999). [14] Analysis of total phenols and other oxidation substrates and antioxidants by means of folin-ciocalteu reagent. Methods in enzymology 299, 152-178.

Slavin, J. (2013). Fiber and prebiotics: mechanisms and health benefits. Nutrients 5, 1417-1435.

Sullivan, E. L., Nousen, E. K., and Chamlou, K. A. (2014). Maternal high fat diet consumption during the perinatal period programs offspring behavior. Physiology & behavior 123, 236-242.

Verma, A. K., and Banerjee, R. (2010). Dietary fibre as functional ingredient in meat products: a novel approach for healthy living—a review. Journal of food science and technology 47, 247-257.

Weiss, J., Gibis, M., Schuh, V., and Salminen, H. (2010). Advances in ingredient and processing systems for meat and meat products. Meat science 86, 196-213.

Yousefi, N., Zeynali, F., and Alizadeh, M. (2018). Optimization of low-fat meat hamburger formulation containing quince seed gum using response surface methodology. Journal of food science and technology 55, 598-604.

Youssef, M., and Barbut, S. (2011). Fat reduction in comminuted meat products-effects of beef fat, regular and pre-emulsified canola oil. Meat Science 87, 356-360.

Zahoor, T., Saeed, F., and Ahmad, A. (2011). Anti-nutritional factors in some date palm (Phoenix dactylifera L.) varieties grown in Pakistan. Internet Journal of Food Safety 13, 386-390.

تأثير استخدام مسحوق نوي البلح كبديل للدهن وعامل مانع للأكسدة علي جودة البرجر البقري

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يعتبر نوي البلح مصدر غني بالألياف و المواد الفينولية لذلك يمكن إستخدامه كبديل للدهن و للحد من الأكسدة الحادثة في البرجر البقري أثناء عمليات الطبخ. لذلك أجريت هذه الدراسة بغرض إستبدال ٢٥، ٥٠، ٧٥% من الدهن الحيواني المضاف عند تصنيع البرجر بمسحوق نوي البلح و قد تم تقييم كل من الخواص الفيزيائية و خواص الطبخ و الخواص العضوية الحسية للبرجر الناتج. و قد أوضحت النتائج أن إضافة مسحوق نوي البلح أدي الي زيادة القيمة الغذائية للبرجر و تحسين خواص الطهي و الخواص العضوية الحسية حيث أدي الي زيادة الإحتفاظ بكل من الدهن و الماء و تقليل الفاقد و خفض معدلات الإنكماش. و قد أظهرت النتائج أيضا أن هناك زيادة في محتوي البرجر البقري من البولي فينولات مما ادي الي إنخفاض قيم حامض الثيوباربيوتيرك في البرجر المحتوي علي نسب من نوي البلح مقارنة بالكنترول. و كانت جميع عينات البرجر المعدة مقبوله من ناحية الخواص العضوية الحسية.