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Original article

Turkey Jerky as a Potantial Meat Snack

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Abstract

The research was aimed to obtain a product with high nutritional value and long shelf life called as Turkey Jerky. It was produced with turkey breast meats which marinated with 7 different spices (*Salvia rosmarinus* (R), *Thymus vulgaris* (T), *Pimenta racemosa* (P), *Origanum majorona* (M), mixed spicy (MX) and control group (C)), vinegar, olive oil, soy sauce and liquid smoke. At the end of the marination, turkey breast meats were dried in the drying oven and kept in room conditions for 30 days after vacuum packaging. Microbiological, chemical, and sensory analyses were performed for treatments on the 0, 15 and 30 days. For turkey meat, the moisture, pH, ash, water activity (aw), fat and protein contents were determined as 72.34± 1.21, 5.83 ± 0.02, 1.18 ± 0.01, 0.972 ± 0.001, 1.05 ± 0.12 and 27.30 ± 0.24 %, respectively. There were significant differences in treatments all chemical properties than control samples. *Salvia rosmarinus* and *Pimenta racemosa* samples had the highest protein and ash content; *Origanum majorona* samples had the highest fat content. After marination, both moisture content and water activity values for all samples had decreased significantly. Otherwise, pH values had increased slightly. TBA value was found in the least control group for the beginning of the storage and the treatments had increasing effect on TBAs values. *Origanum majorona* samples and *Pimenta racemosa* samples had lower TBA values than other treatments. However, control and *Origanum majorona* samples have highest the differences between 0 and 30 days for TBA values. Besides, mix spicy treatment had the lowest differences for 30 days. According to the microbiaological analyses, *Origanum majorona* samples were the most safety treatment. For all samples, it has been observed that the microbial load increases slightly during the maintenance period. Sensory evaluation also dedicted that *Origanum majorona* samples had the best sensorial properties and general accaptibility.

As a result, while the increases in microbial load was not observed much compared to a product that is vacuum packed and stored in room conditions, the chemical contents of the products were generally preserved. Considering these results, the turkey jerky is an alternative healthy snack.

Keywords: Drying, marination, jerky, Turkey.

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INTRODUCTION

Turkey meat is a white meat that is frequently consumed in the world and Turkey. It has richer nutritional composition than other poultry products. Besides, it has also lower price than red meat and it is important for cheaper protein source for consumers. In this study, the turkey breast meat was used, and various spices was added to it to produce jerky, which is a dried meat product (Temelli, 2011). Turkey meat had lots of advantages for processing and healthy consumption, such as the lowest fat content and cholesterol (Bor, 2011). The used spicies had been studied in previous studies and it indicated that they caused to longer shelf life and favourable aroma.

In this study, six types for jerky produced and the antimicrobial and compositional effects of these spices on the product will be examined. It consisted of a control product, all of which were added in mixed proportions and will be produced only by including the standard marination formula (Özenç, 2011). Although Jerky is not consumed much in our country, it is preferred in many countries abroad and each region has marination formulas developed with mixtures of traditional spices (Temelli, 2011). The production steps of the product consist roughly of shaping, marination, drying and packaging of meat. In this study, the vacuum packaging technique was preferred as a packaging technique. As a result, it is aimed to offer an alternative snack enriched spices, the expansion of the use of turkey meat and the use of natural antioxidant substances (Bor, 2011).

MATERIALS and METHODS

Material

The turkey breast meat used in the study was selected from a national brand in a national market. The meats are stored in cold storage (-18 °C) at The Food Control Application and Research Center of Kirklareli University until the procedure is performed. 24 hours before the procedure, the meat was taken to the cold storage at +4 °C and dissolved.

Salt, garlic powder, onion powder, black pepper, *Thymus vulgaris, Pimenta racemosa*, *Origanum majorona*, and *Salvia rosmarinus* used in marination were obtained from local markets in Kirklareli. It was kept under favorable conditions and used in marinating processes. Vinegar, olive oil, soy sauce and liquid smoke, which are used to improve taste, aroma, texture, and shelf life, were obtained from local market, and kept in room conditions at The Food Control Application and Research Center of Kirklareli University and used in marinating processes.

The turkey meats that have been supplied cut in sizes 3-8-0.5 cm after the dissolution stage. Then the meats were mixed with the marinade mixture whose formulas were determined and the sauces and spices in the marinade were penetrated the meat. Meat is left to rest for 24 hours at +4 °C. After completing the resting stage, the meat was lined up on the shelves of the drying oven (Atacama

Dehydrator) and dried for 7 hours at 68 °C. The meats that completed the drying process were kept in room conditions after vacuum packaging (Abant MG-42).

Methods

pH Analysis

10 g of raw and jerky samples weighed, and 100 ml of pure water was added to them. Homogenized samples for 1 minute with the help of ultra-Turrax homogenizer were determined by electrode pH meter after soaking at room temperature for 20-25 minutes (Bor, 2011).

Ash Content

Porcelain crucibles were left with nitric acid (HNO_3) in them the day before use. The next day it was shaken well with tap water, then passed through pure water, dried, then brought to the constant weighing. The weight of the crucible was recorded. Then 3-5 g sample was taken from the sample by weighing it into the crucible. In the ash oven, where the crucible temperature was set to 500 ºC, it was left for 7-8 hours. At the end of this period, if there was a carbonized part, the time was extended a little longer. Then the crucibles were taken to the decyclator and left until they reach room temperature and weighed (Anonymous, 2018).

Ash, % = [(M_2-M_1) / m] x 100

M_2 : Crucible after burning + ash weight

M_1 : Weight of crucible brought to constant weighing

m : Sample weight received

If the result was desired in the dry matter, the above value was multiplied by the factor of 100/Dm. Dm = 125 °C is the amount of dry matter contained in 100 grams of the sample (Anonymous, 2018).

Moisture Content

The amount of moisture of the meats was made twice, raw sample and after cooking. Approximately 5 g samples were weighed in drying containers brought to the fixed weighing. The containers containing samples were kept at 105 °C for 4 hours and then taken to the decyclator to cool. Cooling samples were weighed. This process continued until the difference between the weighings was less than 0.1%. After the procedure, the results were evaluated according to the following formula to calculate the moisture content (Bor, 2011).

Moisture, % = (M_1-M_2/m) x 100

M_1 : Container after drying + sample quantity (g)

M_2 : Container before drying + sample quantity (g)

m : sample quantity (g)

The Thiobarbutiric Acid (TBA) Analysis

To determine the degree of fat oxidation in the samples, 2-Thiobarbuthyric acid (TBA) test was applied by Tarladgis et al. (1960). 10 g sample was homogenized with 100 ml of pure water for about 1 minute and transferred to Kjeldahl balloons. 2.5 ml 4 N HCl and 1 ml Antifoam A were added to the distillation balloons and connected to the distillation unit. Distillation was maintained until 50 ml of distillate was collected. Then 5 ml each was taken from the distilling and pure water for the blind and placed in 25 ml balloon jojes and 5 ml of TBA solution was added on top. The mouth of the balloon jojes was closed with aluminum foil and kept in the boiling water bath for 35 minutes, then cooled and the spectrophotometer read the absorbency value against the blind sample at 538 nm. When the absorbency value is multiplied by 7.8, the result is expressed as the amount of malonaldehyde found in 1 kg of meat mg (Deniz, 2009).

Water Activity Content

For water activity measurement, samples were kept at 25ºC for 30 minutes and stabilized, and then measured repeatedly with the water activity analyzer (Frei et al., 2012).

Fat Content

After homogenizing the sample, it was weighed into 5-10 g Soxhlet cartridges and placed in a petri dish. As with dry matter determination, in the study of 103±2 °C, for example, the water was blown out and the water was cooled by taking the sample decyclator. Extraction device balloons were studied with boiling stones and dried for two hours at 103±2 °C. After the drying process is completed, the balloons are taken to the decyclator and cooled and weighed with a sensitivity of 0.001 g. Cartridges were extracted with hexane for about 8 hours. After the extraction was completed, it was separated from the sample with the solvent rotary and then weighed at a sensitivity of 0.001 g. The amount of fat found in the samples was calculated by percentage (AOAC, 2000).

Protein Content

In this study, protein analyses were performed using the Kjeldahl protein analyzer. 1 g sample was weighed on a precision scale and placed in the combustion tube, 2 tablets of catalyst (3.5 g K_2SO_4, 0.035g Se) and 15 ml of sulfuric acid were added to the incinerator. The burning process continued until the sample received a clear green color. After the formation of green color, the tube was left to cool for a while and 70 ml of pure water was added to it. After these procedures, the tube was inserted into the disstitution device and 50 ml of the 33% NaOH in the tank of the tool was automatically added to the tube. On the other hand, 25 ml of boric acid 4% was put in the flask and connected to the system and the disstition device was operated. After the disstiation ended, the collected distillate was shaken with

0.2 N HCl and nitrogen was calculated with the amount of consumption, and then % protein was found by multiplying by the factor of 6.25 (Kolsarıcı, 2004).

Microbiological Analysis

Escherichia coli : In aseptic conditions, 10 g samples from the samples were placed in sterile plastic bags and placed on them. 90 ml of serum physiological water was put on them. It was then homogenized in Stomacher and 10^{-1} dilution was prepared (Kök et al., 2007).

Even Tryptone X–Glucuronide Medium (TBX) was used for the feeder. Tbx prepared and sterilized. From the 10-1 dilution prepared, up to 10^{-3} was diluted and planted by pour plate method. It was incubated for 24-48 hours at 44.5 °C and counted as typical colonies that gave fluorescent blue color (Kök et al., 2007).

Total Mesophilic Bacteria : 10 g samples from the samples were placed in sterile plastic bags and 90 ml of pure water was added. It was then homogenized in Stomacher and 10^{-1} dilution was prepared (Kök et al., 2007). Plate Count Agar (Oxoid CM 325) was prepared, and sterilized, different dilutions were prepared and samples were inoculated. It was incubated for 48 hours at 30 °C (Kök et al., 2007).

Total Yeast-Mold Content : 10 g samples from the samples were placed in sterile plastic bags and 90 ml of pure water was added. It was then homogenized in Stomacher and 10^{-1} dilution was prepared (Kök et al., 2007). Potato Dextrose Agar (PDA) was used as medium. PDA and a lactic acid solution (10%) were prepared (pH 3.5). PDA and lactic acid solution were sterilized. The samples were incubated for 3-5 days at 20-25 °C (Kök et al., 2007).

Staphylococcus aureus : 10 g samples from the samples were placed in sterile plastic bags and 90 ml of pure water was added. It was then homogenized in Stomacher and 10^{-1} dilution was prepared (Kök et al., 2007). Baird Parker (BP) agar was used as medium. The samples were incubated for 48 hours at 37 °C.

Sensory Analysis

The sensory evaluation was performed by 10 panelists who were either faculty members or undergraduate students in the Departmet of Food Engineering, within the age group of 18-55. They evaluated the appearance, smell, taste, color, chewability, texture, and general acceptibility of samples by rating within the 10 points on a 0 to 10 scale. The panelists were trained and guided by descriptive sensory analysis methods (Lawless and Heymann, 1999).

RESULTS and DISCUSSION

Compositional Analyses

In jerky products prepared using different spices, protein %, fat %, ash %, pH, water activity and moisture % were determined in raw turkey meat to determine the change in chemical composition. The results of the analysis for turkey breast meat were given in Table 1 and Table 2.

Table 1. The chemical properties of turkey breast meat

Analysis	**Turkey Breast Meat**
Moisture, %	72.34 ± 1.21
pH	5.83 ± 0.02
Ash, %	1.18 ± 0.01
Water Activity (a_w)	0.972 ± 0.001
Fat, %	1.05 ± 0.12
Protein, %	27.30 ± 0.24

Table 2. The microbiological properties of turkey breast meat

Microbial Load (log kob/g)	**Turkey Breast Meat**
Total Mesophilic Bacteria	5.2 ± 0.00
S. aureus	2.58 ± 0.01
E. coli	<1
Total Yeast-Mold	5.64 ± 0.14

Bor (2011) examined the use of certain natural antioxidant sources in the marination of turkey meats and found the pH value for raw turkey meat as 6.18% and the moisture content as 73.25%. In our study, the average pH values of raw turkey meats were low compared to Bor (2011) and the moisture content was similar.

Çolak et al. (2011) found the pH value of 5.9, the a_w value as 0.997 and the mold-yeast load as 3.5 log kob/g in the study where they examined the effect of packaging on the shelf life of turkey meat. When the values found were examined, it was seen that the pH and aw value in raw products were similar and the total yeast and mold value was higher.

Kolsarıcı et al. (2004) examined the effect of cold and frozen storage on the chemical and microbiological quality of chicken meats and determined the moisture content in chicken breast meats as 68.82% and pH as 6.47%. They also determined that 6.02 log log kob/g was a total mesophilic creature. In contrast to the values found, it was observed that the humidity in our raw sample was higher, the pH value was lower, and the number of mesophilic creatures was lower.

The analyses to determine the chemical compositions of jerky samples were given in Table 3. As a result of the studies. the amount of protein in the raw sample was determined as 27.30%. Marination and drying were found to increase the amount of protein in Jerky products. The reason for this increase can be explained by the soy sauce used in the drying process and marination and various spices. R has the highest amount of protein with a ratio of 74.11%. When all formulations are considered, jerky product comes across as a product with a high biological value with an average protein content of 58.82%. The ash content and fat of Jerky samples were 5.81% and 6.85% respectively. which was found to be a good quality in terms of health.

Table 3. Chemical compositions of jerky products prepared with different formulations

Jerky	**Protein, %**	**Ash, %**	**Fat, %**
Control Jerky (C)	44.77 ± 1.63	5.23 ± 0.05	6.00 ± 0.14
Thymus vulgaris (T)	54.16 ± 2.14	5.79 ± 0.29	6.3 ± 0.60
S. rosmarinus (R)	74.11 ± 3.07	6.24 ± 0.10	5.10 ± 0.42
O. majorona	62.04 ± 1.19	5.74 ± 0.23	8.24 ± 0.57
Pimenta racemosa (P)	66.26 ± 4.73	5.95 ± 0.01	7.77 ± 0.06
Mix Jerky (MX)	51.59 ± 0.33	5.88 ± 0.15	7.67 ± 0.12

According to similar studies conducted by Kolsarici et al. (2004) and Kim et al. (2012) in chicken meat. it was determined that the protein and ash values of our products are higher. and the amount of fat is lower than the similar Kolsarici et al. (2004) to Kim et al. (2012).

In jerky samples were prepared with different formulations; moisture determination was made to determine the effectiveness of the drying process. The results of moisture determination are given in Table 4. The moisture content of the raw material (turkey breast meats) used in jerky production was determined as 72.34%.

According to the moisture results, it was observed that the moisture content decreased in the S and M samples and increased for the C and R samples, when there was no differeneces for the A and

MX samples. The increase in the amount of moisture content can be explained by the vacuum package affect that it has drawn moisture during the storage period. According to our studies, the moisture content of jerky samples was similar wit Carr et al. (1996). and Kim et al. (2012).

Table 4. Moisture contents of jerky samples.

Moisture%/day	**0**	**15**	**30**
Control Jerky (C)	34.77 ± 1.07	33.52 ± 1.21	30.31 ± 0.08
T. vulgaris (T)	31.55 ± 1.14	28.18 ± 0.74	37.28 ± 0.67
S. rosmarinus (R)	21.34 ± 3.26	22.69 ± 0.19	30.77 ± 1.71
O.majorona (M)	32.52 ± 2.03	22.28 ± 0.24	25.25 ± 0.15
P. racemosa (P)	30.22 ± 0.76	20.15 ± 0.13	30.99 ± 0.22
Mix Jerky (MX)	28.88 ± 5.20	32.28 ± 0.22	29.48 ± 0.60

The pH values of the samples were measured for 30 days to investigate its suitability for microbial development and consumer health. pH analysis results were given in Table 5.

Table 5. pH values of turkey jerky samples.

pH value/day	**0**	**15**	**30**
Control Jerky (C)	5.47 ± 0.02	5.59 ± 0.00	5.62 ± 0.02
T. vulgaris (T)	5.78 ± 0.04	5.52 ± 0.02	5.50 ± 0.01
S. rosmarinus (R)	5.54 ± 0.01	5.65 ± 0.00	5.73 ± 0.02
O. majorona (M)	5.66 ± 0.06	5.62 ±0.09	5.58 ± 0.01
P. racemosa (P)	5.56 ± 0.04	5.44 ± 0.03	5.6 ± 0.01
Mix Jerky (MX)	5.51 ± 0.01	5.64 ± 0.01	5.51 ± 0.02

The pH of turkey breast meats used in jerky production was determined as 5.83. The pH values increased for the C and R samples. It was observed that the pH value of the T and M groups decreased, while the A and MX groups remained constant. The increase and decrease of pH values can be explained by the shelf-life relationship.

The pH values of chicken jerky products made by Kim et al. (2012) is higher than the pH of our turkey jerky products. In the jerky products produced by Lee and Kang (2003) from ostrich meat, the pH values are in line with our study.

The Thiobarbutiric Acid (TBA) Analysis

Analysis was carried out to determine the amount of TBA in turkey jerky products marinated with different spices. The changes of TBA values were determined for 0., 15. and 30. days after production. According to the beginning of the storage time, TBA values were calculated as 0.19, 0.36, 0.46, 0.63, 0.88 mg of malonaldehyde/ kg for C, M, T, A, MX and R, respectively. The results of TBA values for samples were given in Figure 1.

The malonaldehyde-thiobarbutiric acid (TBA) has been widely used for determining of the lipid oxidation in samples (Tokur et al., 2006). As expected, an increase in TBA values was observed with storage. However, it is not desired to a high increase the TBA value, which indicates to the high oxidantion. In the study, it is aimed to prevent oxidation with enrichment. The most effective treatment was determined as R that performed minimum increasing from the initial value (0.99 mg of malonaldehyde/ kg). The other effective treatments were MX, A and T, respectively (Figure 1).

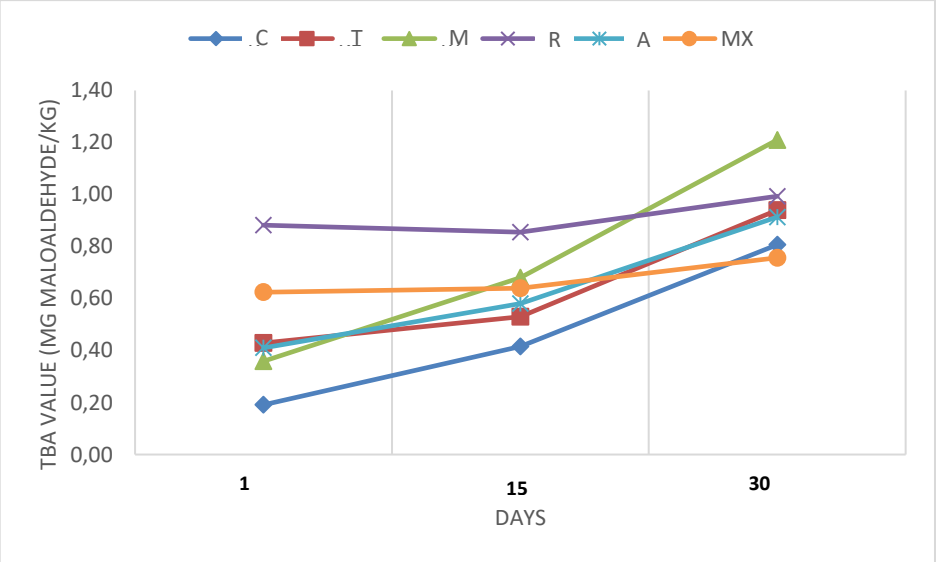

Figure 1. TBA Values of the Control and Enriched Samples.

Compared to the average TBA values of the jerky products produced by Wongwiwat and Wattanachant (2015) and Choi et al. (2016) using chicken meat, the TBA values of our products were lower than Wongwiwat and Wattanachant (2015) and higher than Choi et al. (2016).

Water Activity (a_w)

The meat products have high importance for nutritional components, especially proteins. However, the meat products have varied largely in their composition of water, proteins, fats, carbohydrates, and salts. Therefore, it is important for determining the composition for the processing and formulation of cooked and processed meat products (Sman and Boyer, 2005).

The water activity of turkey breast meats used in jerky production was determined as 0.972. Water activity values of control and enriched samples were given in Table 6.

Table 6. Water Activity of the Control and Enriched Samples.

A_w/day	**0**	**15**	**30**
Control Jerky (C)	0.912 ± 0.004	0.863 ± 0.001	0.88 ± 0.002
T. vulgaris Jerky (T)	0.882 ± 0.003	0.847 ± 0.000	0.867 ± 0.001
S. rosmarinus (R)	0.849 ± 0.002	0.811 ± 0.004	0.809 ± 0.000
O. majorona (M)	0.826 ± 0.006	0.781 ± 0.004	0.831 ± 0002
P. racemosa (P)	0.742 ± 0.003	0.753 ± 0.002	0.817 ± 0.000
Mix Jerky (MX)	0.88 ± 0.002	0.876 ± 0.000	0.857 ± 0.001

As a result of the a_w analysis, an increase was observed in the A group when looking at the values between the first and last days of the products. It was observed that a decrease in C, T, M and MX groups.

When the water activity values of the ostrich jerky produced by Lee and Kang (2003) were examined, it was observed that the water activities of our products were higher. However, according to Kim et al. (2012) who had study about chicken jerky, it was determined that the water activity of our products was similar.

Microbiological Analyses

Total Mesophilic Aerobic Bacteria (TMAB)

Analysis was carried out to determine the total mesophilic bacterias in turkey jerky products. TMAB results are given in Table 7.

Table 7. The results of Total Mesophilic Aerobic Bacteria (TMAB) counts (log cob/g) in the examined samples.

TMAB (log cob/g)/day	**0**	**15**	**30**
Control Jerky (C)	3.97 ± 0.06	4.23 ± 0.15	4.78 ± 0.05
T. vulgaris (T)	4.09 ± 0.02	4.15 ± 0.03	4.57 ± 0.22
S. rosmarinus (R)	4.10 ± 0.01	4.16 ± 0.06	4.33 ± 0.01
O. majorona (M)	4.22 ± 0.03	4.02 ± 0.05	4.21 ± 0.14
P. racemosa (P)	4.26 ± 0.05	4.67 ± 0.04	4.69 ± 0.07
Mix Jerky (MX)	4.59 ± 0.01	4.81 ± 0.03	4.56 ± 0.04

According to the total mesophilic bacteria contents,.it was declined that TMAB contents did not increased for M and MX samples. It was interesting that M samples had the highest moisture content while it had not any increasing for TMAB count. The samples of C, T, R and A had an increasing. These results were similar with literatures (Kilic et al., 2007; Kim et al., 2012).

Staphylococcus aureus

Analysis was performed to determine the number of *Staphylococcus aureus* in turkey jerky products prepared using various marinades. *Staphylococcus aureus* analysis results are given in Table 8.

Table 8. The results of Staphylococcus aureus counts (log cob/g) in the examined samples.

***S. aureus* (log cob/g)/day**	**0**	**15**	**30**
Control Jerky (C)	3.14 ± 0.05	2.87 ± 0.07	3.37 ± 0.16
T. vulgaris (T)	3.04 ± 0	2.26 ± 0.20	3.97 ± 0.00
S. rosmarinus (R)	3.16 ± 0.04	3.30 ± 0,23	3.28 ±0,04
O. majorona (M)	3.27 ± 0.10	3.27 ± 0.14	3.19 ± 0.03
P. racemosa (P)	3.38 ± 0.04	3.23 ± 0.04	3.64 ± 0.12
Mix Jerky (MX)	3.39 ± 0.09	3.49 ± 0.03	3.60 ± 0.00

As a result of the *Staphylococcus aureus* analysis, an increase was observed in the K, T, A, MX samples during storage period. For M and R samples, there were not any changes in contents of *Staphylococcus aureus.*

Williams et al. (2010) study of turkey jerky found that turkey jerky load with barbecue sauce is higher than our products, while turkey jerky load with teriyaki sauce is less than our products. In the studies, the amount of load on the product obtained from chicken meat is higher than our product (Smaoui et al., 2011)

Escherichia coli

Analysis was carried out to determine the number of *E.coli* in jerky products prepared with different formulations. The amount of *E.coli* in turkey breast meats used in jerky production was determined as 0.76 log cob/g. during storage. *E.coli* was not found in any of the products in all the analysis carried out in the days. It can be explained by the fact that the a_w value is under the critical point and the antimicrobial effects of spices. The number of *E. coli* in jerky products obtained using turkey meat in studies is similar with our study (Porto-Fett et al., 2009; Williams et al., 2010).

Total Yeast-Mold

Analysis was carried out to determine the total number of yeast-mold in turkey jerky products marinated with different spices. Total yeast-mold results are given in Table 9.

Table 9. The results of Total Yeast-Mold counts (log cob/g) in the examined samples.

Total Yeast-Mold (log cob/g)/day	**0**	**15**	**30**
Control Jerky (C)	3.13 ± 0.13	4.86 ± 0.00	3.00 ± 0.00
T. vulgaris (T)	3.59 ± 0.09	3.76 ± 0.12	4.29 ± 0.07
S. rosmarinus (R)	3.23 ± 0.21	2.74 ± 0.20	4.46 ± 0.12
O. majorona (M)	4.53 ± 0.10	3.69 ± 0.07	4.30 ± 0.00
P. racemosa (P)	4.51 ± 0.86	3.85 ± 0.40	4.54 ± 0.19
Mix Jerky (MX)	4.42 ± 0.08	3.15 ± 0.12	4.84 ± 0.05

It was not observed that any changes for the samples of A. It has been determined that the values were increased for other samples. These results were similar with Kilic et al. (2007), and higher than Oblinger et al. (1975).

Sensory Analysis

Sensory analysis was performed to measure consumer acceptibility of turkey jerky products. For each treatment, 10 trained panelists were evaluated using descriptive sensory analysis methods with a scoring test. Panelists evaluated the appearance, smell, taste, color, chewability, texture, and general acceptibility of samples by rating within the 10 points on a 0 to 10 scale. The results are given in Table 10.

Table 10. Sensory evaluation of control and enriched samples.

Treatment	Color	Taste	Texture	Appearance	Smell	Chewability	General Acceptibility
Control Jerky (C)	7.2	5.7	6.0	5.9	6.7	6.8	6.3
T. vulgaris (T)	6.5	6.3	6.5	6.0	7.3	6.5	6.8
S. rosmarinus (R)	6.9	6.3	6.4	7.3	7.6	7.4	7.2
O. majorona (M)	6.7	6.6	6.5	6.6	7.0	7.1	6.8
P. racemosa (A)	6.1	6.5	5.3	5.7	7.4	6.3	6.5
Mix Jerky (MX)	6.3	5.7	5.7	6.2	6.8	5.5	5.9

As a result of the evaluations of the panelists, the best score in the color and taste properties were C and R, respectively. However, appereance and smell were affected from enrichment process positively. Control samples gave lower point than others for appereance. Similarly, enrichment process achieved higher points for taste. Only MX samples gave lower point than control for taste evaluation. Besides, *Thymus vulgaris*, *Salvia rosmarinus* (R) and *Origanum majorona* (M) had positively effect on textural properties, except *Pimenta racemosa* samples and mix samples. General acceptability had the highest score for R and M samples, while MX was not preferred than others. Enrichment process of was contributed to nearly all the sensorial properties.

CONCLUSION

According to the research, jerky, which is made attractive with different spices, is a healthy snack and inexpensive protein source. The jerky has some advantages, such as the absence of nitrate-nitrite salts, ready to eat product etc. Besides, the jerky can be included in the diets with its high protein content.

Although it does not contain another additive, there are not any changes in the samples during the storage period indicates that our study has achieved its purpose. In the following studies, it should be researched about different packaging and storage conditions.

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