

# 閹公雞、復陽雞及公雞之皮膚與肌肉色澤、肌肉組成及感官品評評分比較<sup>(1)</sup>

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## 摘 要

本試驗旨在比較閹公雞、復陽雞及公雞之皮膚與肌肉色澤、肌肉組成及感官品評之差異。試驗選用畜試土雞台畜肉十三號公雞 176 隻，雞隻於 10 週齡去勢。於 28 週齡時再將閹雞依雞冠有無再度發育，分為閹雞與復陽雞。雞隻經 24 小時禁食後，每組逢機屠宰 16 隻。試驗結果顯示，復陽雞之皮膚亮度 ( $L^*$  值) 顯著 ( $P < 0.05$ ) 較公雞高。閹公雞之皮膚黃色度 ( $b^*$  值) 顯著 ( $P < 0.05$ ) 較公雞高。皮膚之紅色度 ( $a^*$  值) 於三者間無顯著差異。閹公雞之肌肉  $L^*$  值顯著 ( $P < 0.05$ ) 較公雞大。閹公雞之肌肉  $a^*$  值顯著 ( $P < 0.05$ ) 較復陽雞或公雞小。公雞之肌肉  $b^*$  值顯著 ( $P < 0.05$ ) 較復陽雞或閹公雞小。肌肉脂肪及水分含量，於三者間有顯著 ( $P < 0.05$ ) 差異。水分含量以公雞最高，閹公雞最低；脂肪含量以閹公雞最高，公雞最低。閹公雞之肌肉蛋白質含量顯著 ( $P < 0.05$ ) 較公雞低。閹公雞之肌肉灰分含量顯著 ( $P < 0.05$ ) 較復陽雞或公雞低。閹公雞與復陽雞胸肉及腿肉之嫩度、風味及多汁性等感官品評評分均顯著 ( $P < 0.05$ ) 較公雞佳。綜合本試驗之結果顯示，雞隻去勢會顯著影響皮膚與肌肉色澤、肌肉組成及感官品評評分。復陽雞之皮膚與肌肉色澤及肌肉組成介於閹公雞或公雞間，但較偏向於閹公雞。

關鍵詞：去勢、復陽雞、皮膚與肌肉色澤、肌肉組成、臺灣土雞。

## 緒 言

雄性素已被證實在不同組織具有強的同化作用 (anabolic effect)，可刺激肌肉、骨骼、結締組織及紅血球之生長和促進產生雄性作用 (androgenic effect)，可刺激繁殖系統、行為、心理 (psychological) 及第二性徵之生長或改變 (林, 1999; Burton and Smith, 1972; Hervey *et al.*, 1981; Griggs *et al.*, 1989; Fennell and Scanes, 1992; Lin and Hsu, 2003a)。有關閹公雞之生產技術，在中外書籍中被記載已超過 2,000 年 (鄒, 1995; Stromberg, 1980)。許多報告證實去勢會影響雞隻之行為、生長、肌肉組成與物理性狀、感官品評、皮膚及肌肉色澤 (陳等 2000a, b; York and Mitchell, 1969; Welter, 1976; Mast *et al.*, 1981; Cason *et al.*, 1987)。而有關復陽雞 (slip; 去勢不確實) 對雞隻之生長、肌肉色澤、組成與物理性狀及風味等影響的報告則甚少。Mast *et al.* (1981) 指稱，部分去勢雞隻之增重及飼料利用效率較完全去勢及公雞佳，肌肉嫩度則介於二者之間。Lin and Hsu (2003a) 發現，復陽雞之體重、脛骨長度及直腸溫度，顯著較公雞高或長 ( $P < 0.05$ )，但與閹公雞無顯著差異；腹脂比例於三者間具顯著差異 ( $P < 0.05$ )，以閹公雞最高，公雞最低。復陽雞是因去勢操作時睪丸在腹腔中破碎或與腹腔連結處之睪丸組織未能完全取出，並可分泌雄性素 (Lin and

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Hsu, 2003a)。此為去勢操作不慎所造成，與去勢操作時僅取出單一側睪丸之部分去勢不同。其在閹公雞群之發生比例會因閹雞師傅之技術熟練度而有差異，約介於 15 至 60% 間。復陽雞之羽毛外觀與閹公雞相同，僅雞冠紅色度及大小較閹公雞為紅或較大，因此可由外觀區分出復陽雞及閹公雞。但復陽雞之活體售價每斤 (600 g) 卻比閹公雞之價格低約 8 至 12 元。因此，本試驗旨在探討閹公雞、復陽雞及公雞間之皮膚與肌肉色澤、肌肉組成及感官品評比較，以供業者參考。

## 材料與方法

### I. 試驗動物與試驗設計

本試驗於行政院農業委員會畜產試驗所執行，動物之使用、飼養及實驗內容係依據畜產試驗所實驗動物管理委員會批准之試驗準則進行。試驗採用行政院農業委員會畜產試驗所育成之畜試土雞台畜肉 13 號。於 10 週齡時將公雞逢機分為去勢處理組與未去勢處理組，每處理組 88 隻分置於四欄，每欄飼養 22 隻，共計 176 隻試驗動物。飼養至 28 週齡止，並再將去勢處理組，依雞冠有無再度發育 (大小、顏色及鱗屑狀) 分為閹公雞組與復陽雞組，其中閹公雞 43 隻，復陽雞 41 隻，復陽雞比例為 48.8%。

### II. 試驗動物之飼養管理

公雞於 10 週齡去勢，去勢前禁食 24 小時，水照常給飼，去勢後於 10 – 18 週齡間，餵給蛋白質 19%，代謝能 3,000 kcal/kg 之生長期飼料，於 19 – 28 週齡間，餵給蛋白質 17%，代謝能 2,800 kcal/kg 之肥育期飼料。雞隻依一般飼養管理方法飼養，試驗期間水與飼料採任食，給予 23 小時光照至 28 週齡止。於 28 週齡時雞隻經 24 小時禁食後，進行個別雞隻秤重，每處理組逢機屠宰 16 隻 (每處理組每欄屠宰 4 隻)，於實驗室進行屠體性狀調查，屠宰雞隻經 CO<sub>2</sub> 迷昏、放血、脫毛及取出內臟，進行屠體與內臟秤重及皮膚色澤測定後，屠體依 Koch and Possa (1973) 之方法進行頭頸、翅、胸、背、腿及腳六大部位分切，並取下左右兩側胸肉及腿肉 (去骨、去皮) 供測定肌肉色澤、組成及感官品評之用。

### III. 檢測項目與方法

#### (i) 外科去勢及復陽雞判斷

依 Lin and Hsu (2003a) 之方法進行去勢與區分閹雞及復陽雞。

#### (ii) 肌肉中水分、粗脂肪與蛋白質及灰分含量測定

依 AOAC (1984) 之方法測定。分別將去皮、去骨但未去除脂肪之左側胸肉及腿肉絞碎後，取樣測定之。

#### (iii) 皮膚與肌肉色澤值測定

依 Lyon *et al.* (1980) 之方法，以色差計 (DrLange MC reflectance colorimeter, Germany) 測定皮膚與肌肉之色澤，以 CIE L.a.b. 值代表肌肉之色度，L\* 值代表亮度 (lightness)，a\* 值代表紅色度 (redness)，b\* 值代表黃色度 (yellowness)。胸 (breast) 與腿 (thigh) 部測定左右兩側上中下各三個點，背 (back) 部則測定上中下三點，各點之平均值即為該部位之色澤值。

#### (iv) 肌肉感官品評

將冰凍之右側腿肉及胸肉於 0 – 4°C 冰箱進行解凍 24 小時後，將各別之胸肉及腿肉以鋁箔紙包覆後置於 85°C 水浴槽下水煮約 20 – 30 分鐘，當肌肉中心溫度達 80°C 後取出，將肌肉切成約 1/2 英寸 (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。品評項目包括嫩度、多汁性及風味。採七分法，1 至 7 分表示，嫩度由非常硬至非常柔軟，多汁性由非常乾澀至非常多汁，風味由非常不喜歡至非常喜歡 (Lin *et al.*, 2011)。

### IV. 統計分析

試驗所得資料以統計分析系統 (Statistical Analysis System; SAS, 2006) 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，採用巢式設計 (nested design)，依期望均方進行檢定，以比較閹公雞、復陽雞及公雞間差異的顯著性，以最小平方均值 (Least Squares Mean; LSMean) 測定處理間平均值之差異。

## 結果與討論

### I. 皮膚與肌肉色澤

閩公雞、復陽雞及公雞之皮膚與肌肉色澤之比較列示於表 1 及表 2。試驗結果顯示，復陽雞之背部皮膚  $L^*$  值顯著 ( $P < 0.05$ ) 高於公雞，閩公雞及復陽雞之胸部皮膚  $L^*$  值顯著 ( $P < 0.05$ ) 高於公雞，腿部皮膚之  $L^*$  值則以復陽雞顯著 ( $P < 0.05$ ) 高於閩公雞。復陽雞及閩公雞之胸部皮膚  $a^*$  值顯著 ( $P < 0.05$ ) 較公雞為低，但背部及腿部皮膚之  $a^*$  值，於三處理組間則無顯著差異。背部皮膚之  $b^*$  值於三處理組間成顯著差異，以閩公雞最高，復陽雞次之，公雞最低，但胸部皮膚之  $a^*$  值，於三處理組間則無顯著差異，腿部皮膚之  $b^*$  值則以閩公雞顯著 ( $P < 0.05$ ) 較公雞為高。閩公雞腿部肌肉之  $L^*$  值顯著 ( $P < 0.05$ ) 較公雞為高，但背部及腿部肌肉，於三處理組間則無顯著差異。閩公雞之腿肉、胸肉及背部肌肉  $a^*$  值顯著 ( $P < 0.05$ ) 較復陽雞及公雞高，但公雞之腿肉、胸肉及背部肌肉  $b^*$  值顯著 ( $P < 0.05$ ) 較復陽雞及閩公雞低。此結果與 Lin and Hsu (2003b) 指稱，閩公雞皮膚與肌肉之  $L$  值及  $b$  值顯著較公雞為大，肌肉  $a$  值顯著較公雞為小相類似。但與陳等 (2000a) 於臺灣土雞之研究顯示，閩公雞之肌肉  $L$  值及  $a$  值顯著 ( $P < 0.05$ ) 較未去勢公雞高之結果不完全相同。亦與 Cason *et al.* (1987) 之報告指稱，閩公雞與公雞之皮膚  $L^*$ 、 $a^*$ 、 $b^*$  值並無顯著差異之結果不完全相同。Hillebrand *et al.* (1996) 研究顯示，影響肉類色澤的直接與間接因素包括脂肪含量及肉中之色素含量。Hill and Dansky (1951) 證實，屠體脂肪含量與色素蓄積量成正相關。另睪固酮可抑制黃體生成素 (luteinizing hormone; LH) 之分泌 (Griggs *et al.*, 1989)；去勢或以抗雄性素處理，均有較高之血漿 LH 濃度 (Fennell and Scanes *et al.*, 1996; Moghetti *et al.*, 1999)；而 LH 可促進類胡蘿蔔素 (carotenoids) 之蓄積 (Witschi, 1961)，可增加皮膚及肌肉之黃色度。Lin and Hsu (2003a) 之報告指出，腹脂比例及血漿睪固酮濃度於三者間具顯著差異 ( $P < 0.05$ )，公雞與閩公雞及復陽雞比較有最低之腹脂比例，但有最高之血漿睪固酮濃度，但閩公雞有最高之腹脂比例，最低之血漿睪固酮濃度，復陽雞之濃度或比例則介於閩公雞及公雞之間。故本試驗閩公雞與復陽雞之皮膚與肌肉  $b^*$  值顯著較公雞高之原因，可能與其腹脂比例、肌肉脂肪含量顯著較公雞為高及血漿睪固酮濃度顯著較公雞為低有關。另 Solberg (1968) 指稱，肉類色澤受肌肉中肌紅蛋白 (myoglobin) 與血紅蛋白 (hemoglobin) 之影響。Lyon and Cason (1995) 之報告顯示，肉中脂肪含量增加，導致肌肉中肌紅蛋白含量減少，且會反射大部分光源，使肉色之  $L$  值增加， $a$  值減低。Miltenburg *et al.* (1992) 指稱， $L$  值與肌肉中鐵及血肌質 (hematin) 含量呈顯著 ( $P < 0.05$ ) 負相關， $a$  值與肌肉中鐵及血肌質含量呈顯著 ( $P < 0.05$ ) 正相關。Husak *et al.* (2007) 亦指稱，肌肉中肌紅蛋白含量較高者，肌肉之  $a^*$  值較大。而 Froning *et al.* (1968) 之研究顯示，公火雞之肌紅蛋白含量顯著較母火雞高。故本試驗閩公雞之皮膚與肌肉  $b^*$  值顯著較復陽雞或公雞高及皮膚與肌肉  $a^*$  值顯著較復陽雞或公雞低之原因，可能與閩公雞之腹脂比例與肌肉脂肪含量較高，但肌紅蛋白含量較低有關。這可由閩公雞及復陽雞之血球比容積 (packed cell volume, PCV) (29.2 vs. 32.99 vs. 37.9%,  $P < 0.05$ ) (未發表資料) 以閩公雞最低，復陽雞次之，公雞最高得到佐證。

### II. 肌肉組成

閩公雞、復陽雞及公雞之肌肉組成比較列示於表 3。試驗結果顯示，肌肉脂肪及水分含量，於三者間呈顯著 ( $P < 0.05$ ) 差異，水分含量以公雞最高，閩公雞最低；脂肪含量以閩公雞最高，公雞最低。閩公雞之蛋白質含量顯著 ( $P < 0.05$ ) 較公雞低，肌肉灰分含量顯著 ( $P < 0.05$ ) 較復陽雞或公雞低。此結果與 York and Mitchell (1969) 及陳等 (2000a) 之研究顯示，閩公雞之肌肉脂肪含量顯著 ( $P < 0.05$ ) 較公雞高，蛋白質含量顯著較公雞低之結果相符。雄性素可促進體內氮、鉀及磷之滯留 (Hervey *et al.*, 1981)。Fennell and Scanes (1992) 指稱，雄性素在雞隻可抑制脂肪之蓄積。Pearce (1977) 亦發現雄性素可減低家禽脂肪合成酵素之活性。閩公雞及復陽雞因雄性素分泌降低，至其脂肪蓄積量減少。Kumar *et al.* (1983) 及 Madruga *et al.* (1999) 發現，去勢山羊肉之肌肉灰分含量與未去勢山羊肉間並無顯著差異。而閩公雞為何有較低之肌肉灰分含量，其原因仍不清楚，有待進一步之探討，但作者認為可能與肌肉中之鐵與鉀含量較低有關。因雄性素可促進紅血紅及肌紅蛋白之合成 (Sturike, 1986)，且身體之肌肉量較高者，體內之鉀含量亦較高 (Hervey *et al.*, 1981; Forbes, 1985; Griggs *et al.*, 1989)。這可由閩公雞之 PCV 顯著 ( $P < 0.05$ ) 較復陽雞及公雞為低 (29.2 vs. 32.99 vs. 37.9%,  $P < 0.05$ ) 與血漿鉀離子含量則顯著 ( $P < 0.05$ ) 較復

陽雞及公雞為高 (3.90 vs. 4.23 vs. 4.55 mmol/L,  $P < 0.05$ ) (未發表資料), 及閹公雞之肌肉蛋白質含量及肌肉  $a^*$  值顯著 ( $P < 0.05$ ) 較復陽雞及公雞為低得到佐證。

表 1. 閹公雞、復陽雞及公雞皮膚色澤值之比較

Table 1. Comparison of capon, slip and intact birds on skin colors in Taiwan country chicken cockerels at 28 weeks of age

Item	Capon (n = 16)	Slip (n = 16)	Intact (n = 16)	S.E.
<b>L*</b>				
Back skin	73.81 <sup>ab</sup>	75.50 <sup>a</sup>	72.04 <sup>b</sup>	0.771
Breast skin	72.76 <sup>a</sup>	72.77 <sup>a</sup>	68.77 <sup>b</sup>	0.699
Thigh skin	73.37 <sup>b</sup>	76.14 <sup>a</sup>	75.00 <sup>ab</sup>	0.489
Average	73.31 <sup>ab</sup>	74.80 <sup>a</sup>	71.94 <sup>b</sup>	0.387
<b>a*</b>				
Back skin	6.01	5.13	6.35	0.344
Breast skin	1.89 <sup>b</sup>	2.77 <sup>b</sup>	5.03 <sup>a</sup>	0.432
Thigh skin	1.06	0.17	0.76	0.240
Average	2.99	2.69	4.05	0.321
<b>b*</b>				
Back skin	15.60 <sup>a</sup>	13.27 <sup>b</sup>	11.84 <sup>c</sup>	0.288
Breast skin	12.47	13.23	12.93	0.399
Thigh skin	11.77 <sup>a</sup>	9.30 <sup>ab</sup>	8.94 <sup>b</sup>	0.583
Average	13.28 <sup>a</sup>	11.93 <sup>ab</sup>	11.24 <sup>b</sup>	0.342

<sup>a, b, c</sup> Means in the same row with the different superscripts differ ( $P < 0.05$ ).

L\* = lightness, a\* = redness, b\* = yellowness.

表 2. 閹公雞、復陽雞及公雞肌肉色澤值之比較

Table 2. Comparison of capon, slip and intact birds on muscle colors in Taiwan country chicken cockerels at 28 weeks of age

Item	Capon (n = 16)	Slip (n = 16)	Intact (n = 16)	S.E.
<b>L*</b>				
Back muscle	54.21	51.46	51.27	0.851
Breast muscle	58.49	60.16	56.70	0.929
Thigh muscle	57.70 <sup>a</sup>	54.86 <sup>ab</sup>	51.96 <sup>b</sup>	0.831
Average	56.80 <sup>a</sup>	55.49 <sup>ab</sup>	53.31 <sup>b</sup>	0.488
<b>a*</b>				
Back muscle	3.81 <sup>b</sup>	5.21 <sup>a</sup>	5.69 <sup>a</sup>	0.172
Breast muscle	0.20 <sup>b</sup>	1.17 <sup>ab</sup>	2.24 <sup>a</sup>	0.231
Thigh muscle	1.99 <sup>b</sup>	3.77 <sup>a</sup>	4.87 <sup>a</sup>	0.232
Average	2.00 <sup>b</sup>	3.38 <sup>a</sup>	4.27 <sup>a</sup>	0.214
<b>b*</b>				
Back muscle	8.41 <sup>a</sup>	7.63 <sup>ab</sup>	6.89 <sup>b</sup>	0.278
Breast muscle	7.60 <sup>a</sup>	7.14 <sup>a</sup>	5.26 <sup>b</sup>	0.330
Thigh muscle	6.29 <sup>a</sup>	5.00 <sup>a</sup>	2.71 <sup>b</sup>	0.345
Average	7.43 <sup>a</sup>	6.59 <sup>a</sup>	4.95 <sup>b</sup>	0.234

<sup>a, b</sup> Means in the same row with the different superscripts differ ( $P < 0.05$ ).

L\* = lightness, a\* = redness, b\* = yellowness.

### III. 對肌肉感官品評之影響

表 4 列示閹公雞、復陽雞及公雞之肌肉感官品評比較。結果顯示, 閹公雞及復陽雞腿肉與胸肉之

嫩度、多汁性及風味之感官品評評分均顯著 ( $P < 0.05$ ) 較公雞高。此與肌肉物理性質顯示闖公雞及復陽雞之蒸煮失重 (29.2 vs. 28.5 vs. 30.1%,  $P < 0.05$ )、韌度 (1059.3 vs. 1185.8 vs. 1287.7 g,  $P < 0.05$ ) 及肌纖維直徑 (56.9 vs. 60.9 vs. 70.3  $\mu\text{m}$ ,  $P < 0.05$ ) (未發表資料) 顯著較公雞低之結果一致；亦與 York and Mitchell (1969)、Welter (1976) 及 Mast *et al.* (1981) 等指稱，闖公雞肌肉之感官品評無論在嫩度、多汁性及風味均較公雞佳之結果相符。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。Benjamin *et al.* (1949) 指稱，肌纖維較大者，其肌肉較粗糙及強韌；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。Field (1971) 及謝 (2002) 指稱，與公畜禽比較，闖公畜禽之肌肉單不飽和脂肪酸比例增加，多不飽和脂肪酸比例減少。故闖雞之肌肉感官品評較公雞佳之原因，可能與闖公雞之肌肉脂肪含量較高、肌纖維直徑較小及單不飽和脂肪酸比例較高，多不飽和脂肪酸比例較低有關。

表 3. 闖公雞、復陽雞及公雞肌肉組成之比較

Table 3. Comparison of capon, slip and intact birds on the muscle compositions in Taiwan country chicken cockerels at 28 weeks of age

Item	Capon (n = 16)	Slip (n = 16)	Intact (n = 16)	S.E.
Moisture, %				
Breast muscle	72.43 <sup>b</sup>	72.64 <sup>b</sup>	73.59 <sup>a</sup>	0.210
Thigh muscle	71.85 <sup>c</sup>	74.72 <sup>b</sup>	77.27 <sup>a</sup>	0.290
Sample average	72.14 <sup>c</sup>	73.68 <sup>b</sup>	75.43 <sup>a</sup>	0.232
Fat, %				
Breast muscle	3.26 <sup>a</sup>	1.39 <sup>b</sup>	0.63 <sup>b</sup>	0.269
Thigh muscle	6.86 <sup>a</sup>	4.53 <sup>b</sup>	1.66 <sup>c</sup>	0.336
Sample average	5.06 <sup>a</sup>	2.96 <sup>b</sup>	1.15 <sup>c</sup>	0.298
Protein, %				
Breast muscle	22.58 <sup>b</sup>	24.00 <sup>a</sup>	23.88 <sup>a</sup>	0.226
Thigh muscle	20.03 <sup>b</sup>	20.48 <sup>ab</sup>	20.93 <sup>a</sup>	0.123
Sample average	21.31 <sup>b</sup>	22.24 <sup>ab</sup>	22.41 <sup>a</sup>	0.272
Ash, %				
Breast muscle	1.05 <sup>c</sup>	1.17 <sup>b</sup>	1.32 <sup>a</sup>	0.024
Thigh muscle	0.95 <sup>b</sup>	1.41 <sup>a</sup>	1.07 <sup>ab</sup>	0.026
Sample average	1.00 <sup>b</sup>	1.29 <sup>a</sup>	1.20 <sup>a</sup>	0.021

<sup>a, b, c</sup> Means in the same row with the different superscripts differ ( $P < 0.05$ ).

表 4. 闖公雞、復陽雞及公雞肌肉感官品評之比較

Table 4. Comparison of capon, slip and intact birds on the muscle sensory panel score in Taiwan country chicken cockerels at 28 weeks of age

Item	Capon (n = 16)	Slip (n = 16)	Intact (n = 16)	S.E.
Tenderness				
Breast muscle	5.2 <sup>a</sup>	5.0 <sup>a</sup>	4.3 <sup>b</sup>	0.21
Thigh muscle	6.0 <sup>a</sup>	5.8 <sup>a</sup>	5.0 <sup>a</sup>	0.23
Juiciness				
Breast muscle	5.2 <sup>a</sup>	5.1 <sup>a</sup>	4.3 <sup>b</sup>	0.19
Thigh muscle	5.6 <sup>a</sup>	5.7 <sup>a</sup>	4.6 <sup>b</sup>	0.18
Flavor				
Breast muscle	5.7 <sup>a</sup>	5.4 <sup>a</sup>	4.5 <sup>b</sup>	0.24
Thigh muscle	6.3 <sup>a</sup>	6.0 <sup>a</sup>	5.0 <sup>b</sup>	0.23

<sup>a, b</sup> Means in the same row with the different superscripts differ ( $P < 0.05$ ).

綜合本試驗之結果顯示於畜試土雞台畜肉 13 號族群中，雞隻去勢會影響皮膚與肌肉色澤、肌肉組成及感官品評評分。復陽雞之皮膚與肌肉 L\*、a\*、b\* 值及肌肉組成則介於閹公雞與公雞間，肌肉感官品評評分則趨近於閹公雞。

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# Comparison of skin and muscle color, muscle composition and sensory panel score of capon, slip and intact birds in Taiwan country chicken cockerels<sup>(1)</sup>

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## Abstract

This experiment was conducted to compare skin and muscle color, muscle composition and sensory panel score of capon, slip and intact birds in Taiwan country chicken cockerels. One hundred and seventy-six Taiwan country chicken cockerels were randomly assigned to caponized or intact male groups. Caponized birds were surgically altered at 10 weeks old and raised to 28 weeks old. At 28 weeks of age, the capons were separated into capon and slip groups, depending on the atrophy of the comb and wattle in size. After 24 h of feed deprivation, 16 birds from each group were weighed, sacrificed and cut. The results showed that skin L\* value in slips was significantly ( $P < 0.05$ ) greater than the intact birds. A significantly ( $P < 0.05$ ) greater skin b\* value was found in the capons than that in the intact birds. In addition, the muscle L\* value in the capons were significantly ( $P < 0.05$ ) greater than in the intact birds. Compared with intact birds and slips, capons had a significantly ( $P < 0.05$ ) smaller muscle a\* value. Intact birds had the highest ( $P < 0.05$ ) muscle moisture content and the lowest ( $P < 0.05$ ) muscle fat content. However, the muscle protein content was significantly ( $P < 0.05$ ) lower in capons while intact males and slips had a higher ( $P < 0.05$ ) muscle ash content. The muscle sensory panel score of flavor, tenderness and juiciness in intact birds were significantly ( $P < 0.05$ ) lower than those in others. Moreover, our findings also indicate that the castration resulted in a significant alteration in skin and muscle color, muscle content and sensory panel score.

Key words: Caponization, Slip, Skin and muscle color, Muscle composition, Taiwan native chicken.

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