



## Chemical criteria of chicken meat

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### ABSTRACT

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The chemical composition of each chicken cuts-up is greatly varied from one to another. A total of 50 random samples of chicken meat represented by breast and thigh (25 for each) were collected from local commercial retail shops at Menoufia governorate. Each sample weighting about 100gm. The collected samples were tested for their PH values, TVN, TBA and Peroxide value. The results show that the maximum values of pH in the examined chicken breast and thigh samples ranged from 5.7 to 5.96 and 5.65 to 5.84, respectively with mean values of  $5.81 \pm 0.05$  and  $5.73 \pm 0.03$ , respectively. TVN value in the examined samples of chicken carcasses was ranged from 2.3 to 8.5 with an average of  $5.56 \pm 0.24$  mg% for breast and 3.8 to 10.9 with an average of  $7.12 \pm 0.29$  mg% for thigh. TBA values (mg%) of the examined samples of chicken breast and thigh were ranged from 0.06 to 0.14 and 0.08 to 0.21mg%, respectively with mean values of  $0.09 \pm 0.01$  and  $0.14 \pm 0.01$ , respectively. The peroxide values in the examined samples of chicken carcasses were varied from 0.11 to 0.26 with a mean value of  $0.19 \pm 0.01$  for breast and 0.14 to 0.39 with a mean value of  $0.27 \pm 0.01$  for thigh. From the previous results it could be concluded that chicken meat from local commercial retail shops in Menoufia governorate were acceptable based on their pH values, TVN, TBA and Peroxide value as all samples were nearly within their permissible limits.

**Key words:** Breast, thigh, PH, TBA, Peroxide value.

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### 1. INTRODUCTION

In Egypt, chicken occupy the major role in production and consumption among poultry. Chickens appear more frequently than any other food animals, so acts as a main source of protein in the diet of the people throughout the world. Chicken meat becomes the second most popular meat eaten after red meat. Chicken meat is characterized by ease during preparation, consistent quality and the availability of the wide range of pre-packed,

branded, raw and ready to eat and serve products (shedeed, 1999). Meat from chicken is usually used because of the high chicken meat yield, low shrinkage during cooking, ease of cooking and serving and of low cost (Branscheid, 1993).

The chemical composition of each chicken cuts-up is greatly varied from one to another (Lawrie, 1998).

The meat with a pH below 5.8 had a

pale color, while in meat with pH higher, the color was too dark and it has a great risk on human health. So the ideal pH for meat is between 5.8 and 6.3 (Pearson and Gillette, 1996). The decrease in pH value in meat may be attributed to the breakdown of glycogen with the formation of lactic acid and the increase of pH may be due to the partial proteolysis leading to the increase of free alkaline groups depending on the condition of such changes. Besides, higher pH values of leg meat compared to breast meat could be due to the increase of lactic acid concentration via anaerobic metabolism in breast meat (Jay, 1972).

Accordingly, Total Volatile Nitrogen (TVN) can be considered as a reliable indicative measure for the quality of various food articles specially meat and meat products. In general, TVN in meat products may be increased as the days of storage increased where protein break down (ammonia) may occur due to microbial growth and its proteolytic enzymes (Alina and Ovidiu 2007).

Thiobarbituric acid (TBA) test has been widely used for measuring oxidative rancidity in fat containing food. The TBA test is a sensitive test for determination of the decomposition of products of highly unsaturated fatty acids (Melton, 1983).

Oxidative deterioration results in losing the quality of chicken cuts-up due to development of rancid odor and taste. Moreover, the rancid flavor can develop rapidly during refrigerated or frozen storage of chicken cuts-up which are more susceptible to rancidity because of their high contents of unsaturated fatty acids (Ang, 1988).

The peroxide formation accelerates formation of other peroxides in a propagation step. Peroxides are referred to as "free radicals" and there has been much emphasis

in the press and from the health industry on preventing free radicals. "Free radicals" or peroxides will destroy the normal state of many chemicals in our bodies, in food products, and other biological matter. In food, the presence of peroxides will immediately alter the taste (Chekani-Azar *et al.*, 2009).

Therefore, the present study was planned out to determine pH, total volatile nitrogen (TVN), thiobarbituric acid number (TBA) and peroxide value (PV) in breast and thigh.

## 2. Materials and methods

### 1.2.-Collection of samples :

A grand total of 50 random samples of chicken carcasses (breast and thigh) represented by 25 samples of each were collected from local commercial retail shops at Menoufia governorates. Each sample weighting about 100gm. The collected samples were aseptically transferred, without undue delay, in an insulated ice box to the laboratory and then were subjected to the following examinations.

### 2.2. Determination of pH:

It carried according to (Pearson, 2006)

### 3.2. Determination of Total Volatile Nitrogen (TVN):

The technique applied for determination of total volatile nitrogen (TVN) was recommended by Food and Agriculture Organization "FAO" (1980)

### 4.2. Determination of Thiobarbituric Acid Number (TBA):

The method adopted for estimation of TBA by Pikul *et al.* (1989) was applied

### 5.2. Determination of peroxide value:

It was carried according to Asakawa and Matsushita (1978).

### 6.2. Statistical Analysis: All data were

subjected to statistical analysis according to the procedures reported by Snedecor and Cochran (1980).

## RESULTS

Results achieved in table (1) indicated that the minimum and the maximum values of pH in the examined chicken breast and thigh samples ranged from 5.7 to 5.96 and 5.65 to 5.84, respectively, with mean values of  $5.81 \pm 0.05$  and  $5.73 \pm 0.03$ , respectively.

The data recorded in table (2) indicated that TVN value in the examined samples of chicken carcasses was ranged from 2.3 to 8.5 with an average of  $5.56 \pm 0.24$  mg% for breast and 3.8 to 10.9 with an average of  $7.12 \pm 0.29$  mg% for thigh.

According to Egyptian Organization for Standardization (E.O.S, 2005) for poultry meat, all the examined samples were within the accepted level as TVN were lower than 20 mg% as shown in table (3).

The achieved data in table (4) Showed that the minimum and maximum of TBA values (mg%) of the examined samples of chicken breast and thigh were ranged from 0.06 to 0.14 and 0.08 to 0.21mg%, respectively with mean values of  $0.09 \pm 0.01$  and  $0.14 \pm 0.01$ , respectively.

In table (5) According to Egyptian Organization for Standardization (E.O.S, 2005) for poultry meat, all the examined samples were within the accepted level as TBA were lower than 0.90 mg/Kg.

Table (6) indicated that the peroxide values in the examined samples of chicken carcasses were varied from 0.11 to 0.26 with a mean value of  $0.19 \pm 0.01$  for breast and 0.14 to 0.39 with a mean value of  $0.27 \pm 0.01$  for thigh.

## 2. DISCUSSION

The chemical and nutritional composition of poultry meat is greatly varied from one species to another (Lawrie, 1998).

Chickens appear more frequently than any other food animals, so acts as a main source of protein in the diet of the people throughout the world. Meat from chicken is usually used for infants, young children, aged and convalescents. Chicken meat can be sold as a raw state or in ready to cook form. So, they may be sold as a whole carcass, quartered or disjointed, because of the high chicken meat yield, low shrinkage during cooking, ease of cooking and serving and of low cost (Branscheid, 1993).

Concerning the PH, according to results achieved in table (1), comparing the obtained values from the examined samples of chicken breast, the values were nearly similar, to some extent to, Ristic and Schorn (1977) ( 5.86), Dianek et al., (1989) (5.8) ,Fathi-Eman(2012)( 5.8 to 6.1) and Noha (2017)  $5.78 \pm 5.94$ .

The higher results were achieved by Shedeed (1999) (6.10) and Afifi-Jehan (2000) (6.15).

Furthermore, for the examined chicken thigh the nearly similar records were reported by Shedeed (1999) (5.70),Noha (2017)  $5.68 \pm 5.83$  and Fathi-Eman(2012)( 5.6 to 5.9).

The higher results were obtained by Ristic and Schon (1977) (6.44); Dianek et al., (1989) (6.6), Hassanine- Fatin and Hassan (2003) ( $6.57 \pm 0.03$ ) and Afifi-Jehan (2000) ( $6.21 \pm 0.034$ ).

Finally, for the examined chicken thigh samples, the values were lower than that obtained by Hassanine - Fatin and Hassan (2003) ( $6.67 \pm 0.02$ ).

Table (1): Statistical analytical results of pH values in the examined samples of chicken carcasses (n=25).

Chicken tissues	Min	Max	Mean $\pm$ S.E*
Breast	5.70	5.96	5.81 $\pm$ 0.05
Thigh	5.65	5.84	5.73 $\pm$ 0.03

S.E\* = Standard error of mean

Table (2): Statistical analytical results of Total Volatile Nitrogen "TVN" (mg %) in the examined samples of chicken carcasses (n=25).

Chicken tissues	Min	Max	Mean $\pm$ S.E*
Breast	2.3	8.5	5.56 $\pm$ 0.24
Thigh	3.8	10.9	7.12 $\pm$ 0.29

S.E\* = Standard error of mean

Table (3): Acceptability of the examined samples of chicken carcasses based on their levels of TVN (n=25).

Poultry species	Maximum Permissible Limit (mg %)*	Accepted Samples		Unaccepted Samples	
		No.	%	No.	%
Breast	20	25	100	0	0
Thigh		25	100	0	0

\* Maximum Residual Limit stipulated by Egyptian Organization for Standardization "EOS" (2005).

Table (4): Statistical analytical results of Thiobarbituric acid (TBA) "mg/Kg" in the examined samples of chicken carcasses (n=25).

Chicken tissues	Min	Max	Mean ± S.E*
Breast	0.06	0.14	0.09 ± 0.01
Thigh	0.08	0.21	0.14 ± 0.01

S.E\* = Standard error of mean

Table (5): Acceptability of the examined samples of chicken carcasses based on their levels of TBA (n=25).

Poultry species	Maximum Permissible Limit (mg/Kg)*	Accepted Samples		Unaccepted Samples	
		No.	%	No.	%
Breast	0.90	25	100	0	0
Thigh		25	100	0	0

\* Maximum Residual Limit stipulated by Egyptian Organization for Standardization "EOS" (2005).

Table (6): Statistical analytical results of Peroxide value (PV) "meqO2/kg" in the examined samples of chicken carcasses (n=25).

Chicken tissues	Min	Max	Mean ± S.E*
Breast	0.11	0.26	0.19 ± 0.01
Thigh	0.14	0.39	0.27 ± 0.01

S.E\* = Standard error of mean

The decrease in pH value in meat may be attributed to the breakdown of glycogen with the formation of lactic acid and the increase of

pH may be due to the partial proteolysis leading to the increase of free alkaline groups depending on the condition of such changes

(Jay, 1972).

Concerning TVN, according to the results recorded in table (2) for chicken breast, they are relatively agree, to same extent, with those obtained by Rossadkina (1978) (3.53mg%) and Noha, M.A.(2017) 2.26±7.82

Higher results were recorded by Afifi -Jehan (2000) (13.87±0.182 mg%), Abd El-Wahed (1986) (11.06 mg%), Abd El-Baki *et al.*, (1983) (9.37 mg%) and Fathi (2012)( 5.6 to 5.9).

Concerning the examined samples of chicken thigh, they are nearly similar to those reported by Abd El-Wahed (1986) (10.16 mg%), Abd El-Baki *et al.*, (1983) (8.23 mg%), Noha, M.A.(2017) 3.06±9.57 and Fathi-Eman(2012)( 4.1 to 10.3), while higher results were achieved by Hasanine and Hassan (2003) (30.76 ± 1.07) and Afifi (2000) (12.57 ± 0.222 mg%).

Ammonia is the most spoilage present in spoiled meat and meat products which is directly responsible for spoilage odors and flavors as ammonia, it is an indicator product of amino acid degraded by bacteria and it can be measured as total volatile basic nitrogen (Gill, 1983).

Accordingly, TVN can be considered as a reliable indicative measure for the quality of various food articles specially meat and meat products. In general, TVN in meat products may be increased as the days of storage increased (Reddy *et al.*, 1970).

According to table (3) Egyptian Organization for Standardization (E.O.S, 2005) for poultry meat, all the examined samples were within the accepted level as TVN were lower than 20 mg%.

Concerning TBA, according to table (4) the examined chicken breast muscle results nearly similar to results were recorded

by Afifi (2000) (0.119 ± 0.007 ), Noha, M.A.(2017) 0.03±0.11 and Fathi (2012)( 0.02 to 0.06) . Higher results were obtained by Moawad (1987) (0.31 mg%), Shams El-Din and Ibrahim (1990) (0.58 ± 0.12) and Shedeed (1999) ranged from (0.28 to 1.69 mg%).

For the examined chicken thigh samples, nearly similar records were obtained by Afifi (2000) (0.131 ±.008), Noha, M.A.(2017) 0.04±0.15and Fathi-Eman(2012)(0.05 to 0.12). The obtained results were lower than that recorded by Moawad (1987) (0.51 mg%) ; Shams El-Din and Ibrahim (1990) (0.81 ± 0.15) ; Shedeed (1999) ranged from (0.36 to 2.47 mg%) and Hassanine and Hassan (2003) (0.352 ± 0.015).

The oxidative rancidity in fresh, frozen and cooked chicken breast and leg meat was evaluated by measuring malonaldehyde in fat meat with an improved thiobarbituric acid (TBA) assay with antioxidant protection ( Abd El-Kader, 1996).

In table (5) According to Egyptian Organization for Standardization (E.O.S, 2005) for poultry meat, all the examined samples were within the accepted level as TBA were lower than 0.90 mg/Kg.

According to table (6), indicated that the peroxide values in the examined samples of chicken carcasses were varied from 0.11 to 0.26 with a mean value of 0.19± 0.01 for breast and 0.14 to 0.39 with a mean value of 0.27± 0.01 for thigh.

Once oxidation has run its course, the oxidized food article will have essentially changed, chemically different from its original form and potentially toxic, which is why it is considered rancid and unusable (Amato *et al.*, 1989).

The presence of unsaturated fatty acids in the food articles increases their

nutritive value and decrease the shelf-life of the product. Also, the high percent of saturated fatty acids of the product decrease the nutritional value and increase the shelf-life of the product (Pearson, 1984).

### 3. CONCLUSION

Poultry meat provide to be an excellent food article prepared and considered as a good supplement of animal protein for a deficient diet and consumption of chicken meat has increased therefore the goals of this study were to evaluate the chemical quality of chicken meat. From the results it could concluded that chicken meat from local commercial retail shops were acceptable based on their PH values, TVN, TBA and Peroxide value as all samples were nearly within their permissible limits.

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