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Chemical evaluation of some frozen poultry meat

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Abstract

Ninety random samples of chicken, duck breasts and whole pigeon meat (30 of each) were collected from different supermarkets located in Kalybia Governorate. The collected samples were analyzed for determination of keeping quality of the products by determination of pH, total volatile nitrogen, thiobarbituric acid and peroxide value. The results showed that the mean values of the previous keeping quality tests for chicken breast, duck breast and pigeon meat were 5.77± 0.02, 5.64± 0.02 and 5.62±0.01 for pH, 9.11±0.33, 7.01±0.29 and 10.67±0.32 for TVN, 0.09±0.01, 0.16±0.01 and 0.03±0.01 for TBA and 0.12±0.01, 0.30±0.01 and 0.08±0.01 for peroxide value, respectively. The difference between the examined samples of chicken, duck breasts and pigeon meat were highly significant (p>0.01).Finally application of chemical tests indicated that the examined samples of whole pigeon had the highest keeping quality as compared with chicken and duck breasts.

Key words: TVN, TBA, pH, peroxide value, poultry

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1. INTRODUCTION

Poultry meat constitutes an excellent source of high quality animal proteins required for nutrition of infants, young children, adults and convalescents. In addition, vitamins especially B complex and minerals such as potassium, magnesium and phosphorus are present in considerable amount in the poultry meat as recorded by [6].

Poultry and poultry products provide animal protein of high biological value for consumer at all ages, which contain all the essential amino acids required for human growth, higher proportion of unsaturated fatty acids and less cholesterol value. Moreover, poultry meat is a good source of different types of vitamins as niacin, riboflavin, thiamine and ascorbic acid as well as essential minerals as sodium, potassium, calcium, iron phosphorous, sulpher and iodine [15].

The fresh chicken breast had pH value of 5.8, while the mean pH value of fresh thigh muscle was 6.6, and higher than breast muscle[7] while mean value of the duck breast meat had significantly lower average pH values (5.93) than thigh muscle (6.26) [20], while the mean pH values of frozen and fresh quails were 6.0 and 5.8, respectively as recorded by [1].

The TVN value ranged from 8.7 to 14.6 with an average of 11.29±0.32 mg% for chicken breast moreover, the minimum and maximum TBA values (mg %) of chicken breast ranged from 0.02 to 0.06 with mean value of 0.04 ± 0.01 [10].

The aim of the study was to determine the quality of the frozen poultry meat through the evaluation of pH, TVN, TBA and peroxide values.

2. MATERIALS AND METHODS

2.1. Samples

A total of 90 random samples of frozen poultry breast meats represented by chicken, duck and whole pigeon (30 of each) were collected from different supermarkets in Kalybia Governorate to evaluate their chemical profile.

Each chicken and duck breasts sample weighted were about 300g and then transferred in an insulated ice box to the laboratory without any delay. All collected samples were subjected to the following keeping quality tests as pH, TVN, TBAand peroxide value.

2.2. Determination of pH value [AOAC 5]

Ten grams of examined samples were homogenized with 25ml of neutral distilled water and left to stand for 10 min. and filtered. The pH was determined by using pH meter (Digital, Jenco 609).

2.3. Determination of total volatile nitrogen (TVN) (mg/100g)

The technique applied for determination of TVN was recommended by FAO [12].

2.4. Determination of Thiobarbituric aciid number (TBA) (mg malonaldehyde/kg)

The applied technique was recommended by Krik and Sawyers [14].

2.5. *Determination of Peroxide value* according to Asakawa and Matsushita [4].

The peroxide value (PV) for all examined samples was calculated from the following formula:
PV = (V1 – V0) x T x 1000 / m where:
V1 = volume of thiosulfate solution required to titrate the sample (ml)
V0 = volume of thiosulfate solution required to titrate the blank
T = titre of the sodium thiosulfate solution (normality)
m = weight of sample (g).
The obtained results were statistically evaluated by application of Analysis of Variance (ANOVA) test according to Feldman et al. [11].

3. RESULTS AND DISCUSSION

It is evident from the results recorded in Table 1 that the mean pH value in the examined samples of poultry meats were 5.77 ± 0.02 for chicken breast meat, 5.64 ±0.02 for duck breast meat and 5.62 ± 0.01 for pigeon meat, differences associated with the examined samples of chicken breast, duck breast and pigeon meat were highly significant ($P<0.01$) according to the pH values.

The obtained pH values of the examined chicken breast samples, were nearly similar to that reported by [21, 7, 10], higher results were achieved by [24, 3] this may be attributed to the method of the slaughter and the condition of the poultry before slaughter.

The above mentioned results from the examined duck breast muscles were nearly similar to those obtained by [19, 9], while higher results were achieved by [16, 18, 8, 20].

On the other hand, the above mentioned results of the examined pigeon meat samples were lower than those obtained by [25].

While, the mean values of TVN (mg %) were 9.11 ± 0.33 for chicken breast meat, 7.01± 0.29 for duck breast meat and 10.67 ± 0.32 for pigeon meat.

The differences associated with examined samples of chicken, duck and pigeon were highly significant ($P<0.01$) in relation to the TVN results. N.B. EOS says that TVN must be not more than 20 mg/100mg of

the sample, TBA not more than 0.9 mg/kg malonaldehyde.

The results recorded for chicken breast are relatively agree to those obtained by [2], while higher results were recorded by [3] and lower results were obtained by [22] .

Table 1 Mean values of pH, TVN (mg %), TBA (mg /kg) and peroxide value in the examined chicken breast, duck breast and pigeon samples (n=30).

Poultry meat / Deteriorative criteria	Chicken breast meat	Duck breast meat	Pigeon meat
pH	5.77±0.00 [a]	5.64±0.02 [b]	5.62±0.01 [b]
TVN	9.11±0.30 [b]	7.01±0.29 [c]	10.67±0.32 [a]
TBA	0.09±0.00 [b]	0.16±0.01 [a]	0.03±0.01 [c]
peroxide value	0.12±0.00 [b]	0.30±0.01 [a]	0.08±0.01 [c]

Values within the same raw with different letters were significant differences (p<0.01).

Concerning the examined samples, the pigeon meat samples had the highest proportion of TVN mg %, so it had the highest nutritive value followed by chicken and duck breast samples. This means that the pigeon and chicken meat samples are the most rapid samples for degradation of protein, but all the samples were within the accepted limits (not more than 30mg %) according to [17].

However, the result recorded in Table 1 indicated that the mean values of TBA (mg %) as malonaldehyde were 0.09±0.01 for chicken breast meat, 0.16± 0.01 for duck breast meat and 0.03± 0.01 for pigeon meat, differences associated with the examined samples of chicken breast, duck breast and pigeon were highly significant (P<0.01) as a result of TBA levels.

The results recorded for chicken breast come in accordance with those obtained by [3], higher results were obtained by [23].

Regarding to the examined samples, the duck meat had the highest proportion of TBA (mg %) as compared with chicken and pigeon meat samples as the duck meat had higher percent of fat than others did. Oxidative rancidity occurs at TBA more than 0.9 mg% according to [17]. Therefore, all the examined samples were within the accepted limit.

Results of peroxide values in the examined samples of poultry meats revealed that it was 0.12±0.01 for chicken breast meat, 0.30± 0.01 for duck breast meat and 0.08± 0.01 for pigeon meat, differences associated with the examined samples of chicken, duck and pigeon meat were highly significant (P<0.01) as a result of their peroxide values.

Application of keeping quality tests (pH, TVN and TBA) indicated that the pigeon meat had the highest keeping quality as compared with those of chicken breast and duck meat breast.

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التقييم الكيميائي للحوم الدواجن المجمدة

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الملخص العربى

أجريت هذه الدراسة لمعرفة مدى جودة لحوم الدواجن المجمدة من الناحية الكيميائية لمعرفة مدى صلاحيتها للاستهلاك الأدمي ومدى مطابقتها للمواصفات القياسية المصرية من عينات صدور الدجاج والبط والحمام الكامل حيث تم جمع عدد 90 عينة من لحوم الدواجن المختلفةالمجمدة (30 من صدور الدجاج، 30 من صدور البط، 30 من الحمام الكامل) وكان وزن كل من صدور الدجاج والبط حوالي 300 جم. من محلات السوبر ماركت المختلفة بمحافظة القليوبية وتم فحصها كميائيا لتقدير الحالة الغذائية والكيميائية لكل منها (اختبار تركيز أيون الهيدروجين، تركيز النيتروجين المتصاعد، قيمة حمض الثيوباربيتيورك ورقم البيروكسيد). وقد وجد أن الحمام المجمد يحتوي على أعلى نسبة من متوسط تركيز النيتروجين القلوي المتصاعد (10.67) لاحتوائه على نسبة عالية من البروتين(21.01) على عكس صدور كلا من الدجاج والبط المجمدين. كما أظهرت عينات البط المجمدة أن نسبة حمض الثيوباربيتيورك(0.16) كانت الأعلى لاحتوائه على نسبة عالية من الدهون. وقد كانت جميع العينات مطابقة للمواصفات القياسية المصرية (2005/1090) حيث كان متوسط تركيز النيتروجين القلوى المتصاعد أقل من (20 مجم/100مجم) فى جميع العينات وكان متوسط قيمة حمض الثيوباربيتيورك أقل من (0.9 مجم/كجم) مالونالدهيد. وقد خلصت الرسالة إلى أن الحمام المجمد أعلى فى القيمة الغذائية من صدور كل من الدجاج والبط المجمدين.

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