Effect of Rosemary, Sage and Thyme Addition on Sensory and Chemical Properties during the Storage of Kaurma

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ABSTRACT

Kaurma is a traditional meat product that is prepared in Iraqi Kurdistan with the addition of several condiments (rosemary, sage, thyme). The effects of such condiments addition and the storage time on peroxide value (PV), free fatty acids (FFAs), thiobarbutiric acid (TBA) and pH, of kaurma samples were investigated at 0, 30 and 60 days. Also, their effects on the sensory properties of kaurma products were evaluated. Kaurma product was made from fresh lamb meat, sheep tail fat and salt and then allocated into three treatments and one control sample without condiment. The three treatments comprised the product with the addition of either 1% rosemary, sage or thyme. They are stored at 4 °C for 60 days. PV, FFA,TBA and pH values of the treatments were determined during storage periods at 0, 30 and 60 days. Use of such condiments, particularly rosemary,in the kaurma production resulted in a significant ($P < 0.05$) decrease in the peroxide value PV, free fatty acid FFA, thiobutyric acid TBA and pH values. Kaurma samples with condiments showed the lowest PV, FFA,TBA and pH values compared with control samples .Almost all chemical properties were significantly increased during the storage ($P < 0.05$). The highest rise was observed in the control samples. As the sensory scores of the samples with condiments were higher than the control at the time of observation, using natural condiments in kaurma could be regarded as an indicator for improving the quality characteristics of its production.

INTRODUCTION

Kaurma is a traditional deep-fried meat product which has been produced in homes and villages for many years. It was an important meat product when the food technology and preservation was not as advanced as today. It was mainly produced to satisfy the need of meat products in winters where meat supply was low (1). Kaurma is a cooked meat product made from beef or mutton meat, beef fat, and salt (2). The meat is cut into pieces, of the size of an egg, and is slowly left to be fried into its own melted fat. Extra fat is added if needed (3). As tallow is largely used in kaurma production for its desirable stability effect, it could also be a cause for enhancing the oxidation process in the product and then accelerating of the product deterioration (4). For various purposes as changes in taste, different herbs and species can be incorporated into various meat products including kaurma. Additionally, herbs and species can have other advantageous effects in this product such as reduction in rancidity. Hence, a product like this would be more attractive to consumers who would enjoy a healthy eating (5).

The objectives of this study were to evaluate the use of various condiments in kaurma production and to determine the effectiveness of these natural condiments in preventing or reducing lipid oxidation, rancid odor and color changes in kaurma.

MATERIALS AND METHODS

Kaurma is prepared according to the traditional and local procedure described by indigenous Kurdish villagers of different areas in Iraqi Kurdistan, such as Hawraman, Halabja, Erbil and Duhok. The procedure is similar, in a

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great extent, to what is described in kaurma standard of the Turkish Standard Institute (TSI) and guideline for manufacturing of meat products (6), except in Kurdistan it was stored at open climate rather than refrigerator as in the TSI. Generally the manufactured product in this study is composed of 70% meat weight and 30% sheep tail fat. First of all, lamb was trimmed from fat and connective tissue and was cut into pieces of 3–6 cm3. Table salt (refined and ground) at the amount of 3% of meat weight was added to the meat pieces. After that, sheep tail fat 30% of lamb weight was added to the salty meat and slow cooking at 55.5° C was started in an open-cover boiler. After 30 minutes the rest of the tallow required for kaurma production was incorporated into the mixture and the temperature increased to 105°C. When it reached the proper cooking conditions, the meat was cooked for 3–4 hours. Meat pieces were stirred from time to time for a homogeneous cooking. When the inside of meat color turned from red to dark gray, elasticity of meat was lost and meat become easy to fracture by hand. Hence, the cooking process had finished. Each trial containing 3 Kg cooked kaurma was divided into four groups; the first group named control did not contain any condiments. Treatments separately contained 1 % (rosemary, sage, thyme). After that the cooked meat and herbs were mixed, a total of 4 samples were held at 4 °C for up to 3 months. Samples were taken at the 1st, 30th, 60th, of storage period for analysis. Three trials with 2 replica for each were conducted. The PV, FFAs,TBA, and pH of samples were determined and analyzed for each storage period at 1st, 30th, 60th days of storage period.

Peroxide Value (PV):

For the PV, lipid in kaurma was dissolved in 30 mL chloroform– acetic acid mixture (3:2), treated with 0.5 mL of saturated potassium iodide (KI) solution and kept in the dark for 5 min. Thirty milliliters of distilled water was added to the mixture and shaken. One milliliter of starch solution (1.0% w/v) was added as an indicator. The PV 0.1N was determined by titrating iodine liberated from the potassium iodide with sodium thiosulphate solution. The PVs were expressed as millequivalent O2 per kilogram of fat according to (7) procedure.

Free Fatty Acids Determination:

For FFA analysis, 10 g of ground sample was homogenized with 30 mL of chloroform containing 0.5g of sodium sulfate, and was allowed to settle at room temperature (20 °C) for 5 min, and then filtered through Whatman No. 1 filter paper (Whatman Ltd., U.K.). The FFAs in 25 mL of the filtrate were titrated with a potassium hydroxide solution (0.1 N). Results were expressed as gm of oleic acid/100 g of fat according to (7) procedure.

Thiobarbutric Acid (TBA) Determination:

The TBA assay is commonly used to measure the oxidative rancidity of meat and other fat containing food products. TBA values of samples were determined according to the methods of (8). Samples were prepared according to the procedure and readings taken at 538 nm on spectrophotometer (Shimadzu UV-1601, Japan) were expressed as mg/ malonaldehyde per kg meat. It was calculated as per following equation:

TBA = Absorption rate X 7.8

pH Measurement:

pH was measured from a homogenate prepared by mixing 5 gm of kaurma with 50 mL of distillated water. The mixture was put into the Homogenizer (type LAR, Swiss made) and set on 5000 rounds/min, for 30s. Readings were taken with digital pH meter device-type Pyeunicum of British made, according to (9) procedure.

Sensory Evaluation:

Sensory evaluation was carried out by a six-member semi trained panel. Panel members

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with ages ranging from 25 to 50 were from faculty members and graduate students of Food Science Department of Sulaimani University, that were all experienced with sensory evaluation of various food products. Panelists were asked to evaluate the samples of each treatment for appearance, texture and taste.

Panel evaluated a slice of kaurma from each one of the five treatments and control sample at the same time. Kaurma samples were presented to panel after they were warmed up for 5 minutes. According to the importance of a particular sensory attribute, a whole number was given to sample by the panel: 1–20 for appearance; 1–20 for texture and 1–60 for taste (total of 100).

Statistical analysis:

Analysis of variance ANOVA (General Linear Model) Minitab 17 statistical software was used to determine main effect of rosemary, sage and thyme addition on sensory and chemical properties during the storage of Kaurma. All measurements were done separately for each chemical properties. Statistical significance was determined at the P < 0.05 level and significantly different values distinguished using Tukey's test.

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RESULTS AND DISCUSSION

The PVs were used as indices to assess the level of lipid oxidation in kaurma. Use of condiments (Rosemary ,sage, thyme) in kaurma production resulted in a significant decrease in the PV, and the highest PV was observed in the control group (Mean=8.32, P=0.000). Storage period had a significant effect on the PV of kaurma. It increased in all treatments (P=0.000) at the end of the storage period. The results here were close to that of (10, 11, 12) who reported that the PV of kaurma during storage increased and ranged between 5 and 9 mequiv O2/kg, and between 3.21 and 7.10 mequivO2/kg, respectively. The lowest PV was found in the kaurma samples stored at 4°C and produced with added rosemary, as this herb's extracts exhibited very strong antioxidant activity (13). Many researchers stated that the lipid oxidation could be controlled with the use of antioxidants in meat products (14). The maximum peroxide level of kaurma according to the Turkish Kaurma Standard (15) is set to be 20 mequiv O2/kg.

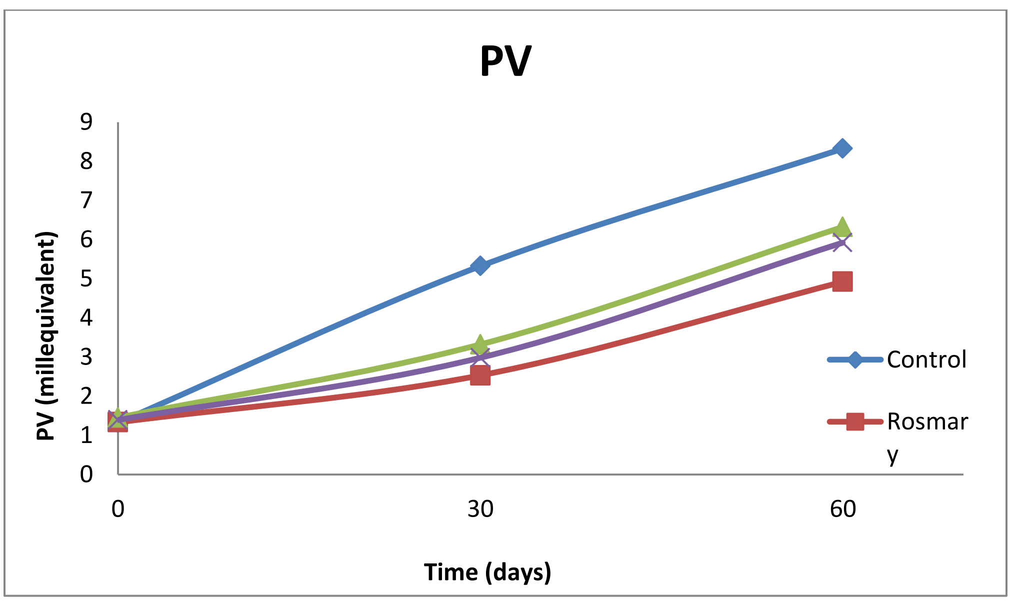

Figure 1. The effect of rosemary, sage and thyme addition on PV during the storage of kaurma.

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The FFA values were significantly affected by condiment addition to the treatments, storage period and storage temperature (P=0.000) in all treatments. Among all treatments, rosemary was the best in reducing lipid oxidation since the samples contained the former generally had the lowest FFA value. The values of thyme and sage sequence were obtained and ranked as the second and third. The effect of condiment was particularly evident at the 60th day of storage. It was determined that FFA values generally increased with storage time. However, the amount of FFAs in fat depends on the hydrolytic activity of the lipases, the microbial metabolic processes and the oxidative reactions that work on the FFAs release in the lipolysis. Furthermore, lipids and phospholipids are hydrolyzed by lipase and phospholipase yielding FFAs, which are oxidized to peroxides (16). (11) found that the FFA value of kaurma stored at 4°C for 180 days was between 0.67 and 1.18 mg KOH/g fat, with an increase during storage.

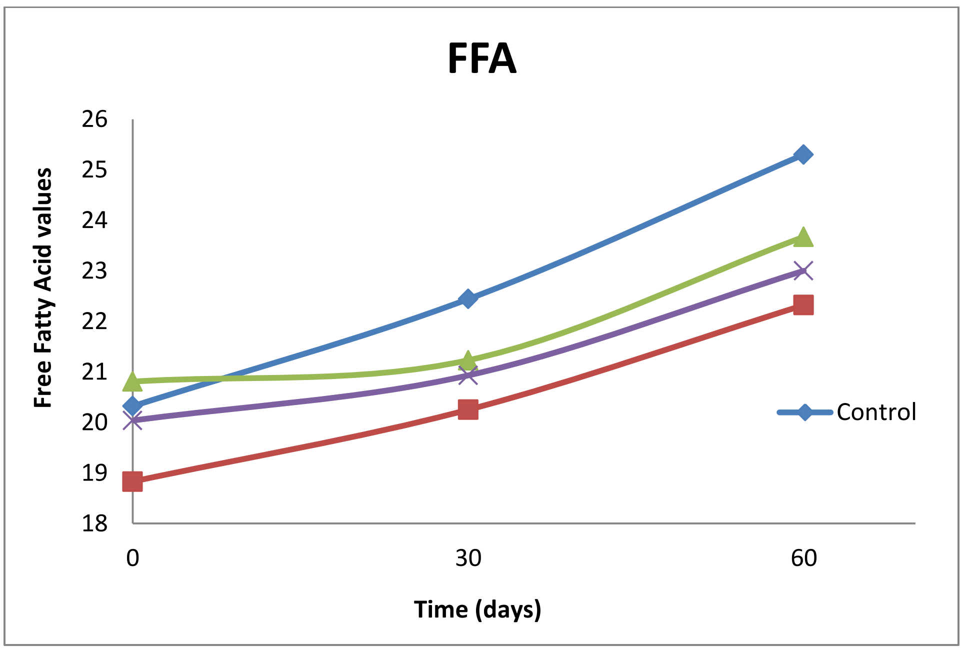

Figure 2. The effect of rosemary, sage and thyme addition on FFA during the storage of Kaurma.

TBA of kaurma samples were significantly affected by the storage period. TBA values of samples were illustrated in (Fig. 4). It was found that TBA values of all samples were lower than that of the control (P=0.000). As it was expected beforehand, the use of condiments reduced the rancidity in the samples and the highest TBA values occurred in control sample (Mean 0.72, P=0.000). Among all treatments, rosemary was the best in reducing lipid oxidation since the sample with rosemary generally had the lowest TBA value (Mean=0.21, P=0.000). The effect of treatments was particularly evident at the 60th day of storage.

If those additives were lined up in terms of antioxidative effect considering the TBA values of samples, rosemary, sage and thyme sequence was obtained. TBA values of control sample rapidly increased during storage period; on the other hand, the increase in TBA was slower for samples with natural condiment addition. Many researchers stated that the lipid oxidation could be controlled with the use of natural or synthetic antioxidants in meat products. (17, 14)

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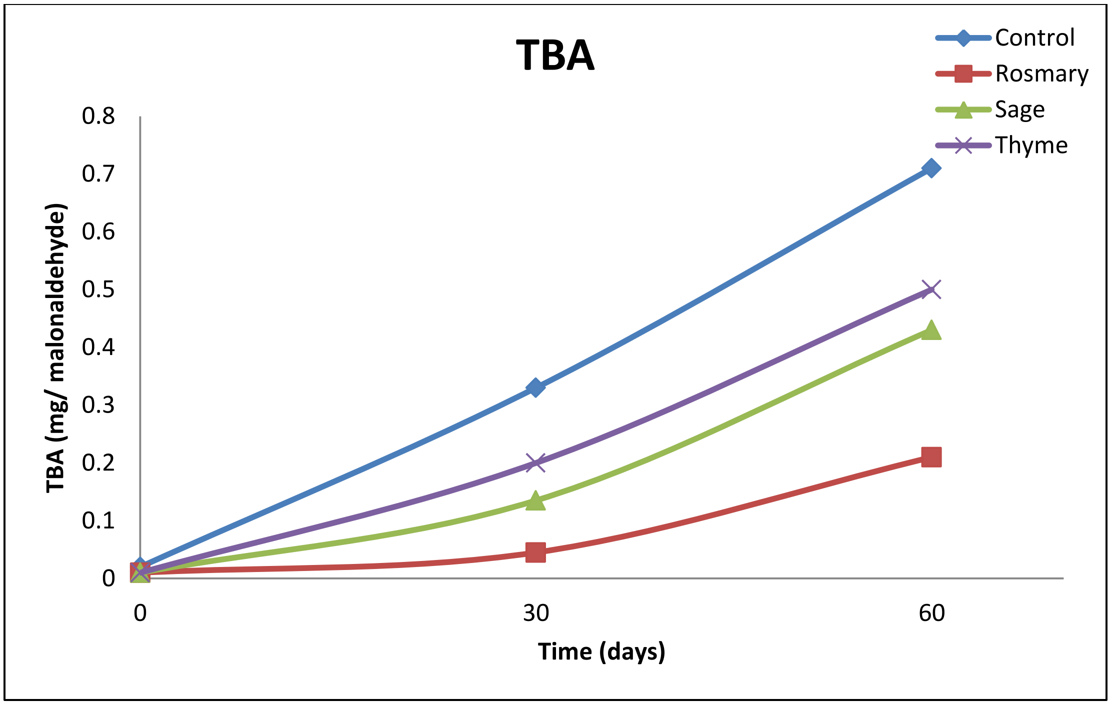

Figure 3. The effect of rosemary, sage and thyme addition on TBA during the storage of Kaurma.

pH of samples gradually increased with time, and the increase in pH became more evident towards to the end of storage (Fig.1). For example, pH of the control sample was initially 5.95 and significantly increased to (Mean=6.10, P=0.000) at 30th of storage, 6.49 at the end of storage. It was also found that the addition of condiments caused a decrease in pH of samples and the lowest pH value was obtained for control sample where pH was lower than any of the samples with condiments. Lowest pH values were observed for samples with thyme and sage .The highest pH was found in rosemary samples (Mean=6.26, P=0.000). Also, storage period and storage temperature had a highly significant effect on the pH values (P=0.000), and the highest pH was determined in the end of the storage period. The pH of meat products to which antioxidant is added is very important in terms of antioxidant effectiveness and product shelf life. According to the kaurma standard (15), the pH of kaurma should be between 4.5 and 6.4. The results in the present study are compatible with the kaurma standard. Also, the pH determined in this study is similar to some research results (4; 18, 19, 20). In a study on the use of tocopherol as an antioxidant, (21) reported that the pH values in the kaurma increased during storage.

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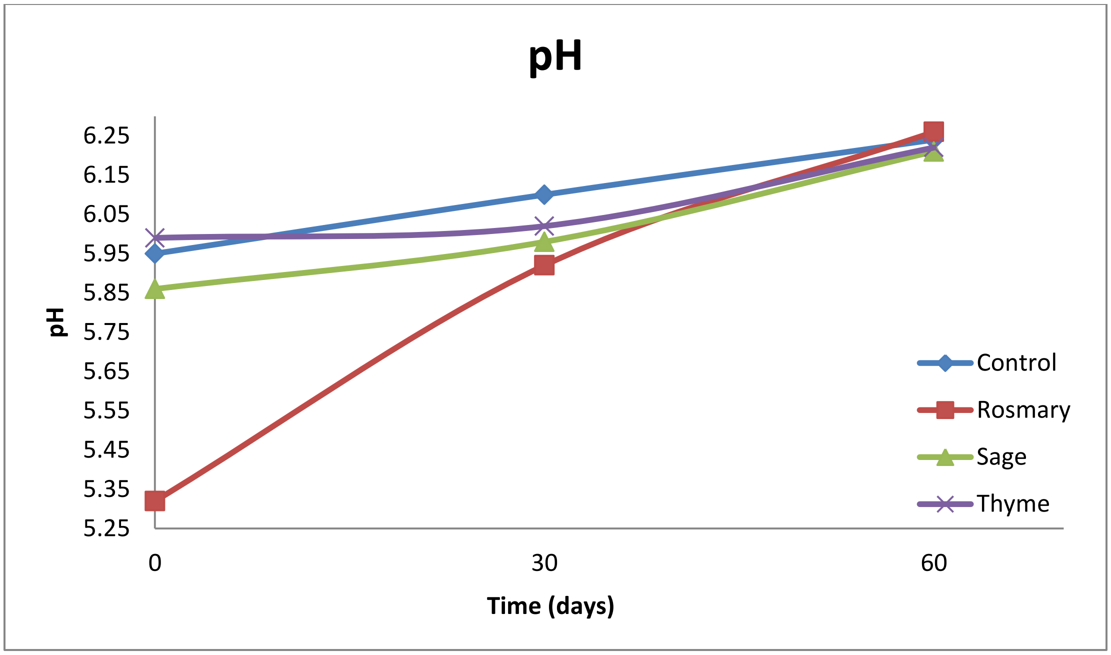

Figure 4. The effect of rosemary, sage and thyme addition on pH during the storage of Kaurma.

Sensory Properties

Sensory properties of samples were illustrated in (Table. 1). The appearance, taste and texture scores of control were lower than those of any kaurma samples with condiments. The highest total score was observed for the sample with rosemary (68.1) that was in accordance with TBA scores as rosemary was found to have a highest antioxidative effect among condiments. However, the statistical results revealed that addition of condiments to the kaurma had positive effect on each of the sensory attributes of samples.

Table 1.Consumer sensory scores of Kaurma samples.

Treatments	Appearance	Taste	Texture	Total
Control	14.1	35.6	10.2	59.9
Sage	15.2	37.8	12.3	65.3
Thyme	13.4	38.0	11.9	63.3
Rosemary	15.1	40.9	12.1	68.1

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