Veterinary Medical Journal – Giza
Faculty of Veterinary Medicine, Cairo University
(ISSN 1110 – 1423)
Accredited from National Authority for Quality Assurance and Accreditation
Giza, 12211 - Egypt

Effect Of Age On Carcass Traits And Meat Quality Of Broilers

Mashaly, M.M..; Emara, M.M.T. and Elmossalami, M.K.
Department of Food Hygiene and Control, faculty of Veterinary Medicine, Cairo University

ABSTRACT

Broilers Cobb chicks reared in the Poultry Rearing Center, Faculty of Veterinary Medicine, Cairo Universityslaughtered at 30th and 42nd day of ageto explore the effect of age on carcass traits and meat quality in terms of chemical and physicochemical attributes.The meat of 30th day old broilers revealed significantincrease (P<0.05) in moistureand ash contents, however, they showedsignificantdecrease (P<0.05)in protein andfat content in comparison with 42nd day old broilers.The meat obtained of 42nd day old revealed significant increase(P<0.05)in total soluble, sarcoplasmic and myofibrillar proteins contents.Regarding the collagen content, the meat of 42nd day old showed significantly higher(P<0.05) contents in comparison to 30th day old broilers. The mean pH values were 5.69,5.65,6.03 and6.00, while that of TVBN (g/100g) were11.51,12.18,8.49 and 10.66; and that of TBARS (mg malonaldehyde/kg) were0.06, 0.09,0.18 &0.29 forbreast and thighmuscles of 30th dayand 42nd dayrespectively.Age induced a significant effect on water holding capacity of muscles, where breast and thigh of 42nd day were significantly higher(p<0.05) than those of 30th day.

Key words: Age, Broiler, meat quality, proteins, collagen,water holding capacity.

INTRODUCTION

Poultry meat production and consumption has dramatically increased over the last few decades **(American Meat Institute, 2004)**. The relatively low costs of poultry production, the rapid growth rate of broilers, the high nutritional value of the meat and the introduction of many new further processed poultry products increased the popularity of poultry in many countries during the last few decades **(Barbut , 2002).** The number of chickens heads produced in the world and in Egypt in 2013 was around 2174.4 billions and 126.1 million. Meanwhile, the world chicken meat production in 2012 was about 92.8 million tonnes, from which Egypt produced only 0.8 million tonnes**(FAOSTAT, 2015).**

Poultry meat comprises an essential component in the human diet all over the world due to its high sensory characteristics, attractiveness, and nutritive value as it is characterized by low fat content with high levels of unsaturated fatty acids, low sodium and cholesterol content as well as high protein content **(Bourre, 2005; Barroeta, 2006; Bonoli et al., 2007; Givens, 2009; Hwang et al., 2011).**

Meat quality can be defined as the over all characteristics including physical, chemical, biochemical, microbial, sensory, technological, hygienic, nutritional and culinary properties of meat **(Ingr, 1989 ; Xiong, 1999)**. Appearance, texture, juiciness, wateriness, firmness, tenderness, odor and flavor are among the most important and perceptible meat features that influence the initial and final quality judgment by consumers before and after purchasing a meat product **(Cross et al., 1986)**. Furthermore, quantifiable properties of meat such as water holding capacity, shear force, drip loss, cook loss, pH, shelf life, collagen content, protein solubility, cohesiveness, and fat binding capacity are indispensable for processors involved in the manufacture of value added meat products **(Allen et al., 1998).**

Technological and quality parameters can be influenced by several factors including slaughter age, origin **(Poltowicz and Doktor, 2012)**, breed and sex **(Musa et al., 2006),** nutrition **(Ramzija et al., 2010)**, environmental condition **(Du and Ahn 2002b; Wang, et al., 2009)**, slaughtering method **(Addeenet al., 2014)** and biochemistry of the post-mortem muscle **(Santos et al., 2004)**. Among the most important factors affecting quality of poultry meat are origin and slaughter age. They mainly determine the organoleptic attributes of meatand its technological properties.

Knowledge available on meat quality and the effect of age on the quality and technological properties of broiler meatis insufficient, therefore, the aim of this study was planned out to investigate the relationships between slaughtering age of broiler and meat quality characteristics.

MATERIALS AND METHODS

Sample collection

Agrand total of one hundred and fifty1-day old unsexed broilers Cobb chicks were obtained from a local hatchery. Chicks were divided randomly into five groups and housed in a floor pen equipped with Sawdustlitter, with a bird density 10 birds/m^2in the Poultry Rearing Center, Faculty of Veterinary Medicine, Cairo University. The starting temperature was 33°C then decreased gradually 2°C each week until reach 21°C at the 6^{th} week. Continuous lighting was provided throughout the experiment. All experimental birds under experiment were vaccinated against Avian Influenza, Newcastle, Infectious Bronchitis and Gumboro diseases.The feed and water were provided ad-labium along the duration of the experiment in mash, pellet form.The diets were formulated to cover the nutrient requirements for Cobb broilers (Cobb manual, 2005).

At the end of the experiment (30^{th} and 42^{nd} day of age), 11 birds from each group were randomly selected and slaughtered for evaluation of meat quality and carcass characteristics. All birds were fasted for two hours before slaughter, while water was available till the time of slaughter. Birds were slaughter following the Halal method allowing all flowing blood to drain out of the carcass. After complete absence of signs of life, all birds were eviscerated manually at the experimental unit in the Poultry Rearing Center, Faculty of Veterinary Medicine, Cairo University then kept individually at 4°C for 24 hours. After evisceration, eviscerated body were weight, breast weight, marylands(thigh plus drumstick) weight and organ (heart, gizzard and liver) weight were recorded. After elapse of 24 hours active chilling post-slaughter, the skin was removed and the breast and thigh were dissected into separate muscles and subjected for investigations.

Chemical analysis

Proximate analysis (AOAC, 1995)

Breast, thigh and skin were rendered into uniform mass by passing three times through a meat mincer and mixed thoroughly after each mincing time before being used for determination of moisture, total protein, ether extractable lipids and ash.

Measurement of soluble proteins(%)

Sarcoplasmic proteins(%)

Sarcoplasmic proteins solubility was determined by homogenizing one gram of raw muscle sample in 10 ml of ice-cold 25 mmol/l potassium phosphate buffer (pH 7.2) using a stomacher (Lab blender 400) at the lowest speed. Homogenate was left to stand in a shaking water bath (GFL-1083, Germany) at 4±°1C overnight. The mixture was then centrifuged at 1500rpm for 20 minutes (Joo et al., 1999),and the protein (%)of the supernatant was determined using Kjeldahl method(Tyszkiewicz and Klossowska, 1997).

Total and myofibrillar proteins(Joo et al., 1999)

Total soluble proteins were determined by homogenizing one gram meat sample in 20 ml ice-cold 1.1 mol/l potassium iodide in a 100 mol/L phosphate buffer (pH 7.2). The procedures for homogenization, shaking, centrifugation, and protein determination were the same as described for sarcoplasmic protein. Myofibrillar proteins(%) were obtained by calculating the difference between total and sarcoplasmic protein.

Measurement of collagen content

Hydroxyproline standard curve

Fifty mg of L-hydroxyproline (BDH Chemicals Ltd, England) were dissolved in 100 ml distilled water by adding one drop of conc. H_2SO_4. Ten ml from the previous solution were diluted to 100 ml with distilled water to get a working standard. An actual working solution was prepared by diluting 10, 20, 30, 40 ml from the previous working standard solution to 100 ml with distilled water. From the diluted working standard, 0.1, 0.2, 0.3 and 0.4 were made up to one ml with distilled water (representing 1, 2, 3 and 4 µg hydroxyproline standards). A standard graph was plotted with different concentration of hydroxyproline using Unico(1200Series,USA) spectrophotometer

against the blank at 450nm(**Nueman and** Logan, 1950).

Collagen content

Soluble and insoluble collagen content of meat samples were determined according to the procedure of Nueman and Logan (1950) and Mahendrakar et al. (1988). Two grams of meat sample were cooked in boiling water bath for 30 min.and hydrolyzed with 40 ml of 6 N HCl in a hot air oven (Heraeus D-63450 Hanau, Germany) at 105℃ for 18 hours. The hydrolysate was filtered, and the volume was adjusted to 50 ml with distilled water. pH of 25 ml aliquot was adjusted to 7.0 with 40% NaOH and the volume was made to 50 ml with distilled water. One ml from the obtained aliquot was mixed with one ml each of 0.001 M copper sulfate, 2.5 N NaOH and 6% H_2O_2 (For blank,one ml distilled water was used instead of the aliquot). After mixing, the tubes were kept at room temperature for 5 minutes with occasional shaking. The tubes were then heated at 80°C for 5 minutes in a water bath (Kubota YCW-04M, Japan) with frequent rigorous shaking, then cooled in ice, and 4ml of 3N H_2SO_4 and 2 ml of 5% 4-dimethylaminobenzaldehyde in n-propanol were added. After thorough mixing, the tubes were heated again at 70°C for 16 minutes in water bath. Absorbance of the test sample was measured at 540 nm against the blank using Unico (1200 Series, USA) spectrophotometer. The calculation for estimating the hydroxyproline (g/100 g) in meat was outlined by **Woessner (1961)** using the following equation:

$$\text{Hydroxyproline (g/100g)} = \frac{O_U \times C_s \times T_A \times T}{O_S \times A \times V \times W \times 1000 \times 1000} \times 100$$

Where

O_U	Optic density of the unknown	C_s	Concentration of the standard
T_A	Total volume from which aliquot was taken	T	Total volume made
O_S	Optic density of the standard	A	Aliquot taken
V	Volume of solution used for neutralization	W	Weight of the sample taken

Collagen content =Hydroxyproline solubilize% × 7.25

Physicochemical examinations

Measurement of pH value

Five grams from each of the prepared muscle sample were homogenized with 20 ml distilled water for 10-15 seconds (Kandeepan et al., 2009). pH was measured using pH meter (LovibondSenso Direct) with a probe type electrode (Senso Direct Type 330) where three readings for each sample were obtained and the average was calculated. The pH meter was calibrated every two samples using two buffers 7.0 and 4.0

Measurement of Total Volatile Basic Nitrogen'TVBN"

Ten grams of muscle sample were macerated with 100 ml tap water and washed into a distilling flask with 200 ml tap water, then 2 grams magnesium oxide were added. A macro-Kjeldahl distillation apparatus was connected to the distillation flask containing 25 ml of 2% boric acid solution and few drops of methyl-red indicator (0.016 g methyl red, 0.083 g bromocresol green per 100 ethanol) with the receiving tube was dipped below the liquid, with distillation continued till collection of 200 ml. The condenser was then washed with distilled water and the distillate was titrated with 0.05 M (0.1N) sulphuric acid. The Total Volatile Base Nitrogen (mg/100 gram sample) was calculated as the titration multiply by 14 (Kearsley et al., 1983).

Thiobarbituric Acid Reactive Substances "TBARS"

Five grams from each muscle sample were homogenized with 15 ml deionized distilled water using a stomacher (Lab blender 400) for 10 seconds at the highest speed. One milliliter of the homogenate was mixed with 50 µl butylated hydroxyanisole (7.2%) and one ml each of 15mM 2-thiobarbituric acid and 15% trichloroacetic acid. The mixture was vortexed, incubated in a boiling water bath for 15 minutes to develop color, then cooled under running water for 10 minutes, vortexed again, and centrifuged for 15 minutes at 2500 rpm. The absorbance of the resulting supernatant

was measured at 531 nm using Unico 1200 (USA) series spectrophotometer against a blank containing one ml of deionized water and2mlof2-thiobarbituricacid-trichloroacetic acid solution. The reading was multiplied by 7.8 to obtain the value of thiobarbituric acid reactive substances expressed as milligrams of malonaldehyde per kilogram of sample(Du and Ahn, 2002a).

Measurement of Water Holding Capacity

Water Holding Capacity "WHC" percentage was measured by centrifuging 20 g samples at 15,000 rpm for 20 minutes in cooling centrifuge (Jouan, MR 18-12, USA). The supernatant was weighted and the percentage of WHC was calculated as the ratio of supernatant to the sample weight (Hongsprabhas and Barbut, 1999).

Statistical analysis

Each analysis was run in three replicates and the collected data were analyzed using SPSS statistics 20 for windows. Results were recorded as mean ± SE. Analysis of variance was performed by ANOVA procedure to compare between different treatments by the least significant difference (LSD) and significance was defined at $P<0.05$.

RESULTS AND DISCUSSION

Table (1): Carcass characteristics of broilers

	30th day	42nd day
Live weight (g)	1823.89 ± 99.72 ^{a}	3421.35 ± 227.47 ^{b}
Un-eviscerated carcass (g)	1638.27±96.79^a	3163±194.50^b
Eviscerated carcass (g)	1335.27 ± 91.85^a	2558.52 ± 160.03^b
Carcass weight after Chilling (g)	1308.38 ± 94.26^a	2558.52 ± 160.03^b
Drip (%)	2.03 ± 0.97^a	0.85 ± 0.55^b
Dressing (%)	49.51 ± 2.02 ^{a}	52.63 ± 1.75^b
Skin with subcutaneous fat	179.48 ± 23.08 ^{a}	303.98 ± 35.39^b
Breast muscle (g)	366.14 ± 49.72 ^{a}	785.87 ± 77.38 ^{b}
Thigh muscle (g)	282.52 ± 21.55 ^{a}	561.33 ± 42.50 ^{b}
Neck (g)	73.93 ± 10.11^a	126.44 ± 16.02 ^{b}
Wing (g)	128.39 ± 10.48^a	252.87 ± 26.61 ^{b}
Giblet (Liver, Heart , Gizzard)(g)	93.57 ± 9.38^a	132.88 ± 13.98 ^{b}

a-b means with different superscripts within the same column differ significantly at $P<0.05$

From the results showen in table (1); it is clear that carcass traits of broilers grown to different age 30th, 42nd day old showed significant effect on dressing percentage wich increased gradually with age and The yield (%) of high valued primal cuts like breast, thigh on the basis of dressed carcass weight, increased with age and slaughter weight. Drip(%) decreased significantly with increasing slaughter weight. These results were in good agreement with those reported by Muthukumar et al. (2011).

Table (2): Proximate chemical analysis (%)

	Breast		Thigh		Skin	
	30th day	42nd day	30th day	42nd day	30th day	42nd day
Moisture	75.34 ± 0.28^a	74.30 ± 0.45^b	75.01 ± 0.33^a	72.39 ± 0.74^b	49.08 ±0.54^a	44.84 ± 0.61^b
Protein	19.89 ± 0.27^a	20.99 ± 0.30^b	15.38 ± 0.32^a	17.06 ± 0.47^b	0.95 ± 0.19^a	0.58 ± 0.14^b
Total soluble proteins	15.69 ± 0.31^a	17.49 ± 0.24^b	12.23 ± 0.20^a	14.53 ± 0.28^b	ND	ND
Sarcoplasmic proteins	5.76 ± 0.14^a	6.95 ± 0.15^b	4.21 ± 0.12^a	4.91 ± 0.17^b	ND	ND
Myofibrillar proteins	9.93 ± 0.19^a	10.54 ± 0.17^b	8.02 ± 0.15^a	9.62 ± 0.14^b	ND	ND
Fat	3.18 ± 0.32^a	3.49 ± 0.54^b	8.12 ± 0.42^a	9.44 ± 0.94^b	42.18 ±0.50^a	46.03 ± 0.57^b
Ash	1.49 ± 0.13^a	1.19 ± 0.10^b	1.37 ± 0.09^a	1.04 ± 0.14^b	7.72 ± 0.54^a	8.51 ± 0.19^b
Collagen content	0.15 ± 0.01^a	0.21 ± 0.01^b	0.25 ± 0.01^a	0.39 ± 0.01^b	0.52 ± 0.01^a	0.76 ± 0.01^b

$^{a-b}$ means with different superscripts within the same column differ significantly at $P<0.05$

As showen in table (2) proximate chemical analysis of breast, thigh muscles and skin; it is clear that meat from 30thday old had significantly (P<0.05) higher moisture , ash and lower protein , fat content in comparison with 42ndday. However, ash content was significantly (P>0.05) differ between age. The obtained results were in agood agreement with those reported by Lawrie (2006) who found that all the different components of proximate muscle analysis will increase with an increase in age, except moisture content.

While proximate chemical analysis of skin showed that 30thday had significantly (P<0.05) lower fat, ash but higher moisture and protein content in comparison with 42ndday.

Total soluble proteins, myofibrillar and sarcoplasmic proteins revealed significant (P<0.05) difference between 30thday meat and 42ndday meat as showen in table (2).

Results of collagen content revealed the presence of significant differences (P<0.05) between the breast, thigh muscles and skin of the investigated age groups, where muscles and skin of young animals had significantly (P<0.05) lower collagen content. The effect of age on collagen is probably due to the increase in pyridinoline content of intramuscular collagen and cross link formation between tropocollagen fibrils (Bosselmann et al., 1995). The obtained result were in agreement with those reported byJayasena et al. (2013) which found high total collagen content in thigh meat than breast.Collagen plays major roles in determining eating quality of cooked meat. As collagen fibrils are heated during cooking, they shrink, resulting in a fluid loss and less tender meat. They also act to hold muscle fibers together after shrinkage (Weston et al., 2002).

Table (3): Physicochemical properties

	Breast		Thigh		Skin	
	30thday	42ndday	30th day	42ndday	30thday	42ndday
pH	5.69 ± 0.01[a]	5.65 ± 0.03[b]	6.03 ± 0.02[a]	6.00 ± 0.03[b]	6.49 ± 0.03[a]	6.49 ± 0.04[a]
TBA (mg/kg)	0.06 ± 0.01[a]	0.09 ± 0.02[b]	0.18 ± 0.02[a]	0.29 ± 0.02[b]	0.22 ± 0.04[a]	0.31 ± 0.03[b]
TVBN (mg/100 gm)	11.51 ± 0.26[a]	12.18 ± 0.41[b]	8.49 ± 0.36[a]	10.66 ± 0.60[b]	5.06 ± 0.39[a]	5.60 ± 0.30[b]
WHC (%)	70.35 ± 0.55[a]	71.36 ± 0.29[b]	70.26 ± 0.95[a]	73.83 ± 0.23[b]	ND	ND

[a-b] means with different superscripts within the same column differ significantly at P<0.05

The mean pH values were significantly (P< 0.05) differ between different investigated breast and thigh muscles of young and old broiler. The mean values of pH meat from30thday old had significantly (P<0.05) higher pH in comparison with meat from 42ndday old while the mean pH values of skins were non-significantly (P>0.05) differ . These results were in good agreement with Díaz et al. (2010), meanwhile, it was not in agreement withthose reported byAbdullah et al. (2010) who found that younger birds had lower pH values than older one.

The values of TVBN (µg/100g) and of TBARS (mg/kg) of breast, thigh muscles and skin of 30th day old were significantly (p<0.05) lower than those of 42nd day. The higher TVBN of 42nd day may be due to the higher protein contents of muscles of these animals which consequently resulted in production of more volatile products during degradation. TBARS content is commonly used to evaluated lipid oxidation (Rey et al., 2001), which is related to meat deterioration (Paniangvait et al., 1995). The higher TBARS values in 42ndday may be due to higher fat contents of muscles and skin which consequently resulted in production of more malonaldehyde generated from lipid hydroperoxides during degradation.

The values of water holding capacity "WHC" of breast and thigh of 42nd day were significantly (p<0.05) higher than those of 30thday . Therefore the "WHC" was affected by age and these results were in agreement with those reported by Muthukumar et al. (2011) who reported that WHC higher by increasing slaughter age. Díaz et al. (2010) reported that meat of the youngest animals showed lower water holding capacity.

CONCLUSION

It can be concluded thatage induced a significant effect on different meat quality characteristics, physicochemical and technological properties of Broiler meat. Meat of youngerbroiler had significantly highermoisture and ash contents, and decrease of protein and fat content in comparison with older one. 42nd day old meat revealed significant higher of total soluble, sarcoplasmic , myofibrillar proteins contentsandcollagen content.

REFERENCES

Abdullah, A.Y.; Muwalla, M.M.; Maharmeh, H.O.; Matarneh, S. K. and Abu Ishmais, M.A. (2010): Effects of Strain on Performance, and Age at Slaughter and Duration of Post-chilling Aging on Meat Quality Traits of Broiler. Asian-Aust. J. Anim. Sci., 23: 1645-1656.

Addeen, A.; Benjakul, S.; Wattanachant, S. and Maqsood, S. (2014): Effect of Islamic slaughtering on chemical compositions and post-mortem quality changes of broiler chicken meat. International Food Research Journal, 21: 897-907.

Allen, C.D.; Fletcher, D.L.; Northcutt, J.K. and Rusell, S.M. (1998): The relationship of broiler breast color to meat quality and shelf life. Poultry Sci., 77:361-366.

American Meat Institute (2004): Overview of U.S. Meat and Poultry Production and Consumption. http://www.meatami.com/

AOAC "Association of Official Analytical Chemists"(1995): Official Methods of Analysis. Association of Official Analytical Chemists. 16th ed., Washington, DC, USA.

Barbut, S. (2002): Poultry Products Processing. An Industry Guide. (2nd Ed) CRC PRESS. Boca Raton, London, New York, Washington, D.C.

Barroeta, A.C. (2006): Nutritive value of poultry meat: Relationship between vitamin E and PUFA. Worlds Poult. Sci. J., 63: 277–284.

Bonoli, M.; Caboni, M. F.; Rodriguez-Estrada, M. T. and Lercker, G. (2007): Effect of feeding fat sources on the quality and composition of lipids of precooked ready-to-eat fried chicken patties. Food Chem., 101: 1327-1337.

Bosselmann, A.; Moeller, C.; Steinhart, H.; Kirchgessner, M. and Schwarz, F.J. (1995): Pyridinoline cross-links in bovine muscle collagen. Food Science, 60: 953–958.

Bourre, J.M. (2005): Where to find omega-3-fatty acids and how feedinganimals with diet enriched in omega-3-fatty acids to increase nutritional value derived products for human: What is actually useful. Journal Nutrition Health and Aging, 9: 232–242.

Cobbmanual(2005):http://www.cobb-vantress.com/

Cross, H.R.; Durland, P.R. and Seideman, S.C. (1986): Sensory qualities of meat. Pages 279-320 in: Muscle As Food. P.J. Bechtel, ed. Academic Press, New York, NY.

Díaz, O.; Rodríguez, L.; Torres, A. and Cobos, A. (2010): Chemical composition and physico-chemical properties of meat from capons as affected by breed and age. Spanish Journal of Agricultural Research, 8:91-99.

Du, M. and Ahn, D.U. (2002a): Effect of antioxidants on the quality of irradiated sausages prepared with turkey thigh meat. Poultry Science, 81: 1251–1256.

Du, M. and Ahn, D.U. (2002b): Effect of dietary conjugated linoletic acid on the growth rate of live birds and on the abdominal fat content and quality of broiler meat. Poultry Sci., 81:428-433.

FAO "Food and Agriculture Organization" (2015): FAOSTAT. FAO Statistics Division. Accessed 30 January 2015.
http://faostat3.fao.org/download/Q/QA/E

Givens, D.I. (2009): Animal nutrition and lipids in animal products and their contribution to human intakeand health. Nutrients, 1: 71–82.

Hongsprabhas, P. and Barbut, S. (1999): Use of cold set-whey protein gelation to improve poultry meat batters. Poultry Science, 78: 1074-1078.

Hwang, K. E.; Choi, Y. S.; Choi, J. H.; Kim, H. Y.; Kim, H. W.; Lee, M. A.; Chung, H. K.and Kim, C. J. (2011): Effect of ganghwayakssuk (Artemisia princepsPamp.) on oxidative stability of

deep fried chicken nuggets. Food Sci. Biotechnol,20:1381-1388.

Ingr, I. (1989): Meat quality: Defining the term by modern standards. Fleisch. , 69: 1268.

Jayasena, D.D.; Jung, S.; Kim, H. J.; Bae, Y. S.; Yong, H.I.; Lee, J.H.; Kim, J.G. and Jo,C.(2013): Comparison of Quality Traits of Meat from Korean Native Chickens and Broilers Used in Two Different Traditional Korean Cuisines. Asian Australas. J. Anim. Sci., 26:1038-1046.

Joo, S.T.; Kauffman, R.G.; Kim, B.C. and Park, G.B. (1999): The relationship of sarcoplasmic and myofibrillar protein solubility to color and water holding capacity in porcine Longissimus muscle. Meat Science, 52: 291–297.

Kandeepan, G.; Anjaneyulu, A.S.R.; Kondaiah, N.; Mendiratta, S.K. and Lakshmanan, V. (2009): Effect of age and gender on the processing characteristics of buffalo meat. Meat Science, 83: 10-14.

Kearsley, M.W.; El-Khatib, L. and Gunu, C.O.K.A. (1983): Rapid determination of total volatile nitrogen in fish and meat. Association of Public Analysts, 21:123-128.

Lawrie, R.A. (2006): Lawrie's Meat Science. 7th ed. Wood head Publishing, Cambridge, England.

Mahendrakar, N.S.; Dani, N.P.; Ramesh, B.S. and Amla, B.L. (1988): Effect of post-mortem conditioning treatments to sheep carcarsses on some biophysical characteristics of muscles. Food Science and Technology, 25: 340–344.

Musa, H.H.; Chen, G.H.; Cheng, J.H.; Shuiep, E.S. and Bao, W.B. (2006): Breed and Sex Effect on Meat Quality of Chicken. International Journal of Poultry Science, 5:566-568.

Muthukumar, M.;Sen, A.R.; Naveena, B.M.; Vaithiyanathan, S. and Patil, S.G. (2011): carcass traits and meat quality attributes of broilers grown to different body weights. The indian journal of animal sciences, 81:615-620.

Nueman, R.E. and Logan, M.A. (1950): Determination of hydroxyproline content. Biology and Chemistry, 184: 299-306.

Paniangvait, P.; King, A.J.; Jones, A.D. and

German, B.G. (1995): Cholesterol oxides in foods of animal origin. Food Science, 60: 1159–1174.

Poltowicz, K. and Doktor, J. (2012): Effect of slaughter age on performance and meatquality of slow-growing broiler chickens. Ann. Anim. Sci., 12: 621–631.

Ramzija, C.; Meho, B.; Jasminka,S.; Aleksandar,B.;Selma,C. and Mira,P. (2010): Study of the effect of broiler nutrition and duration of fattening on the lipid status of meat. Tehnologijamesa., 2:110–114.

Rey, A.I.; Kerry, J.P.; Lynch, P.B.; López-Bote, C.J.; Buckley, D.J. and Morrissey, P.A. (2001): Effect of dietary oils and alpha-tocopheryl acetate supplementation on lipid (TBARS) and cholesterol oxidation in cooked pork. Animal Science, 79: 1201–1208.

Santos, H.C.; Brandelli, A. and Ayub, M.A. Z. (2004): Influence of post-mortem aging in tenderness of chicken breast fillets. Ciência Rural, 34:905-910.

Tyszkiewicz, I. and Klossowska, B.M. (1997): Mechanicaltenderisation of pork meat: protein and water release due to tissue damage. Science of Food and Agriculture, 73: 179–185.

Wang, K. H.; Shi, S. R.; Dou, T. C. and Sun, H. J. (2009): Effect of a free-range raising system on growth performance, carcass yield, and meat quality of slow-growing chicken. Poul. Sci., 88: 2219-2223.

Weston, R.; Rogers, R.W. and Althen, T.G. (2002): The role of collagen in meat tenderness. a review. The Professional Animal Scientist, 18: 107–111.

Woessner, J.F. (1961): The determination of hydroxyproline in the tissue and protein samples containing small proportions of amino acid. Archives of Biochemistry and Biophysics, 93: 440–442.

Xiong, Y. L.; Ho, C.-T., and Shahidi, F. (1999): Quality characteristics of muscle foods. In Y. L. Xiong, C.-T. Ho & F. Shahidi (Eds.), Quality attributes of muscle foods, (pp. 1-10). New York: KA/PP

الملخص العربى

تأثير العمر على صفات الذبيحة و جودة لحوم بدارى دجاج التسمين

أجريت هذه الدراسة لبيان تأثير العمر على جودة لحوم دجاج التسمين والخصائص التكنولوجية في واحدة من اكثر سلالات التسمين انتشارا وأهمية وهي "الكوب". تمت التربيه فى مركز تربيه الدواجن ورعايه الحيوان ،كلية الطب البيطري جامعة القاهرة.وتم الذبح عند اليوم 30 و42 من العمر لاستكشاف تأثير العمر على صفات الذبيحة وجودة اللحوم منحيث الصفات الفيزيائية والكيميائية. أظهر التحليل الكيميائي للحوم دجاج التسمين عند 30 يوم أرتفاع نسبة الرطوبة و الرماد بصورة معنويه فضلا عن انخفاض محتوى البروتين والدهون مقارنة بلحوم دجاج التسمين عند 42 يوم. بالنسبه للبروتينات القابلة للذوبان وبروتينات الليفات العضلية وبروتينات الساركوبلازم و الكولاجينفكان للعمر تأثير بصورة معنويه فكانت اعلى فى عمر 42 يوم. وكان متوسط تركيز أيون الأس الهيدروجينى 5.69 ، 5.65، 6.03 و 6.00، أما بالنسبة للمركبات النيتروجينية الطيارة (جم/100جم) كانت 11.51، 12.18، 8.49و10.66،أما حامض الثيوباربتيورك (مجم مالونالدهيد/كجم) كانت 0.06، 0.09 ، 0.18 و 0.29 للصدر والورك عند عمر30 و 42 على التوالي. و كان للعمر تأثيراً كبيراً على قدرة اللحوم على الاحتفاظ بالمياه حيث كانت لحوم الدواجن عند 42 يوم أعلى في المقدرة على ربط الماء عن اليوم 30.