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Effects of surgical caponisation on growth, carcass and some haematological parameters in cockerel chickens

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Abstract

The study was conducted to assess the effects of surgical caponisation on growth, carcass and some haematological parameters in cockerel chickens. Sixty (60) apparently healthy day old chicks were randomly distributed into two experimental groups (caponised and un-caponised) of thirty (30) cockerels each. The birds were caponised at the age of eight (8) weeks old and slaughtered at sixteen (16) weeks of age. The means of weekly weight gain, feed consumption, feed conversion ratio and final body weight in the two groups were not significantly different ($p>0.05$) except the mean of final body weight that was significantly different ($p\leq0.05$). The mean weights of carcass, eviscerated carcass, hind-limb and fore-limb of the two groups were significantly different ($p\leq0.05$) while that of the breast was not significantly different ($p>0.05$). The mean weights of the heart, liver and gizzard of the two groups were significantly different ($p\leq0.05$) however the mean weight of the kidney was not ($P>0.05$). All the mean values of Packed Cell Volume (PCV), Haemoglobin Content (HBC) and Mean Corpuscular Haemoglobin Concentration (MCHC) in the two groups were not significantly different ($p>0.05$) however the White Blood Cells (WBC) was significantly different ($p\leq0.05$). It was concluded that the surgical caponisation of cockerel chickens at eight (8) weeks of age has significant effects on the growth and carcass traits ($p\leq0.05$) except on kidney ($p>0.05$) and has no significant effects on the haematological parameters ($p>0.05$) except on WBC ($p\leq0.05$).

Keywords: Caponisation, Carcass, Cockerel, Growth, Haematological.
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Introduction

Capons are male chickens whose testes have been surgically removed through the process of caponization. Due to the resultant androgen deficiency, secondary male sexual characters including the comb, wattle, fighting behaviour, and vocalization degenerate, and maturity regresses to an immature stage (Jacob & Ben Mather, 2000)

It is well known that the abdominal fat pad is significantly increased in capons, regardless of the breed and the age of caponization at slaughter (Cason *et al*., 1988; Tor *et al*., 2002). The accumulation of body lipids plays an important role in meat quality because it enhances flavour, texture and meat juiciness when compared with intact cockerels (Chen *et al*., 2005). Despite the fact that fat is not generally appreciated by modern consumers in meat products due to health-related reasons, its ability to enhance sensory attributes remains a major part of traditional or quality products (Symeon *et al*., 2010). It has also been documented that, capon meat contains higher amount of linolenic acid along with other poly-unsaturated fatty acid which are good for health compared to the non-capon meat (Synder *et al*., 1962). However, reports on the caponization effects on quality and quantity of poultry meat are inconsistent.

In growth performance and muscle production, Mast *et al*. (1981), Hsieh (2003) and Chen *et al*. (2006) all demonstrated that caponization enhanced chicken growth. Other researches did not show this positive result (Fennell & Scan, 1992; Wang, 2001; Chen *et*

al., 2005) or even a negative response on growth (Kuo, 2002). Such disparity in results might be attributed to differences in breed, age and age at caponization (Kuo-Lung *et al*., 2007). In haematology, since there is paucity of information in literature on effects of caponisation, the data obtained would serve as baseline information for further studies on the effects of caponisation on haematological parameters of cockerel chickens.

Although capons are being produced in the United States, France, and Italy, where they are marketed as products of special quality (Symeon *et al*., 2010), little is known about it in Nigeria. Therefore, the aim of this study was to assess the effects of surgical caponisation on growth, carcass and haematological parameters in cockerel chickens.

Materials and methods

Birds management and experimental design

The present study was conducted in the poultry unit, livestock farm of Niger State College of Agriculture located in Mokwa. Mokwa is located at latitude 9°17'38" North and longitude 5°3'16. East (Google maps, 2013).

Sixty (60) apparently healthy day old chicks were purchased from Zarm farm Ilorin, Nigeria and were randomly distributed into two experimental groups (caponized and un-caponized) of thirty (30) cockerels each. The birds were vaccinated, given water *ad libitum* and fed commercial starter diet from week one (1) to week six (6) and then commercial grower diet from week seven (7) till the end of the experiment at week sixteen (16).

Caponization

All the cockerels in the caponized group were caponized at eight (8) weeks of age. The birds were deprived of feed and water for 24 hours before the procedure. Anaesthesia was achieved by a combination of ketamine at 20mg/kg live body weight and diazepam at 1mg/kg live body weight. After the removal of the feathers and the skin was cleaned with antiseptic socked cotton, then 1.5cm incision was made between the two (2) last ribs. A ribs retractor was inserted and the membranes were cleared with groove director. The testicles were then removed. The site was then re-disinfected and left unstitched (Jacob & Ben Mather, 2000).

Measurement

All weights were measured using a sensitive electronic balance (Mettler balance P 1210, Mettler instrument AG. Switzerland; sensitivity: 0.001g). Live weight was measured every week started from eight (8) weeks of age until the end of week sixteen. Feed intake was also monitored daily beginning from week eight (8) till week sixteen (16). Weights of cold carcass, eviscerated carcass, edible viscera (heart, liver, kidney & gizzard), hind-limb, fore-limb, breast as well as spleen were measured after the slaughter.

Haematological Parameters: At 16 weeks of age, 2 ml of blood was collected through brachial veins from ten (10) randomly selected birds from each group. The blood was collected by sterile syringe with needle and transferred to sterile test tube containing Ethylene Diaminetetra Acetic Acid (EDTA). It was used within two hours after collection to determine Packed Cell Volume (PCV), White Blood Cells (WBC), Haemoglobin concentration(HBC) and Mean Corpuscular Haemoglobin Concentration (MCHC).

Slaughter procedure

At the end of the experiment at sixteen (16) weeks, the birds were fastened 24 hours before slaughtering and ten (10) chickens per group (caponized and un-caponized) were randomly selected to determine the effects of caponisation on the parts and internal organs of the chickens. The birds were slaughtered using Halal method of slaughtering (Wilson, 2005) and were allowed to bleed for two (2) minutes before been de-feathered.

Statistical analysis

All the recorded weights, weekly feed consumption, feed conversion ration as well as the haematological parameters (PCV, WBC, HBC & MCHC) were expressed as Mean ± SEM (Standard Error of Mean) and subjected to statistical analysis using Statistical Package for the Social Sciences (SPSS) version 17.0. Independent sample t-test at 95% confidence interval (CI) was used to determine the level of significant difference in mean values between the two groups. Values of ($P \leq 0.05$) were considered significant.

Results

The means of weekly weight gain, weekly feed consumption, feed conversion ratio and final body weight is presented in table 1. The results indicated that the mean final body weights of the caponised group were significantly different ($p \leq 0.05$) from those of un-caponised group. However, means of weekly weight gain, feed conversion ratio

and weekly feed consumption of the two groups were not significantly different (p>0.05) from each other. Although the mean numerical value of feed conversion ratio in the caponised group was lower than the un-caponised group. Table 2 shows the carcass traits of the two groups. From the results showed that the mean weights of carcass, eviscerated carcass, hind-limb and fore-limb of the caponised group were significantly different (p≤0.05) from those of the un-caponised group. The breast weight of the caponised group however, was not significantly different (p>0.05) from those of uncaponised.

Table 3 presented the results of internal organ traits. All the weights of the heart, liver and the gizzard of the caponised group were significantly different (p≤0.05) from those of the un-caponised. The weight of the kidney however, in the caponised group was not significantly different (p>0.05) from the un-caponised group. Table 4 presented the summary of the results of some haematological parameters. All mean values of the PCV, HBC & MCHC of the caponised group were not significantly different (p>0.05) from the un-caponised group. However, the mean value of WBC in caponised group was significantly different (p≤0.05) from the un-caponised group. Table 1: Mean (±SEM) body weight gain, weekly feed consumption, feed conversion ratio & final body weight of un-caponized and caponized cockerels in grams.

Table 1: Mean (±SEM) body weight gain, weekly feed consumption, feed conversion ratio and final body weight of un-caponized and caponized cockerels in grams

Parameters	Uncaponized	caponized	p-value
Weekly weight gain (g)	97.556±15.469	126.587±26.096	0.357^{NS}
Weekly feed consumption (g)	24582.375±122.390	24934.000±1161.729	0.831^{NS}
Feed Conversion Ratio	1.181±0.110	1.135±0.113	0.774^{NS}
Final body weight (g)	1123.862±26.841	1374.037±32.761	0.000*

^{NS} Not Significant (P>0.05), *Significant (p≤0.05)

Table 2: Mean (±SEM) weight of carcass traits of uncaponized and caponized cockerels in grams

Parameters	uncaponized	caponized	p-value
Eviscerated carcass weight(g)	797.200±16.763	870.000±25.534	0.028*
Carcass weight (g)	952.800±17.591	1058.800±30.0831	0.007*
Hind limb weight (g)	273.200±6.347	298.800±8.376	0.025*
Fore limb weight (g)	111.200±3.389	120.400±2.125	0.034*
Breast weight (g)	90.800±3.593	104.400±5.406	0.051^{NS}

^{NS} Not Significant (P>0.05), * Significant (p≤0.05)

Table 3: Mean (±SEM) weight of internal organ traits of uncaponized and caponized cockerels in grams

Parameters	Uncaponized	caponized	p-value
Heart weight (g)	4.400±0.267	6.800±0.327	0.000*
Liver weight (g)	14.800±2.175	22.400±1.067	0.006*
Kidney weight (g)	2.000±0.000	2.400±0.267	0.168^{NS}
Gizzard weight (g)	62.400±1.655	72.000±2.108	0.002*

^{NS} Not Significant (P>0.05), *Significant (p≤0.05)

Table 4: Mean (±SEM) haematological parameters of uncaponized & caponized cockerels

Parameters	Uncaponized	caponized	p-value
PCV (%)	29.160±1.359	27.800±0.399	0.358^{NS}
HB (g/dl)	9.920±0.471	9.340±0.159	0.268^{NS}
WBC (X10g/dl)	10.540±0.800	18.960±0.794	0.000*
MCHC (g/dl)	33.980±0222	33.580±0.310	0.308^{NS}

^{NS} Not Significant (P>0.05), *Significant (p≤0.05)

Discussion

The significant difference observed between the mean final body weights of the two groups might be due to the elimination of the male sex hormone in the caponised birds. Which results in males becoming more docile and less active, thereby, allowing more efficient conversion of feed into growth, fat deposition and improved meat quality (Deyhim *et al*., 1992; Fennell & Scanes, 1992; Fennell *et al*., 1996; Jacob & Ben Mather, 2000). This result is in line with findings of Welter (1976), Rahman *et al*. (2004) and Chen *et al*. (2006) who reported that capons were significantly heavier than intact males. This result differs from the studies of Fennell & Scanes (1992), MurielDuran (2004) and Miguel *et al*. (2008) who reported in older ages ranging from 12-32 weeks, there seem to be no significant effect of caponisation on body weights.

The non-significant difference or lack of effect in mean weekly weight gain and mean weekly feed consumption as well as feed conversion ratio has also been reported in other studies (Mast *et al*., 1981; Chen *et al*., 2005; Symeon *et al*., 2010). However, since the mean numerical value of the feed conversion ratio of the caponised group was lower than that of the un-caponised group, then the caponised group was better in terms of performance (Gosh & Samanta, 2008). The significant difference observed in mean weights of cold carcass, eviscerated carcass, hind-limb and fore-limb of the caponised group as against the uncaponised, might be due to deficiency of androgen in the caponised chickens since androgen inhibition on chicken growth has been reported in other studies (Deyhim *et al.,* 1992; Fennell & Scanes, 1992).

The result of breast weight not been found to be significantly different in this study agreed with the work of Shao *et al*. (2009) but differed with the findings of Tor *et al*. (2002), Hsu & Lin (2003), Miguel *et al.* (2008) and Symeon *et al*. (2010) who reported significantly heavier breast in caponised chicken than in either sham-operated or un-caponised chicken. This might indicate that growth of breast muscle was unaffected by lack of androgen (Shao *et al*., 2009). The effects of caponisation on internal organs have been displayed in other studies. Heavier liver in capons as found in this study has also been reported by Rahman *et al.* (2004). An opposite trend was found by Miguel *et al*. (2008), whereas Hsu & Lin (2003) found no significant difference in capons and intact males. The significant difference found in the liver might be because, liver is the primary site for the de-novo synthesis of fatty acids in birds (Mayes & Botham, 2003) and, in heavy breeds, it accommodates the increased lipogenic needs first by increasing in size (Shapira *et al.*, 1978).

With regards to the heart weights, the result disagrees with the findings of Miguel *et al.* (2008) and Symeon *et al*. (2010) who reported that capons generally seem to have lighter hearts than intact males. The result of gizzard as reported here is not in agreement with the reports of Hsu & Lin (2003); Miguel *et al*. (2008) and Symeon *et al*. (2010) who reported no effect by caponisation on gizzard in chickens. This difference in the results might be due to difference in breeds, strains, age at surgery as well as age at slaughter (Cason, *et al.*, 1988), since most of these cited works were done on local breeds of chickens.

Concerning the haematological parameters (PCV, WBC, HBC & MCHC), to our knowledge, there is no any study in the literature with regards to the effect of caponisation on them. Because there is lack of similar or related work, an elaborate discussion could not be done for the observed effects of caponisation on PCV, WBC, HBC and MCHC.

In conclusion, the surgical caponisation of cockerel chickens at eight (8) weeks of age has significant effects on the growth and carcass traits except on kidney and has no significant effects on the haematological arameters($p>0.05$) analysed except WBC.

Since we could not draw a conclusive result on some of haematological parameters studied due to the paucity of their relevant information in literature, it is hereby recommended, that more work be carried out on the effects of surgical caponization, on these haematological parameters (PCV, WBC, HBC & MCHC) of cockerel chickens.

References

Cason JA, Fletcher DL & Burke WH (1988). Research note: Effects of caponization on broiler growth. *Poultry Science*, **67**(6): 979-981.

Chen KL, Chiou WT & Chiou PWS (2005). Caponization and testosterone implantation effects on blood lipid and lipoprotein profile in male chickens. *Poultry Science*, **84**(4):547-552.

Chen KL, Hsieh TY & Chiou PWS (2006). Caponization effects on growth performance and lipid metabolism in Taiwan country chicken cockerels. *Asian-Australian Journal of Animal Science*, **19**(3): 438-443.

Deyhim FR, Moreng E & Kienholz EW (1992). The effect of testosterone propionate on growth of broiler chickens. *Poultry Science*, **71**(11):1921-1926.

Fennell MJ & Scanes CG (1992). Inhibition of growth in chickens by testosterone,5-dihydrostestorone and 19 nortestosterone. *Poultry Science*, **71**(2):357-366.

Fennell MJ, Radecki SV, Proudman JA & Scanes CG (1996). The suppressive effects of testosterone on growth in young chickens appears to be mediated via a peripheral androgen receptor; Studies of the anti-androgen ICI 176,334. *Poultry Science*, **75**(6):763-766.

Google Maps (2013) www.maps.google.com.ng/maps?hl=en&tab=ll, retrieved 2013-06-22.

Gosh N & Samanta R (2008). Manual on avian production and management. International book distributing company (publishing division), Lucknow, India. Pp 120.

Hsu JC & Lin CY (2003). Influence of caponization on the carcass characteristics in Taiwan country chicken cockerels. Asian-australas. *Journal of Animal Science*, **16**(4):575–580.

Hsieh TY (2003). *Effects of caponization in Taiwan country chicken cockerels on growth performance and lipid metabolism*. MSc Thesis, Department of Animal Science, National Chung-Hsing University, Taiwan. Pp 13.

Jacob J & Ben Mather F (2000). Capons (University of Florida Extension service PS54). http://www.edis.ufl.edu, retrieved 2012-07-20.

Kuo TW (2002). *Effect of different caponized ways and different caponized weeks on meat characteristics of Taiwan country Chicken*. MSc Thesis, Department of Animal Science, National Chung-Hsing University, Taiwan. Pp 23.

Kuo-Lung C, TsaiTzu C, Kou-Joong L & Peter Wen-Shyg C (2007). The effects of caponization age on muscle characteristics in male chicken. *Asian-Australasian Journal of Animal Sciences*, **20**(11): 1684-1688.

Mast MG, Jordan HC & Macneil JH (1981). The effect of partial and complete caponization on growth rate, yield and selected physical and sensory attributes of cockerels. *Poultry Science*, **60**(8):1827–1833.

Mayes PA & Botham KM (2003). Biosynthesis of fatty acids. In: Harper's Illustrated Biochemistry. (RK Murray, DK Granner, PA Mayes, & VW Rodwell, *editors*). McGraw-Hill, London, UK. Pp 173.

Miguel JA, Ciria J, Asenjo B & Calvo JL (2008). Effect of caponization on growth and on carcass and meat characteristics in Castellana Negra native Spanish chickens. *Animal*, **2**(2):305–311.

Muriel Duran A (2004). The effect of caponization on production indices and carcass and meat characteristics in free-range Ex-tremena Azul chickens. *Spanish Journal of Agricultural Research*, **2**(2):211–216.

Rahman MM , Islam MA, Ali MY, Khondaker MEA & Hossain MM(2004). Effect of Caponization on Body Weight, Hematological Traits and Blood Cholesterol Concentration of Nara Chicken. *International Journal of Poultry Science*, **3** (4): 284-286.

Shao Y, Junying-Li C & Zhao C (2009). The Effects of Different Caponization Age on Growth Performance and Blood Parameters in Male Tibetan Chicken. *Asian Journal of Animal and Veterinary Advances*, **4**(5): 228-236.

Shapira N, Nir I, & Budowski P (1978). Response of lipogenic enzymes to over-feeding in liver and adipose tissue of light and heavy breeds of chicks. *British Journal of Nutrition*, **39**(1):151–157.

Symeon GK ,Mantis F , Bizelis I,Kominakis IA ,& Rogdakis E (2010). Effects of caponization on growth performance, carcass composition, and meat quality of medium growth broilers. *Poultry Science*, **89**(7):1481–1489.

Synder JM,Rowth OA, Scholes JC & Lee CE (1962). Profitable poultry management. (24th

edition). Beacon division of Textron, Gayuga, New York. Pp 15.

Tor M, Estany J, Villalba D, Molina E, & Cubilo D (2002). Comparison of carcass composition by parts and tissues between cocks and capons. *Animal Research*, **51**(5): 421–431.

Wang, H. T. 2001. Effects of surgical caponization and administration of Estradiol to chicken embryos on daily activity, agonistic behaviour, growth performance, carcass traits and sensory evaluation of males Taiwan country chickens. MSc Thesis, Department of Animal Science, National Chung-Hsing University, Taiwan. Pp 18.

Welter JF (1976). The effects of surgical caponization on production efficiency and carcass yield of roosters. *Poultry Science*, **55**(4):1372–1375.

Wilson GW (2005). Wilson's Practical Meat Inspection. (7th edition). Blackwell Publishing, USA. Pp 82.