屠宰週齡對大體型閹雞生長性能、肌肉組成及品質之影響(1)

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收件日期：105 年 4 月 22 日；接受日期：105 年 6 月 6 日

摘　要

本試驗旨在探討屠宰週齡對大體型閹公雞肌肉組成、物理性質及感官品評之影響。試驗選用 13 週齡去勢之大體型閹公雞 (竹北仿土雞) 594 隻，雞隻採平飼，91 － 126 日齡 (13 － 18 週齡) 餵給含蛋白質 18%、代謝能 3,200 kcal/kg 之飼糧，127 － 217 日齡 (18 － 31 週齡)，餵給含蛋白質 15%、代謝能 2,800 kcal/kg 之飼糧。試驗期間水與飼料採任食，每天給予 23 小時光照。從 25 週齡起每隔一週秤重及屠宰 36 隻，至 31 週齡止，測定生長性能、肌肉組成、物理性質及感官品評等性狀。結果顯示，大體型閹雞之增重可持續至 29 週齡，之後會失重，且飼料轉換率隨週齡增加而變差。28 週齡以前屠宰之雞隻胸肉水分含量顯著 (P < 0.05) 較 29 週齡以後屠宰之雞隻高；胸肉脂肪含量、蒸煮失重、彈性與咀嚼性隨週齡增加而增加，而蛋白質含量則隨週齡增加而降低；胸肉內聚性以 30 週齡屠宰之雞隻顯著 (P < 0.05) 較其他週齡屠宰之雞隻低，28 週齡屠宰之雞隻肌肉風味感官品評顯著 (P < 0.05) 較 25 及 31 週齡屠宰之雞隻差，嫩度感官品評以 29 週齡以後屠宰之雞隻顯著 (P < 0.05) 較 27 週齡以前屠宰之雞隻差，多汁性感官品評以 27 週齡屠宰之雞隻顯著 (P < 0.05) 較 28 週齡以後屠宰之雞隻佳，總接受性感官品評以 25 及 27 週齡屠宰之雞隻顯著 (P < 0.05) 較 28 及 29 週齡屠宰之雞隻佳。由本試驗之結果觀之，大體型閹公雞於 27 週齡屠宰即可獲得良好之肌肉品質，如考慮利潤飼養期最好不要超過 29 週齡。

關鍵詞：大體型閹雞、屠宰週齡、生長性能、肌肉品質。

緒　言

隨著國人生活水準的提高，雞肉品質日益受到重視，俗稱『太監雞』的閹雞肉逐漸受到消費者青睞。與公雞比較閹公雞已被證實其肌纖維直徑與面積較小 (Lin and Hsu, 2003a; Lin *et al.*, 2011)、肌肉韌度與剪切值較低 (Lin and Hsu, 2002; Lin *et al.*, 2011)、肌肉脂肪含量較高、風味、嫩度及多汁性之感官品評較佳，特別是腿部肌肉 (Lin *et al.*, 2011)、皮膚與肌肉之 L 值 (亮度) 及 b 值 (黃色度) 較大 (Lin and Hsu, 2003b)，頭頸、腿部及腳爪比例較低，背部、翅膀及胸部比例較高 (Lin and Hsu, 2003b)。有關閹雞之生產技術，在中外書籍中記載已超過 2,000 年 (鄒，1995；Winter and Funk, 1960; Stromberg, 1980)。在臺灣閹雞之飼養均採用有色雞種，屠宰隻數約佔有色肉雞屠宰量的 0.8% (915,000 隻 / 年)，產值的 2.1% (農業統計年報，2013)。雖然閹公雞之早期生長速度 (去勢後 6 － 8 週內) 較公雞差，但整期之增重及飼料利用效率反而比公雞好 (Lin and Hsu, 2002)，是雞農可以選擇的飼養方式之一。閹雞依上市體重可分為大體型閹雞 (體重在 3.5 kg 以上) 及小體型閹雞 (體重在 3.5 kg 以下)，但以大體型閹雞之活雞售價較高。然飼養大體型閹雞之業者普遍認為須飼養至 30 週齡以上，才能獲得品質優異的肌肉品質或嗜口性，但王 (2001) 及 Lin and Hsu (2002) 之研究發現，小體型閹公雞之增重於 24 週齡後即變緩，飼料利用效率隨週齡增加而變差。王 (2001) 更指出，閹公雞飼養超過 31 週齡甚至會有輕微失重發生。另 Lin and Hsu (2003a) 及 Lin *et al.* (2012) 之報告指稱，雞隻去勢會導致脛骨破裂強度及皮層厚度顯著降低，且 Gassner *et al.* (1958) 及 Lesson *et al.* (1976) 指出，閹公雞存在腳弱問題，常導致胸部肌肉水疱或膿疱 (breast blisters)、瘀傷及屠宰時脛骨骨折而影響屠體品質。大體型閹公雞是否須飼養至 30 週齡以上實值得探討。而有關屠宰週齡對閹公雞生產效益、屠體性狀、肌肉組成、物理性質及嗜口性之影響的相關研究並不多。本試驗旨在探討屠宰週齡對大體型閹公雞之生長性能、肌肉組成、物理性質及感官品評之影響，藉以瞭解大體型閹雞之肌肉組成與品質於屠宰週齡之變化，以提供閹雞飼養者之參考。

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(1) 行政院農業委會畜產試驗所研究報告第 2505 號。
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材料與方法

I. 試驗動物與試驗設計

試驗選用 13 週齡去勢之大體型閹公雞 (竹北仿土雞) 594 隻，91 － 126 日齡餵給含蛋白質 18%、代謝能 3,200 kcal/kg 之飼糧。127 － 217 日齡，餵給含蛋白質 15%、代謝能 2,800 kcal/kg 之飼糧。試驗期間水與飼料採任食，每天給予 23 小時光照，雞隻於 18 週齡秤重，並開始記錄飼料採食量。從 25 週齡起每週齡秤重並逢機取樣 36 隻雞進行屠宰，供肌肉組成、物理性質及感官品評測定，試驗至 31 週齡結束。

II. 樣品採集與分析項目及方法

(i) 肌肉組成

依 AOAC (2000) 之方法測定。將去皮、去骨及去除脂肪之胸肉，置於 -20℃下冷凍。測定時將肌肉樣品置於 4℃冰箱解凍 24 小時，將胸肉絞碎後，取樣測定之。水分之測定使用空氣乾燥法，脂肪之測定使用 Soxhelt 脂肪萃取器以乙醚萃取之，蛋白質測定使用凱式氮法 (Kjeldahl) 測定氮百分率，氮百分率轉換至蛋白質百分率以 6.25 為轉換係數。

(ii) 蒸煮 (Cooking loss) 失重

將胸肉解凍後依 Florene *et al.* (1994) 方法修飾測定之。將右側胸肉秤重後置入夾鏈帶內，沈浸於 80℃水浴池中 25 分鐘，再放在流水中冷卻 15 分鐘，將表面的水分擦乾後秤重，二者間之差即為蒸煮失重。

(iii) 肌肉流變學特性測定

參考 Lyon and Lyon (1996) 之方法，於胸肉解凍後，將胸肉沈浸於 80℃水浴槽中 25 分鐘，再放在流水中冷卻 15 分鐘後，將肉順著肌纖維之方向 (與肌纖維方向平行) 切成 2 × 1 × 1 cm^3 (長 × 寬 × 高) 之長方體肉塊，肉塊以保鮮膜包裹直至測定為止。以流變儀 (NRM-2010J-CW, Fudoh Rheometer) 做咀嚼性測定，選取其中之韌度 (toughness)、內聚性 (cohesiveness)、彈力 (elasticity) 及咀嚼性 (chewiness) 作為肌肉品質之衡量指標，測得之結果以記錄器 (FR-801, Rheo Plotter, Japan) 畫出圖形並進行數據之紀錄。測定條件如下：力量承受範圍 (range)：2,000 g、載物臺速度 (test speed)：30 cm/min、紀錄速度 (sweep speed)：15 cm/min、套頭直徑 (adaptor diameter)：15 mm、樣品高度 (sample height)：10 mm、檢出重量 (detector)：2 kg。

(iv) 感官品評

將冰凍之胸肉於 0 － 4℃冰箱進行解凍 24 小時後，將胸肉以鋁箔紙包覆後置於 85℃水浴槽中水煮約 20 － 30 分鐘，當肌肉中心溫度達 80℃後取出，將肌肉切成約 1/2 英吋 (1.3 cm) 立方體大小之肉塊，並將肉塊放置於溫暖之隔熱容器直至進行感官品評為止。以 17 位人員進行感官品評，每位品評人員分別從各處理組之樣品中選取一塊肌肉進行品評。品評項目包括風味 (flavor)、質地 (texture)、嫩度 (tenderness)、多汁性 (juiciness) 及總接受度 (overall acceptability)。

III. 統計分析

試驗所得資料以統計分析系統 (Statistical Analysis System; SAS, 2013) 套裝軟體進行統計分析，使用一般線性模式程序 (General Linear Model Procedure; GLM) 進行變方分析，以最小平方均值 (Least Squares Mean; LSM) 測定法比較各處理組間差異的顯著性。

結果與討論

I. 對生長性能之影響

週齡對生長性能之影響列示於表 1。結果顯示，大體型閹雞之增重可持續至 29 週齡，之後即會有輕微失重發生，此結果與王 (2001) 發現閹公雞於 31 週齡後有失重現象之結果相似。另 Lin and Hsu (2002) 指出，小體型閹公雞之體增重於 24 週齡後即十分緩慢。累積飼料轉換率於 25 至 31 週齡間隨週齡增加而變差，尤其是在 29 週齡之後。Lin and Hsu (2002) 指出，小體型閹公雞之累積飼料轉換率隨週齡增加而變差，且於 24 週齡後飼料轉換率即明顯變差。每增重 1 公斤之飼料成本隨週齡增加而增加，閹公雞之每公斤活體價格 (盤價) 約介於 133.3 (古早閹或小型閹雞) － 183.3 元 (竹北仿閹雞)，如飼養超過 29 週齡，後期之增重成本將比活體售價高 (飼料成本於 13 元 / 公斤計算)，因此大體型閹公雞之飼養期必須考慮到餵飼之飼料價格，依飼料成本而適當調整。

II. 對胸肉組成之影響

表 2 列示屠宰週齡對肌肉組成之影響。結果顯示，28 週齡以前屠宰之雞隻胸肉水分含量顯著 ($P < 0.05$) 較 29 週齡以後屠宰之雞隻高。此與 Edwards *et al.* (1973)、Grunder *et al.* (1987) 及林 (2003) 指稱，肌肉水分含量隨

週齡增加而減少之結果相符。胸肉脂肪含量隨週齡增加而增加，以 29 週齡以後屠宰之雞隻胸肉脂肪含量顯著 ($P < 0.05$) 較 27 週齡以前屠宰之雞隻高。此與 Edwards *et al.* (1973)、Grunder *et al.* (1987) 及林 (2003) 指稱，肌肉脂肪含量隨週齡增加而增加之結果一致。胸肉蛋白質含量隨週齡增加而降低，以 26 週齡以前屠宰之雞隻胸肉蛋白質含量顯著 ($P < 0.05$) 較 27 週齡以後屠宰之雞隻高。此與 Grunder *et al.* (1987) 及林 (2003) 指稱，肌肉蛋白質含量隨年齡增加而減少之結果一致。但與 Edwards *et al.* (1973) 發現於 2 至 10 週齡之白肉雞肌肉蛋白質含量隨週齡增加而增加之結果不同，此可能與 2 至 10 週齡之雞隻，肌肉蛋白質合成仍處於旺盛階段有關。30 週齡以後屠宰之雞隻胸肉灰分含量顯著 ($P < 0.05$) 較 29 週齡以前屠宰之雞隻低。

表 1. 週齡對大體型閹公雞生長性能之影響

Table 1. Effect of ages on growth performances of heavy type caponized cockerels

Items	Body weight gain (g)	Feed conversion, feed /gain u	Feed cost of 1 kg B. W. gain, NT$[#]
18-25 wk	857.2[f]	10.85[e]	141.1[e]
18-26 wk	904.0[e]	11.59[de]	150.7[de]
18-27 wk	982.3[d]	11.99[d]	155.9[d]
18-28 wk	1,099.0[b]	11.98[d]	155.72[d]
18-29 wk	1,156.5[a]	13.01[c]	169.1[c]
18-30 wk	1,123.0[ab]	14.50[b]	188.5[b]
18-31 wk	1,056.7[c]	16.49[a]	214.4[a]
S. E.	5.5	0.12	1.8

[a ~ f] Means in the same column without the same superscripts are significantly different ($P < 0.05$).

[#] 13.0 NT$ of per kg feed cost.

表 2. 屠宰週齡對大體型閹公雞胸肉組成之影響

Table 2. Effect of slaughter ages on breast muscle composition of heavy type caponized cockerels

Items	Weeks of age							
	25	26	27	28	29	30	31	S. E.
Moisture, %	73.62[a]	72.89[a]	73.12[a]	72.62[a]	71.89[b]	72.02[b]	72.03[b]	0.180
Fat, %	1.43[c]	1.51[c]	1.93[b]	2.25[ab]	2.43[a]	2.51[a]	2.39[a]	0.126
Protein, %	26.07[a]	26.03[a]	25.61[b]	25.13[c]	25.07[c]	25.03[c]	24.96[c]	0.134
Ash, %	1.25[a]	1.26[a]	1.23[ab]	1.24[a]	1.25[a]	1.15[b]	1.14[b]	0.028

[a, b, c] Means in the same row without the same superscripts are significantly different ($P < 0.05$).

III. 對胸肉物理性質之影響

屠宰週齡對胸肉物理性質之影響列示於表 3。結果顯示，胸肉蒸煮失重隨週齡增加而增加，以 28 週齡以後屠宰之雞隻胸肉蒸煮失重顯著 ($P < 0.05$) 較 27 週齡以前屠宰之雞隻高。此與林 (2003) 指稱，肌肉蒸煮失重隨週齡增加而增加之結果一致。Honikel (1998) 指稱，肌肉加熱導致肌肉蛋白質變性及結締組織收縮為產生蒸煮失重之主要原因。蒸煮失重與感官品評之多汁性與嫩度有密切關係，蒸煮失重高者感官品評之多汁性 (Sales, 1995; Van Oeckel *et al.*, 1999) 與嫩度 (Van Oeckel *et al.*, 1999) 較低者差。胸肉韌度隨週齡增加而增加，以 30 週齡以後屠宰之雞隻胸肉韌度顯著 ($P < 0.05$) 較 29 週齡以前屠宰之雞隻高。此與 May *et al.* (1962) 及 Nakamura *et al.* (1975) 表示，雞肉之剪切值隨年齡增加而增加之結果相符；亦與 Gerrard *et al.* (1987) 發現公牛肉之剪切值隨年齡增加而增加一致。正常公畜之肌肉剪切值隨年齡增加而增加之原因，可能與熱殘存性膠原蛋白比例增加 (Nakamura *et al.*, 1975; Gerrard *et al.*, 1987) 及肌纖維直徑增加 (Benjamin *et al.*, 1949; Tuma *et al.*, 1962) 等有關。韌度為表達樣品壓縮、折曲、扭曲與拉伸等之綜合性質，意即肌肉之韌度越大則表示其抵抗壓縮、折曲、扭曲與拉伸等不同型式之外力能力越強。韌度可反映感官品評之嫩度或硬度，韌度值低者感官品評之嫩度較佳。年齡對肌肉內聚性之影響並無一致性，以 30 週齡屠宰之雞隻顯著 ($P < 0.05$) 較其他週齡屠宰之雞隻低。內聚性表示樣品分子與分子間作用引力之強弱，意即樣品在發生破裂前所能承受的最大力量；樣品內聚性越大表示將此樣品分子與分子間拉開所需的能量相對越多。內聚性可反映官能品評樣品分散容易度，值越低樣品分散速度越快。27 週齡以前屠宰之雞隻胸肉彈性顯著 ($P < 0.05$) 較 28 週齡以後屠宰之雞隻低。彈性代表樣品受外力產生變形後其恢復原狀的速度。胸肉咀嚼性隨年齡增加而增加，以 29 週齡以後屠宰之雞隻顯著 ($P < 0.05$) 較 28 週齡以前屠宰之雞隻

高。咀嚼性代表樣品咀嚼至可吞嚥狀態所消耗之能量；意即咀嚼性越高咬合次數越多。

表 3.　屠宰週齡對大體型閹公雞胸肉物理性狀之影響

Table 3.　Effect of slaughter ages on the physical properties of breast muscle for heavy type caponized cockerels

Items	Weeks of age							
	25	26	27	28	29	30	31	S. E.
Cooking loss, %	19.12^{d}	21.39^{c}	22.19^{c}	23.91^{b}	24.02^{b}	25.91^{a}	23.98^{bc}	0.53
Toughness, g	1,342.79^{d}	1,589.81^{c}	1,606.61^{bc}	1,537.02^{c}	1,533.43^{c}	1,683.32^{b}	1,870.61^{a}	24.01
Cohesiveness	0.39^{ab}	0.40^{a}	0.39^{ab}	0.40^{a}	0.40^{a}	0.35^{b}	0.42^{a}	0.01
Elasticity	0.46^{d}	0.50^{c}	0.50^{c}	0.61^{a}	0.63^{a}	0.56^{b}	0.61^{a}	0.01
Chewiness, g	307.02^{c}	353.12^{bc}	329.11^{c}	326.51^{c}	407.12^{b}	410.71^{b}	536.90^{a}	24.26

$^{a, b, c, d}$ Means in the same row without the same superscripts are significantly different ($P < 0.05$).

IV. 對胸肉感官品評之影響

表 4 列示屠宰週齡對胸肉感官品評之影響。結果顯示，以 28 週齡屠宰之雞隻肌肉風味品評顯著 ($P < 0.05$) 較 25 及 31 週齡屠宰之雞隻差。屠宰年齡介於 25 至 31 週齡間，對質地品評並無顯著之差異。肌肉之嫩度品評以 29 週齡以後屠宰之雞隻顯著 ($P < 0.05$) 較 27 週齡以前屠宰之雞隻差。此與肌肉流變儀測定之韌度結果相符。肌肉之多汁性品評以 27 週齡屠宰之雞隻顯著 ($P < 0.05$) 較 28 週齡以後屠宰之雞隻佳。此與肌肉蒸煮失重測定之結果相符。肌肉之總接受性以 25 及 27 週齡屠宰之雞隻肌肉顯著 ($P < 0.05$) 較 28 及 29 週齡屠宰之雞隻佳。肌肉之風味、嫩度、多汁性及質地品評結果受許多因素的影響，但主要與肌肉脂肪含量、脂肪酸比例及肌纖維大小有關，Wood *et al.* (1986)、Cameron *et al.* (1990) 及 Sales (1995) 發現肌肉脂肪含量高者較低者有較佳之肌肉嗜適口性，特別在嫩度、多汁性、風味及芳香味 (aroma) 上。Herring *et al.* (1965) 及 Tuma *et al.* (1962) 指稱，肌纖維較大者，其肌肉較粗糙及強韌，肌纖維大小和肉的韌度成正相關；Cameron and Enser (1991) 發現肌肉中之單不飽和脂肪酸比例增加，多不飽和脂肪酸比例減少，可改善肌肉適口性。

表 4.　屠宰週齡對大體型閹公雞胸肉感官品評之影響

Table 4.　Effect of slaughter ages on the panel test of breast muscle for heavy type caponized cockerels

Items	Weeks of age							
	25	26	27	28	29	30	31	S. E.
Flavor	4.20^{a}	4.10^{ab}	4.11^{ab}	3.79^{b}	4.04^{ab}	4.11^{ab}	4.36^{a}	0.050
Texture	4.11	4.07	4.00	3.84	3.93	4.00	4.06	0.045
Tenderness	4.30^{a}	4.10^{a}	4.26^{a}	3.82^{ab}	3.59^{b}	3.78^{ab}	4.03^{a}	0.049
Juiciness	4.20^{ab}	3.97^{b}	4.68^{a}	3.72^{b}	3.79^{b}	3.71^{b}	3.97^{b}	0.093
Overall-acceptance	4.37^{a}	4.12^{ab}	4.47^{a}	3.74^{b}	3.81^{b}	3.99^{ab}	4.14^{ab}	0.066

$^{a, b}$ Means in the same row without the same superscripts are significantly different ($P < 0.05$).

由本試驗之肌肉組成、物理性質與感官品評結果觀之，大體型閹公雞於 27 週齡屠宰即可獲得良好之食肉品質，如考慮飼養利潤飼養期最好不要超過 29 週齡。

參考文獻

王效天。2001。手術去勢閹雞和雞胚時期注射雌二醇對臺灣土雞生長後期至性成熟後日間作息，鬥爭行為，生長成績，屠體性狀及官能品評之影響。碩士論文，中興大學，臺中市。

林正鏞。2003。去勢狀態、屠宰與去勢年齡與營養濃度對臺灣閹公土雞生長、血液、屠體與骨骼性狀之影響。博士論文，國立中興大學，臺中市。

鄒介正。1995。去勢術。中國農業百科全書 (何康與劉瑞龍主編)，北京，中國農業出版社。農業歷史卷 pp. 273-274。

農業統計年報。2013。行政院農業委員會，臺北市。

Association Official Analytical Chemists. 2000. Official methods of analysis. 14th ed. Washington D.C.: Association Official

Analytical Chemists.

Benjamin, E. W., H. C. Pierce and W. D. Termohlen. 1949. Marketing poultry products. 4th ed. John Wiley and Sons, Inc., New York, NY, USA.

Cameron, N. D., P. D. Warriss, S. J. Porter and M. B. Enser. 1990. Comparison of Duroc and British Landrace pigs for meat and eating quality. Meat Sci. 27: 227-247.

Cameron, N. D. and M. B. Enser. 1991. Fatty acid composition of lipid in *Longissimus dorsi* muscle of Duroc and British Landrace pigs and its relationship with eating quality. Meat Sci. 29: 295-307.

Edwards, H. M. Jr., F. Denman, A. Abou-Ashour and D. Nugara. 1973. Influences of age, sex and type of dietary fat supplementation on total carcass and fatty acid composition. Poult. Sci. 52: 934-948.

Florene, G., C. Touraille, A. Oual, M. Renerre and G. Moni. 1994. Relationships between postmortem pH changes and some traits of sensory quality in veal. Meat Sci. 37: 315-325.

Gassner, F. X., E. C. Reifenstein, Jr., J. W. Algeo and W. E. Mattox. 1958. Effects of hormone on growth, fattening and meat production potential of livestock. Recent Progr. Horm. Res. 14: 183-218.

Gerrard, D. E., S. J. Jones, E. D. Aberle, R. P. Lemenager, M. A. Diekman and M. D. Judge. 1987. Collagen stability, testosterone secretion and meat tenderness in growing bulls and steers. J. Anim. Sci. 65: 1236-1242.

Grunder, A. A., J. R. Cham and A. Fortin. 1987. Plasma very low density lipoproteins, abdominal fat lipase and fatness during rearing in two strains of broiler chickens. Poult. Sci. 66: 471-479.

Herring, H. K., R. G. Cassens and E. J. Briskey. 1965. Further studues on bovine muscle tenderness as influenced by carcass position, sarcomere length and fiber diameter. J. Food Sci. 30: 1049-1054.

Honikel, K. O. 1998. Reference methods for the assessment of physical characteristics of meat. Meat Sci. 49: 447-457.

Lesson, S., J. D. Summers and J. P. Walker. 1976. The effect of light and diet on performance and carcass quality of capons. Poult. Sci. 55: 438-470.

Lin, C. Y. and J. C. Hsu. 2002. Effects of surgical caponization on growth performance, fiber diameter and some physical properties of muscles in Taiwan country chicken cockerels. Asian-Aust. J. Anim. Sci. 15: 401-405.

Lin, C. Y. and J. C. Hsu. 2003a. Comparison of some selected growth, physiological and bone characteristics of capon, slip and intact birds in Taiwan country chicken cockerels. Asian-Aust. J. Anim. Sci. 16: 50-56.

Lin, C. Y. and J. C. Hsu. 2003b. Influence of surgical caponization on the carcass characteristics in Taiwan country chicken cockerels. Asian-Aust. J. Anim. Sci. 16: 575-580.

Lin, C. Y., L. C. Lin and J. C. Hsu. 2011. Effect of caponization on muscle composition, shear value, ATP related compounds and taste appraisal in Taiwan country chicken cockerels. Asian-Aust. J. Anim. Sci. 24: 1026-1030.

Lin, C. Y., J. C. Hsu and T. C. Wan. 2012. Effect of age and caponization on blood parameters and bone development of male Taiwan native chickens. Asian-Aust. J. Anim. Sci. 25: 994-1002.

Lyon, B. G. and C. E. Lyon. 1996. Texture evaluations of cooked, diced broiler breast samples by sensory and mechanical methods. Poult. Sci. 75: 812-819.

May, K. N., R. L. Saffle, D. L. Downing and J. J. Powers. 1962. Interrelations of post-mortem changes with tenderness of chicken and pork. Food Technol. 16: 72-78.

Nakamura, R., S. Sekoguchi and Y. Sato. 1975. The contribution of intramuscular collagen to the tenderness of meat from chickens with different ages. Poult. Sci. 54: 1604-1612.

Sales, J. 1995. Ostrich meat review: a South African viewpoint. Canadian Ostrich Magazine 4: 20-25.

SAS. 2013. SAS user guide: Statistics. SAS Inst., Cary, NC.

Stromberg, L. 1980. Caponizing modern management and profitable marketing, pp.7-15. Stromberg, publishing. Co., Minn., USA.

Tuma, H. J., J. H. Venable, P. R. Wuthier and R. L. Hendrickson. 1962. Relationship of fiber diameter to tenderness and meatiness as influenced by bovine age. J. Anim. Sci. 21: 33-36.

Van Oeckel, M. J., N. Warnants and Ch. V. Boucque. 1999. Comparison of different methods for measuring water holding capacity and juiciness of pork versus on-line screening methods. Meat Sci. 51: 313-320.

Winter, A. R. and E. M. Funk. 1960. Poultry-Science and practice. J. B. Lippincott Co., New York, NY, USA.

Wood, J. D., R. C. D. Nones, M. A. Francombe and O. P. Whelehan. 1986. The effects of fat thickness and sex on pig meat quality with special reference to the problems associated with overleanness. Anim. Prod. 43: 535-544.

Effect of slaughter age on growth performances, muscle compositions and quality of heavy type caponized native chickens [1]

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Received: Apr. 22, 2016; Accepted: Jun. 6, 2016

Abstract

An experiment was carried out to determine the effects of slaughter age on muscle compositions, physical properties and eating quality of heavy type caponized native chickens. A total of five hundred and ninety-four cockerels were surgically caponized at 13 weeks of age. Capons reared in floors were fed diets containing 18% crude protein and 3,200 kcal/kg metabolizable energy during from 91 to 126 days old and fed diets containing 15% crude protein and 2,800 kcal/kg metabolizable energy during from 127 to 217 days old. Feed and water were provided *ad libitum*. Incandescent light was provided 23 hours per day during experimental period. Birds were slaughtered from 25 weeks of age through 31 weeks of age with 1 week interval, which were slaughtered thirty-six birds in each week. The growth performances, muscle compositions, physical properties and taste panel scores were used as criteria for the determination of the optimum slaughter age of heavy type caponized native chickens. The results indicated that the accumulation body weight gain reached peak at 29 weeks of age and declined at 30 weeks of age. Besides, the feed conversion of capons, dropped significantly ($P < 0.05$) with the advance of age. Furthermore, the moisture content of breast muscle of birds before 28 weeks of age were higher ($P < 0.05$) than those of birds after 29 weeks of age. In addition, the fat content, cooking loss, elasticity and chewiness of breast muscle increased and the protein content of breast muscle decreased with the increase of slaughter age. Therefore, the breast muscle cohesiveness of birds was lower ($P < 0.05$) at 30 weeks of age than birds at 26, 28, 29 and 31 weeks of age. Accordingly, the sensory panel scores for breast muscle flavor of birds were higher ($P < 0.05$) at 28 weeks of age than those of birds at 25 and 31 weeks of age. Also, the sensory panel scores for breast muscle tenderness were lower ($P < 0.05$) after 29 weeks of age birds than those before 27 weeks of age birds. However, after 28 weeks of age birds had lower ($P < 0.05$) sensory panel scores for breast muscle juiciness than birds at 27 weeks of age birds. In addition, the sensory panel scores for breast muscle overall-acceptance of birds were higher ($P < 0.05$) at 25 and 27 weeks of age than those of birds at 28 and 29 weeks of age birds. Moreover, our findings also indicate that slaughtering at 27 weeks old of could reach excellent meat quality and the optimal age to market was no more than 29 weeks of age for heavy type caponized native chickens.

Key words: Heavy type capons, Slaughter age, Growth performance, Meat quality.

(1) Contribution No. 2505 from Livestock Research Institute, Council of Agriculture, Executive Yuan.
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