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STUDY ON PRODUCTION PERFORMANCE AND CARCASS CHARACTERISTICS OF KADAKNATH NATIVE CHICKEN IN VARIOUS METHODS OF REARING SYSTEMS

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ABSTRACT
A study was undertaken for comparative assessment of effect of different systems of rearing of Kadaknath chicken on carcass traits at Instructional Livestock Farm Complex for Madras Veterinary College, Madhavaram Milk Colony, Chennai. A total of 300 day old Kadaknath chicks were randomly divided into three treatment groups (T1, T2 and T3) of 100 chicks each. The T1, T2 and T3 group of birds were reared under cage system, deep litter system and mud floor system respectively. Standard management practices were practiced in all systems of rearing. All groups were fed with 40% grower mash, 40% broken rice and 20 % finely chopped Co4 fodder grass. At 4th week, 8th week and 12th week of age the average weight of T1, T2, T3 group birds were 0.410 ±0.012 kg, 0.382 ±0.018 kg, 0.365 ±0.002 kg, 0.683 ±0.032 kg, 0.607 ±0.029 kg, 0.598 ±0.027 kg and 0.958 ±0.043 kg, 0.872 ±0.048 kg, 0.761 ±0.036 kg respectively. At the end of 16th week of age, live body weight of birds of T1, T2 and T3 groups were taken and then they were humanely slaughtered at ILFC slaughter hall. The following data on live weight, carcass weight and dressing percentage of T1, T2, and T3 group were recorded as 1.51 ±0.01 kg, 1.32 ±0.052 kg, 1.20 ±0.052 kg and1.04 ±0.01kg, 0.88 ±0.031 kg, 0.79 ±0.01 kg and 69.02 ±0.13%, 67.32 ±0.13%, 66.14 ±0.25% respectively. Cut up parts yield viz. breast, thigh, drumstick, back, wing, neck and giblets of three group birds were recorded. The feed conversion ratio of T1, T2 and T3 group of birds were 4.06 ±0.17, 4.32 ±0.64, 4.51 ±0.38 respectively. The results revealed that the growth performance, feed conversion ratio, carcass weight, dressing percentage and cut up parts yield of birds reared under cage system was significantly higher compared to that reared under deep litter and mud floor system.

KEY WORDS: Rearing System, Kadaknath, Live weight, Carcass traits.

INTRODUCTION

Kadaknath is an important indigenous breed of poultry inhabitating vast areas of Western Madhya Pradesh mainly the Jhabua and Dhar Districts and adjoining areas of Gujarat and Rajasthan. This breed has evolved through natural selection in indigenous agro-ecological conditions and is well adapted to the local environment. The Kadaknath birds reveals appreciable degree of resistance to diseases compared with other exotic breeds of fowl in its natural habitat in free range. Kadaknath birds are also resistant to extreme climatic conditions like summer heat and cold winter stress and can thrive very well under adverse environments like poor housing, poor management and poor feeding. There are three main varieties of Kadaknath breed are Jet black, Pencilled and Golden Kadaknath. In all the three varieties of Kadaknath breed most of the internal organs exhibit intense black colouration which is due to the deposition of melanin pigment in the connective tissue of organs and in the dermis (Rao and Thomas 1984). Kadaknath breed is poor in egg production potential, but their black flesh is very delicious and popular. Its flesh is of higher value and is being used for the treatment of many diseases in human beings by tribals / adivasies living in Jhabua District of Madhya Pradesh. However, this needs proper scientific evaluation. Nowadays Kadaknath birds are in great demand and are very costly. The meat and eggs are also reckoned to be a rich source of protein (Rao and Thomas, 1984).

Human health, nutrition, and animal welfare are increasingly attracting consumer attention and organic food markets are becoming more popular. Poultry products, which are an important food source worldwide, are similarly experiencing growth in the organic market. Many consumers believe that poultry rearing using conventional confinement systems leads to animal stress, resulting in negative physiological and behavioural responses and poor performance. In contrast, outdoor raising systems could improve bird growth condition and decrease stress (Mikulski *et al*., 2011). In addition, Outdoor production system, without any confinement can reduce stress and increase comfort and bird welfare, furthermore leading to products better taste and flavour compared to conventionally produced broiler chicken (Lewis *et al*., 1997, Fanatico *et al*., 2006). Many consumers prefer to buy products from chickens raised outdoors (free range) because they believe that these products have superior sensory qualities or in other words, taste better (Yang *et al*., 2015). This perception has been confirmed by Fanatico *et al*., 2006 found that an outdoor (free range) raising system improved the flavour of chicken meat. The same group also showed significantly different growth rates among chickens of difference genotypes when they were reared with or without outdoor

access (Fanatico *et al*., 2005). In contrast, Mikulski *et al*., Reported in 2011 that body weight (BW) and meat yield and quality of chickens was primarily due to genotype, and outdoor access did not negatively affect their growth performance or meat yield. Certainly, a multitude of factors, including genotype, age, sex, diet, density, environment, exercise, and pasture intake, impact the growth and performance of birds (Gordon & Charles 2002). The objective of present study was to evaluate the effect of cage system, deep litter system and mud floor system on growth rate, feed conversion ratio and carcass traits of kadaknath chicks.

MATERIALS & METHODS

The trial was carried out at Instructional Livestock Farm Complex for Madras Veterinary College, Madhavaram Milk Colony, Chennai. A total of three-hundred day old chicks, were randomly divided into three treatment groups (T1, T2 and T3) of 100 chicks each. The T1, T2 and T3 group of birds were reared under cage system, deep litter system and mud floor system respectively. The cage raising system is typically used in the broiler industry, applied in the present study with 3 birds in each cage and each cage measuring 90 cm × 45 cm ×50 cm in size. Birds in the deep litter system were raised in solid-floored pens in which paddy husk used as bedding materials with side curtains. The birds in the mud floor system were raised in a mud floor run and covered with net and shade available which provided both feed resources and habitat for the chickens. Additional feed and water were also provided in this system using trough feeders and water pans with reservoirs. Ground predators were excluded by net fencing and overhead predators were excluded by netting over the paddocks. Standard management practices were practiced in all systems of rearing. All groups were fed with 40 % grower mash, 40% broken rice and 20 % finely chopped Co4 fodder grass. Access to feed and water was free, and diets were formulated according to National Research Council [1994] feeding standards. All birds were offered the same feed and water *ad libitum*. Birds and feed were weighed weekly to determine body weight and feed intake, and to calculate the feed conversion ratio. At the end of the sixteenth week of the experiment, after 10 hours fasting, all birds were weighed individually and slaughtered and sacrificed humanely by cervical dislocation. They were properly bled for two minutes and then scalded using water at temperature, 60^{o}C. After de-feathering, the plucked weight was recorded. The heads and shanks were removed. After evisceration, the carcass yield was recorded. The weight of the cut-up parts (Breast, Thighs, Drumsticks, Neck, Back, Wings) and Giblets were determined. Dressing Percentage was calculated as the ratio between the eviscerated carcass and live body weight after fasting. The percentages of weights of breast meat, leg meat, Back meat, Wing, Neck, Giblet were calculated in relation to eviscerated carcass weight. Data were processed by one-way ANOVA (SPSS Statistics 17.0 software). When appropriate, differences among system means were compared with Duncan multiple-range test and were considered significant at $P< 0.05$.

RESULTS AND DISCUSSION

The Body weight gain, and feed conversion ratio (feed/gain) of the chickens in each of the three raising systems are shown in Table 2. Higher fourth week body weight (0.410 ±1.22) was observed in this study, which is not in agreement with earlier report of Haunshi *et al.* (2011). In the present study, sixteenth week body weight of Kadaknath was ranges from 1.20±0.63 Kg to 1.51±0. 032 Kg. Singh *et al*. (2007) reported average 40-week body weight of Kadaknath was 1.407 kg. Average body weight Kadaknath at 21 and 52 week of age was 1.30 ± 26.39 kg and 1.55 ±21.04 kg, respectively (Mohan *et al*., 2008). The feed intake and feed conversion ratio of chickens in the cage group were both significantly higher than that of the chickens in the deep litter and mudfloor system ($P < 0.05$). The chickens in the mud floor system had the lowest body weight and poor feed conversion ratio. Birds in the cage group gained more body weight than those in the free-range group ($P <0.05$) and had a better feed/gain ratio than the birds in either of the other groups ($P< 0.05$). These differences may be explained by the inherent variability in mud floor system, free-range birds in mud floor system are exposed to some factors that are inherently variable, such as light intensity, photoperiod, and temperature. This was expected because the chickens dispensed a lot of energy as they move freely on run. Furthermore, birds raised in a free-range system have access to the various forages, insects, and worms found on pasture, these may contribute some dietary nutrients and thus interfere with their normal intake of commercial feed. As was expected, the growth performance of birds in the free-range raising system was inferior to that of birds raised in more controlled environments, this is likely because the free-range birds were exposed to fluctuating temperatures and increased exercise in the yards, thus increasing their energy requirement and influencing their feed conversion. Similar results have been reported previously, for example, in 2002 Castellini *et al.* demonstrated that growth rates and feed efficiencies were lower in outdoor organic raising systems than in other (conventional) systems.

Since then there has been much researchers examined the influence of different production systems on the growth performance of birds. Wang *et al.* (2009) found that body weight and weight gains of Gushi female chickens in a free-range raising system were much lower than those of chickens raised in indoor solid-floored pens. Dou et al. (2009) also found that a free-range raising system for chickens negatively influenced body weight, weight gain, and feed conversion ratio (feed/gain). However, some studies have demonstrated that the growth performance of chickens was not affected by their outdoor access, possibly due to relatively less exercise of the free-range group (the pasture was removed) (Chen et al. 2013) and perhaps owing to increased exercise of the indoor floor group (the deep litter was provided) (Sogunle *et al*., 2012). The mean carcass yield, dressing percentage, breast muscle yield, leg muscle yield, back, wing yield, neck yield and giblets of chickens in each of the three raising systems are shown in Table 3. The raising system significantly affected carcass yield, dressing percentage, breast muscle as well as leg muscle, back muscle and giblets yields ($P <0.05$). There was no difference in wing and neck yields among the different rearing systems ($P >0.05$). The carcass yield, dressing percentage, breast muscle, leg muscle, back and giblets of chickens in the cage group was significantly

greater than that of chickens in the deep litter system and mud floor system (P <0 .050). The carcass yield, dressing percentage, breast muscle yield, leg muscle yield, back and giblets in the mud floor system was significantly lower than that of chickens in both the cage groups and deep litter system (P >0.05). Similar findings have been reported by Fanatico *et al.* (2005), Wang *et al.* (2009), and Chen *et al.* (2013). In contrast, Castellini *et al.* (2002) and Feddes *et al.* (2002) stated that the carcass yield significantly increased when birds had outdoor access because of increased motor activity. In the current study, we found that carcass yield, dressing percentage, breast, leg muscle, back and giblets yield were influenced by the different rearing system. In contrast Fanatico *et al.* (2005), Wang *et al.* (2009), Jiang *et al.* (2011), Mikulski *et al.* (2011), and Chen *et al.* (2013) all similarly demonstrated a lack of significant differences in meat yield between cage system, deep litter system and mud floor raised birds. Castellini *et al.* (2002) and Feddes *et al.* (2002) found that the breast and leg meat percentages increased in free range system, likely because of greater physical activity, when birds had free range access and a lower stocking density in an organic production system. In conclusion, in Kadaknath chickens, the cage system had significant positive effects and mud floor system had significant negative effect on growth performance, feed conversion and carcass characteristics.

TABLE 1: Body weight and Feed Conversion Ratio of Kadaknath Birds in Different Rearing Systems

Sl. No	Parameters	Treatment-1 (Cage System)	Treatment-2 (Deep litter System)	Treatment -3 (Mud Floor System)
1.	Day-old body weight(Kg)	0.029 ± 0.001	0.029 ± 0.001	0.029 ± 0. 001
2.	4th week body weight(Kg)	0.410 ± 0.012^{a}	0.365 ± 0.002^{b}	0.382 ± 0.018^{c}
3.	8th week body weight(Kg)	0.683 ± 0.032^{a}	0.607 ± 0.029^{b}	0.598 ± 0.027^{c}
4.	12th week body weight(Kg)	0.958 ± 0.043^{a}	0.872 ± 0.048^{b}	0.761 ± 0.036^{c}
5.	16th Week Body Weight(Kg)	1.51 ± 0.032^{a}	1.32 ± 0.15^{b}	1.20 ± 0.63^{c}
6.	Feed Conversion Ratio	4.06 ± 0.17^{a}	4.32 ± 0.64^{b}	4.51 ± 0.38^{c}

Means bearing different superscripts within rows differ significantly at P<0.05.

TABLE 2: Carcass Characteristics of Kadaknath Birds in Different Rearing Systems

Sl.No	Parameters	Treatment-1 (CageSystem)	Treatment-2 (Deep litter System)	Treatment -3 (Mud Floor System)
1.	Carcass Yield (Kg)	1.04 ± 0.13^{a}	0.88 ± 0.02^{b}	0.79 ± 0.06^{c}
2.	Dressing Percentage (%)	69.02 ± 1.38^{a}	67.32 ± 1.68^{b}	65.14 ± 3.72^{c}
3.	Cut up part yields (%)			
	Breast	22.3 ± 3.41^{a}	21.6 ± 3.9^{b}	20.4 ± 5.8^{c}
	Thigh	16.05 ± 0.91^{a}	15.90 ± 0.64^{b}	14.92 ± 1.84^{c}
	Drumstick	16.45 ± 1.7^{a}	15.98 ± 1.4^{b}	15.13 ± 0.92^{c}
	Back	21.4 ± 2.51^{a}	20.52 ± 0.38^{b}	19.92 ± 1.5^{c}
	Wing	9.1 ± 0.60^{a}	8.98 ± 0.13^{a}	8.97 ± 0.27^{a}
	Neck	5.03 ± 0.04^{a}	4.95 ± 0.6^{a}	4.93 ± 0.01^{a}
	Giblets	8.6 ± 0.96^{a}	7.7 ± 0.32^{b}	7.13 ± 0.53^{c}

Means bearing different superscripts row wise differ significantly ($P < 0.05$).

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