



Research Article

Evaluation of Caponization on Growth and Meat Quality Parameters of Dual-Purpose Chicken

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Abstract

Caponization is a surgical technique that alters the sexual maturation of male chickens and improves quality characteristics of carcass and meat. The present experiment was conducted in order to evaluate the effects of caponization on body weight, carcass composition and meat quality of dual purpose chicken. A total of 48 dual-purpose breeds of Chicken, namely New Hampshire (NH) and Black Australorp (BA) were examined in a 2 × 2 factorial design each treatment having twelve birds till the age of 32 weeks. The results showed that the growth rate up until the age of 20 are not significant statistically which became significant afterwards ($p < 0.01$). Likewise, some desirable changes in body morphology, carcass quality ($p < 0.05$) and dressing out recovery were also observed. The hedonic ranking test also inferred that the meat from capons are liked by consumers highly significantly ($p < 0.01$). The results of this study indicate that the caponized chicken can be used as a valuable material for production of high quality meat. Based on the overall results patterns and indication of this study, a more detailed study to minutely study the fatty acid, amino acid and mineral profile along with evaluation of the proper age at which caponization can bring about the most desirable changes should be lined up.

Keywords: Caponization; body weight; meat quality

Introduction

Chicken contribute a significant proportion to the national economy as well the national food and nutritional status of Nepal (Sharma *et al.*, 2008; Osti *et al.*, 2017). The value of chicken meat is increasing everyday as it is considered safe for individuals with various health and metabolic complications. However, taste of chicken meat is always in question as it is not as much relished as the chevon or other meats are (Sharma *et al.*, 2008). Several indigenous and technical research are underway to enhance the taste of chicken. Among those practices are caponization, which has been followed by the farmers of mid-western terai as a tool to increase the taste in chicken (Banerjee, 2012).

Caponization has been a prominent practice of sterilizing a rooster since ages for a religious region in the beginning and then for improved body weight gain while for improved quality such as juiciness and tenderness (Calik, 2014). Such practice is believed to divert the energy expenditure mechanism of the chicken from sexual and reproductive physiology and behaviour to enhance secondary male characters like comb, wattle and fighting (Chen *et al.*, 2006; Chen *et al.*, 2010; Chen *et al.*, 2010). In addition, such diversion mechanism of the nutrients enhance deposition of fat thereby facilitating the tenderness of the meat and ultimately improving the flavour, texture and juiciness of meat (Lin and Hsu, 2003; Chen *et al.*, 2010; Kwiecień *et al.*,

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2015). Likewise, the hormonal changes afterwards has been found responsible for the induction of growth hormone secretion and promotion of mineral profile in the European chicken (Ford and Klindt, 1989). The overwhelming majority of commercially produced chickens are strains selectively bred for heavy body weight and rapid growth. In contrast, capons are slower-growing and yet typically appealing to “the gourmet market and in certain ethnic communities” (Jacob and Mather, 2000). A number of method for carrying out this process are in practice globally (Rahman *et al.*, 2004). Therefore, this study has been designed to evaluate the effectiveness of caponization in bringing in positive changes in the quantity and quality of meat produced.

Materials and Methods

Experimental Location, Treatment and Design

The study was conducted at Poultry Research Unit of Swine and Avian Research Program (SARP), Khumaltar, Lalitpur (27°39'N and 85°19'E). The study was conducted for a period of 32 weeks including two dominating dual-purpose breeds of Nepal, namely New Hampshire (NH) and Black Australorp (BA). Forty-eight individual birds in Factorial setup of the experimentation (2 breeds × 2 Caponization methods) were reared in separately partitioned deep litter system.

The treatments of the study were as follows:

Caponization Breed	Capon	Intact
New Hampshire	Treatment I	Treatment II
Black Australorp	Treatment III	Treatment IV

Bird Management and Caponization

Each pen housed twelve birds and offered with similar feeding and other management practices throughout the experiment. The birds receiving twelve individuals of each

breed were surgically caponized at the age of 16 weeks and rest twelve individuals of each breed were kept intact as check. Caponization was done by the trained technicians. Thereafter, they were grown separately in four pens with similar feeding and other management.

Data Collection

The body weights of the individuals at weekly interval were recorded for next twelve weeks. Changes of comb, wattle, hackle feather, saddle feather and head were also observed.

Statistical Analysis

The data thus obtained was analyzed by using MS-Excel 16.6.4 and Harvey computer software packages (Harvey, 1990). Mean separation was done by DMRT at 0.05 level of significance (Steel and Torrie, 1980).

Results and Discussion

Morphological Features

As morphological appearance, comb and wattle were observed bigger in control groups than their caponized counterparts. Further disintegration across the breeds suggests that they were larger in Black Australorp than in New Hampshire. As behavioral changes, caponized birds were quiet, docile and sluggish compared to the control birds. The secondary sex characters like comb, wattle, hackle and saddle feather were depressed due to the deficiency of testosterone in capons. This observation in this experiment are in support of the findings elsewhere (Chen *et al.*, 2006; Chen *et al.*, 2010; Symeon *et al.*, 2013; Cui *et al.*, 2017).

Body Weight

The Least Square Mean and Standard Error of Least Square Means of the Body weight of the cockerels at different age are shown in the Table 1. The impact of both caponization method and breeds on the growth performance of chicken remained non-significant statistically throughout the fortnightly observation schedule of starting from 16th to 20th weeks of age. However, the differences started to become more visible and evident thereafter.

Table 1: Least Square Means and Standard Error of Body Weight (in grams) of chicken at different ages in relation to the breed and caponization status

Factors	Age of chicken (weeks)					
	16	18	20	22	24	26
Overall	1806±24.0	1970±21.9	2113±27.0	2338±26.4	2438±39.3	2550±34.0
Breed						
New Hampshire	1813±33.9	1930±31.0	2068±38.2	2298±37.4	2451±55.6	2527±48.1
Black Australorp	1798±33.9	2011±31.0	2157±38.2	2379±37.4	2425±55.6	2574±48.1
Significance	NS	NS	NS	*	**	**

NS= Non Significant (P>0.05), *Significant (p≤0.05), **Highly Significant (p≤0.01).

The effect of Breed and caponization status on Body weight of cockerel is also jointly presented in Fig. 1. The graph shows that the weight of the capons are always been higher than that of either intact or growth of chicken with either NH or BA breeds.

This result is in contrast with some studies better (Muriel Duran, 2004; Symeon et al., 2010) but at the same time not as desired as it was reported by other researchers (Chen, Hsieh and Chiou, 2006). Similar pattern of differences were recorded by Rahman *et al.* (2004) wherein the significance of the difference was not evident during the earlier weeks. This could largely because of the time taken for the capons to have shown the accumulated effect of diverted nutrient use other than for the sexual and reproductive functions (K. L. Chen *et al.*, 2010; Lin, Hsu and Wan, 2012).

Dressing Recovery and Carcass Characteristics

The Table 2 provides readers an impression of the impact of caponization on dressing percentage and some other carcass characteristics of chicken. The carcass of major economic interest of the chicken has also been processed in terms of their dry matter recovery was also assessed. The results showed that though the caponization or the breed effects were not visible on breast dry matter, the thighs of the New Hampshire outperformed that of the Black Australorp breeds.

The result of thigh is in consistence with the results obtained in Greece in layer males (Symeon *et al.*, 2012) but rather in contrast with that of Lin and Hsu (2003). This is largely attributable to altered testosterone levels ultimately positively affecting the process of protein synthesis (Tor *et al.*, 2002; Symeon *et al.*, 2013).

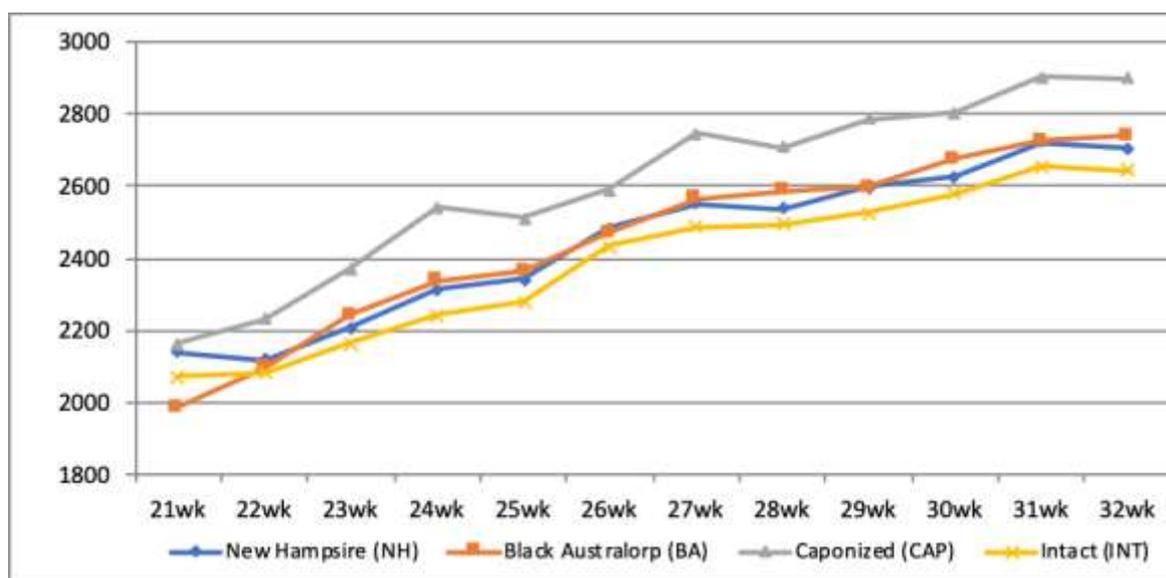


Fig. 1: Effect of Caponization and Breed on Body Wt. (g) at different age (wk.) of cockerels

Table 2: Effect of caponization and breed on dressing recovery and DM content of carcass

Factors	Live Wt. (gram)	Dressed Wt. (gram)	Dressing %	DM%	
				Breast	Thigh
Overall	2640±23.2	2117±17.0	80.25±0.3	29.67±0.3	27.26±0.2
Breed					
New Hampshire	2629±32.8	2100±24.1	79.92±0.4	29.45±0.4	27.76±0.2
Black Australorp	2651±32.8	2134±24.1	80.57±0.4	29.89±0.4	26.76±0.2
Significance	NS	NS	NS	NS	**

NS= Non Significant (P>0.05), **Highly Significant (p≤0.01).

Table 3: Effect of caponization and breed on sensory quality of meat

Attribute	Intact		Capon		Significance
	NH	BA	NH	BA	
Flavour	3.29±1.48	3.36±1.55	4.71±1.13	4.43±1.12	NS
Juiciness	3.61±1.04	4.07±1.11	4.06±1.02	4.13±0.99	*
Tenderness	3.77±0.93	3.33±1.11	3.89±1.44	3.82±1.02	**
Overall acceptance	4.01±1.30	3.88±1.47	4.83±1.44	5.02±1.20	*

NS= Non Significant (P>0.05), *Significant (p≤0.05), **Highly Significant (p≤0.01).

Qualitative Traits

Qualitative traits were judged in terms of flavour, juiciness, tenderness and overall acceptance of the meat from a panel of ten members who were provided with a sheet of paper to judge based on anonymity maintained by encoding of the samples being tested. Each sample belonged to a different treatment group. The results are then compiled and decoded. The processed results are presented in the Table 3. The results show that meat from capons were liked the most by the evaluators (p<0.01). Among the breeds, the sensory parameters were higher for New Hampshire.

These results are in support of the general observations and results reported by a number of studies carried out across different parts of the globe (Lin and Hsu, 2003; T. T. Chen et al., 2010; Kwiecień et al., 2015). However, Muriel Duran (2004), in contrast, reported that tenderness, juiciness and flavour in both capons and roosters had no difference as revealed by the hedonic ranking of the meat. The quality parameters like juiciness, tenderness and flavour are primarily governed by the profile of the fatty acids in the meat and the changes that is brought about by the caponization which again is affected by the interaction effect of the breeds (Kwiecień et al., 2015).

Conclusion

Caponization is the traditional practice of value addition of chicken especially in the mid-western part of the country. However, with proper evaluation of the quantitative as well as qualitative attributes of the capons, the scaling up efforts have not gotten much further. This study has attempted to bring the practice in the radar of the scientific investigation. More importantly, the results are somehow encouraging to the farmers and technicians with the enthusiasm to further investigate into greater details of the practice. One of the most important aspect to be studied, based on the studies elsewhere and the preliminary results of this study as well, include the need to assess different age of caponization as the growth and quality parameters tend to progress and improve a couple of months after caponization. In addition, other amicable as less invasive as possible, and less

distressful methods are needed to be studied in the days to come.

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