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USING PUMPKIN IN IMPROVING SOME QUALITATIVE CHARACTERISTICS OF BEEF

Asraa Yacoob Yousif

Animal Production Department, Agriculture College, Basrah University, Iraq.

Abstract

The study showed that using pumpkin with concentrations up to (10, 30 and 50 %) to prolong the preservation of frozen beef for a period up to (0.1, 5.30 days), where chemical tests (free fatty acids and peroxide value), hydrogen value and sensory tests were performed, including (color, flavor, tenderness, juiciness and general plausibility) during preservation by freeze. The control group showed high free fatty acids at the end of the preservation period (0.34 to 30), while the agent of beef with pumpkin oil were (0.23, 0.23 and 0.22) respectively. For the peroxide value, the peroxide value of the beef with pumpkin decreased in all occupations compared to the control occupations which was (3.10) at the end of the preservation period (30 days). The results showed high hydrogen value of the beef with pumpkin compared to the control sample. For sensory evaluation, sample of beef with pumpkin significantly increased as its sensory characteristics including color, flavor, tenderness, juiciness and public Plausibility increased.

Key words: Pumpkin, beef meat, free fatty acids, peroxide value.

Introduction

Since the beginning of human civilizations, plants have been used to treat different types of diseases. Although modern medicine has shown greater developments, but the role of plants in medicine and health care is still recognized. Due to the poisoning that comes from taking drugs (Mala and Kurian, 2016) and the increased number of bacteria that cause diseases and resist many antibiotics, a need to produce new occupations of antibacterial has emerged. The most important sources of antibiotics are plants that provide us with various occupations such as antimicrobial and effective pharmaceutical occupations as they contain alkaloids, phenols and resins (Belguith *et al.,* 2010). In the last few decades, researches have shown the use of pumpkin in traditional medicine to treat many diseases (blood pressure, anti-diabetes, anti-tumor, antibacterial, anti-cholesterol, anti-intestinal parasites (Fu *et al.,* 2006).

Pumpkin is a leafy plant belonging to the Cucurbitaceae and has the ability to live in different climatic conditions (Acosta-patina, 2001). The Cucurbitaceae includes polysaccharides, sapindales, minerals and protein (Al-showayman, 2012) Pumpkin provides high energy because of the effective compounds which are (flavonoids, glycosides and phenols) known as "Antioxidant" (Leman *et al.*, 2003; Dorman *et al.*, 2007). The pumpkin seed oil is unstaturated fat with a high percentage of (linolic acid, oleic), so it's considered as a high antioxidant (Jakab and Jablonkai, 2003). Antioxidants are compounds that block or delay oxidation of other molecules by inhibiting or diffusion of oxidative reactions. when adding these compounds to food products, especially, fats and fatty foods, the expiry time increases by delaying oxidation of fats (Aouidi *et al*., 2011; Valenzule *et al*., 2014; Seed *et al*., 2012) and that Pumpkin is a product that contains fibers which were used as food additives to improve food qualities as color, flavor and tenderness; it contains also antioxidants and antibacterial compounds (Caili and Q. uanhong, 2006; Kapilan, 2015).

The study aimed to use pumpkin pulp as a meat substitute in beef burger to reduce the amount of fat and to improve the sensory and technological characteristics of the meat product.

Materials and Methods

1. Meat (thigh area) was purchased from the local markets and kept in the refrigerator temperature of 4°C

***Author for correspondence :** E-mail: asraayacoob@yahoo.com

for only one day, the next day the process of cutting it completely from the flesh was done, after that the process of chopping by the electric chopper was done (diameter of the electric chopper was 4 mm).

2. Fat: Bovine calf fat (around the kidneys) was purchased from the local markets and kept refrigerated at a temperature of 4°C for only one day and chopped by the electric chopper.

3. Process of manufacturing and processing chopped meat

• Buy a pumpkin and then grind it by the electric meat grinder.

• Make burgers (50 gm / piece).

The Steps:

1. control without additives

2. First occupation: replace 10% of the meat by 10% of the pumpkin.

3. Second occupation: replace 30% of the meat by 30% of the pumpkin.

4. Third occupation: replace 50% of the meat by 50% of the pumpkin.

The Tests:

Chemical and physical tests for burgers

• Evaluating Peroxide value

1. The *Peroxide value* was evaluated according to (Parsn et al., 1981), where 10 gm of the well-grinded meat was put into (30 ml) of chloroform solution and acetic acid (40-60) in a cone jar, then filter it and take the filtrate.

2. (3-5) Potassium iodide saturated solution was added to the jar contents and then close the jar tightly.

3. The jar contents were stirred into circles till the fat or oil dissolves and then put the jar in a dark place for (20-25 minutes).

4. 20 ml of distilled water was added to the jar contents, then make singular equation of iodide with sodium thiosulfate solution (N 0.001) up before the point of equation (pale yellow).

5. Some drops of starch solution were added to the jar with continuous titration till the blue color disappears.

Calculating the Peroxide value

$$\text{Peroxide value} = \frac{Na2S2O3mlxNx1000}{Wt.of\,Sample}$$

Free fatty acids (FFA) were determined based on Pearson *et al*., (1981). 3g of finely chopped meat was weighted and added to 50 ml ethyl alcohol at a concentration of 98%, heated in a water bath until boiling, drops of the phenolphthalein indicator were added. the mixture was titrated with 0.1N potassium hydroxide solution until the solution turns to light pink and the percentage of free fatty acids was estimated by using the following equation:

$$\text{Free Fatty Acid\%} = \frac{Titration\,(A-B)\,x\,n\,x\,282\;x\,100}{1000\;x\;wt\;o\;sample\;gm}$$

Table 1: Peroxide value of the traditional beef burgers and the pumpkin substituted beef burgers with different percentages.

Preservation periods / Treatments	0	15	30	Average
0% control	2.23	2.61	3.10	2.65
10%	2.23	3.31	2.32	2.29
30%	2.23	2.25	2.28	2.25
50%	2.23	2.24	2.25	2.24
average	2.23	2.35	2.49	2.36
RLSD of occupations = 0.333; RLSD of periods = 0.120				

PH Determination

The pH was calculated according to John *et al.,* (1975) using pH meter

Organoleptic characteristics test

It was carried out according to Pearson and Tauber, (2002).

Statistical Analysis

The data were analyzed by using Complete Randomized Design (CRD) and using the SPSS program. Version 24 (2016) The averages were compared using the least significant difference of (LSD) at ($P<0.05$).

Results and Discussion

Table 1, shows the Peroxide value of the traditional beef burgers and the pumpkin substituted beef burgers by different percentages, where we noticed significant decrease in peroxide value of the sample of the pumpkin substituted beef burgers compared to the control sample,

Table 2: Free fatty acids in the traditional beef burger and in the pumpkin substituted beef burgers at different concentrations.

Preservation periods / Treatments	0	15	30	Average
0% control	0.13	0.37	0.52	0.34
10%	0.13	0.26	0.31	0.23
30%	0.13	0.26	0.32	0.23
50%	0.13	0.23	0.31	0.22
average	0.13	0.28	0.36	0.26
RLSD of occupations = 0.107; RLSD of periods = 0.86				

Table 3: Hydrogen value of the traditional beef burgers and the pumpkin substituted beef burgers with different percentages.

Preservation periods / Treatments	0	15	30	Average
0% control	5.22	5.35	5.94	5.36
10%	5.22	5.55	6.22	5.66
30%	5.22	5.62	6.32	5.72
50%	5.22	5.81	6.48	5.84
average	5.22	5.59	6.12	5.64
RLSD of occupations = 0.057; RLSD of periods = 0.363				

the means were 2.24, 2.25, 2.31 successively in the occupations concentrations 10, 30, 50% compared to the control agent which was 2.61 for 15 days of the freeze preservation period.

At the end of the preservation period, the means of the Peroxide value of the sample of the beef burgers the occupations were 2.25, 2.28, 2.32 successively compared to the control agent which was 3.10. It's due to the pumpkins that contains antibacterial (AL-Ghazal, 2012), (Daretal, 2017) which inhibits the micro-organisms growth that cause meat spoilage, producing of lipase enzyme which is responsible for oxygenate. This result is consistent with (Ethiraj and Balasundaram, 2016) as they consider pumpkin is antioxidant as it contains effective compounds such as steroids, glycosides, phenols and alkalis) which are natural antioxidants.

Table 2, shows the percentage of free fatty acids in the pumpkin substituted beef burgers at the concentration of 10, 30, 50%, where the results showed significant decrease ($p<0.05$) of the percentage of free fatty acids compared by the control sample; the averages on the 15th day of preservation by freezing were 0.26, 0.23, 0.26 successively, while the control occupation was 0.37. We notice at the end of the freezing preservation period, which was 30 days that the percentage of free fatty acids was 0.31 at the occupation 50% of pumpkin concentration compared to control occupation which was 0.52%.

Where we notice the pumpkin role in the slowest process of fat analyzing along the freezing preservation period, it may be attributed to containing effective compounds such as flavonoids, alkalines and others which work on inhibiting bacteria (Mala and Kurian, 2016), that results in inhibiting the production of lipase enzyme excreted from some types of bacteria that help in meat analytic rancidification.

The results in table 3, show high significance of hydrogen value in the sample of the pumpkin substituted beef burgers at the end of the preservation period which was 30 days, where the hydrogen value was (6.22, 6.32, 6.48) successively at the concentrations of 10, 30, 50 compared to the control occupations 5.94. Increasing of the hydrogen value of the freeze preserved occupations was due to the effective compounds that pumpkins contains, such as alkaloids, phenols and resins (Dissanayake1 *et al.*, 2018), which has the ability to decrease the radicals resulted from oxygenate.

Table 4, shows the sensor evaluation for the traditional beef burgers and the pumpkin substituted beef burgers by different percentages, in addition, it shows that there's a significant difference at the level ($p<0.05$) of the color qualitative characteristics of different concentrations of the minced meat additives compared to the control sample, as concentration of 30% of pumpkin exceeded in increasing the color degree to (2.12, 2.27) for freeze preservation periods at 18 degree, it's due to the color decrease. The color decrease of the control sample is due to changing of the hemoglobin color because of the long preservation period, which results in decreasing the color degree after preserving the meat. This result is consistent with (Anwar *et al.*, 2011), who found out changing in the qualitative characteristics of the beef burger preserved by freeze for 12 weeks.

Table 4: Sensor evaluation of the traditional beef burgers and the pumpkin substituted beef burgers with different percentages.

Occupations / Preservation periods		Color	Flavor	Tenderness	Juiciness	General Plausibility
Control	0	6.33	6.14	5.22	5.56	6.11
	15	6.13	6.26	5.00	5.23	6.07
	30	5.84	6.21	5.02	5.13	6.18
Average		6.10	6.22	5.08	5.31	6.18
10%	0	6.33	6.26	7.01	7.09	7.74
	15	6.62	6.24	7.32	7.20	7.64
	30	6.49	6.24	7.35	7.23	7.61
Average		6.48	6.25	7.22	7.17	7.66
30%	0	6.33	7.08	8.06	7.80	8.09
	15	7.27	8.21	8.70	7.93	8.13
	30	7.12	8.12	8.54	7.45	8.07
Average		6.91	7.80	8.43	7.72	8.10
50%	0	6.33	6.53	6.55	7.04	7.54
	15	6.40	6.24	6.62	6.75	7.48
	30	6.32	6.26	6.53	6.55	7.32
Average		6.35	6.34	6.57	6.78	7.45
LSD of occupations = 0.21, 0.39, 0.65, 0.12, 0.25; LSD of periods = 0.92, 0.49, 0.20, 0.16						

The results showed a significant increase in the evaluation of the flavors degree when adding pumpkin to the beef burgers compared to the control occupations which averaged 6.22 while the average rating of the flavor increased to 7.80 at 30% concentration of pumpkin. There is a significant decrease in flavor during increasing the preservation periods due to the slow loss of volatile materials and undesired smells during the preservation period due to chemical spoilage on the surface of the meat, in addition to the undesirable flavors resulting from the oxidative rancidity occurring during preservation. This result is consistent with (Anwar *et al.*, 2011) as it was found that the flavor is decreased by increased preservation periods of burger, the characteristics of tenderness and juiciness appear, a significant increase in the evaluation compared to the control occupations, where the average degree was, while the value of tenderness and juiciness at the concentration of 30%, 8.43 and 7.72 respectively. It's is due to the increase of tenderness and juiciness and the lack of loss by cooking beef burger. This result is consistent with (Ammar, 2012), where tenderness and juiciness increased compared to the control occupations when using charlock in making burger.

It is noted from the table that characteristic of general plausibility of the pumpkin substituted beef burgers at the concentration of 30% achieved the highest rating where the rate was very good compared to the control occupations. For the preservation periods, we noted that all the characteristics decreased with increasing of preservation periods such as color, flavor, tenderness and juiciness; this decrease in burger's flavor at freezing preservation resulted from decomposition and lipid oxidation processes, which affects tenderness and juiciness.

Conclusions

The results show that the use of pumpkin with different concentrations improved the qualitative characteristics of burger (physical, chemical and sensory) compared to the control occupations by reducing the percentage of free fatty acids and peroxide value during freeze preservation process.

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