International Journal of Veterinary Sciences and Animal Husbandry

ISSN: 2456-2912
VET 2024; 9(4): 74-77

www.veterinarypaper.com
Received: 01-05-2024
Accepted: 05-06-2024

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Effect of different system of rearing on carcass characteristics in Aseel chicken at farmer's field

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Abstract
The aim of this study was to assess the carcass characteristics of Aseel chickens raised under varying rearing systems in farmers' field. Seventy-two Aseel birds (from 18 farms) were selected @ 24 birds from each system *viz*. intensive, semi-intensive, and backyard, respectively. Samples of feed were collected from each farm to analyse their proximate composition, as well as the levels of copper and zinc. The selected birds were weighed, slaughtered, and bone and liver samples were taken for analysis of copper and zinc contents using Atomic Absorption Spectroscopy. The crude protein content of feed offered to birds reared under intensive, semi- intensive and backyard system of rearing were 17.24%, 12.71% and 9.22%, respectively. The dressing percentage and liver weight were significantly (p<0.01) higher in intensive system, compared to semi- intensive and backyard system of rearing. There was no significant (p≥0.05) difference in weight of giblets and cut up parts yield reared under different systems. The present study revealed that the feeding of concentrate feed with high protein, fat, copper and zinc significantly improved the dressing percentage and liver weight in Aseel birds grown under intensive system as compared to semi-intensive and backyard system at farmer's field.

Keywords: Aseel chicken, carcass characteristics, cut-up parts yield and system of rearing

Introduction
Traditional poultry farming is integral to the rural economy and the empowerment of women, contributing 30% to the national egg production. In rural areas, desi chicken farming serves as a substantial additional income for the 70% of the population (Khandait *et al*., 2011) [8]. Aseel is a prominent native breed reared primarily for both gaming and meat production. Aseel chicken is renowned for its remarkable stamina, impressive stride, disease resistance, ability to thrive in challenging climates, and the superior taste and flavour of its meat and eggs (Singh and Pathak, 2017) [19]. Therefore, Aseel chickens typically fetch higher prices compared to other improved breeds. Poultry producers are adopting intensive commercial farming systems to enhance the production efficiency, taste, and market price competitiveness of Aseel chickens (Satheeskumar *et al*., 2012) [17].

Aseel chickens are typically raised in intensive systems, often until they reach 10 to 12 weeks of age. Whereas, Aseel chickens raised in backyard rearing systems are typically marketed when they reach 30 to 34 weeks of age. Due to slow growth rate of Aseel chicken, feeding them a commercial broiler or layer diet is neither economical nor conducive to achieving optimal growth performance (Haunshi, 2011) [7]. Therefore, additional investigations are necessary to determine the baseline values for achieving optimal production performance in Aseel chickens. In this regard, as part of ascertaining the status of copper and zinc in body tissues of Aseel chicken, the objective of the present study was to compare the carcass characteristics and segmented parts of Aseel chickens reared under intensive, semi-intensive, and backyard farming systems under farm conditions.

Materials and Methods
The field study was carried out in the northwestern and northeastern regions of Tamil Nadu, India. A total of 48 farms were surveyed to assess the feeding practices under intensive, semi-intensive, and backyard rearing systems. Ultimately, 18 farms were selected @ six farms from

each system (intensive, semi-intensive, and backyard) for studying the carcass characteristics. In the intensive system, the flock size ranged from 300 to 5000 birds, while in the semi-intensive system, it varied between 100 and 300 birds. The backyard system had flock size ranging from 20 to 150 birds. Birds reared in the intensive system were marketed at 10 to 12 weeks, in the semi-intensive system at 17 to 24 weeks, and in the backyard system at 34 to 38 weeks of age.
In the intensive system of rearing, the birds were fed with *albidum* quantity of commercial poultry feeds. In the semi-intensive system, the birds received commercial feeds mixed with grains or brans. Meanwhile, the birds in the backyard system were primarily fed with grains alone.

Chemical analyses
The feeds and feed ingredients used for feeding Aseel chicken in different system of rearing were analysed as per the protocols of AOAC (2019) [2] for its proximate composition, copper and zinc contents.

Slaughter study
A total of 72 birds, comprising 24 birds from each system *viz.* intensive, semi-intensive, and backyard rearing, were selected at the marketing age. Additionally, six samples of feed were also collected. The birds were weighed and slaughtered to study their carcass characteristics, and samples of tibia bone and liver were collected for analysis of copper and zinc content.

Ethical committee approval
Institutional Animal Ethics Committee, Veterinary College and Research Institute, Namakkal approved the protocol and conduct of the field study.

Estimation of copper and zinc in feed samples
The feed samples were ground and 0.5 g of the sample was wet digested on a hot plate using diacid (2:1 v/v of nitric: perchloric acid). Once the digestion was completed, the digested solution was filtered and transferred to a 50 ml volumetric flask using Whatman filter paper No.42 and the volume was adjusted to 50 ml (Palma *et al.* 2015) [14]. The concentration of copper and zinc in feed samples was analysed using Atomic Absorption spectroscopy at AFAQAL, Veterinary College and Research Institute, Namakkal.

Statistical analyses
The data collected on various parameters were statistically analysed as per the method of Snedecor and Cochran (1989) [20] and one-way analysis of variance (ANOVA) with Duncan post hoc test performed to assess the significance of differences among different systems of rearing. The analysis was carried out with the SPSS software package.

Results and Discussion
Composition of diets
In the intensive rearing system, the levels of crude protein, crude fat, copper, and zinc contents were significantly higher ($p< 0.01$) as compared to those in the semi-intensive and backyard rearing systems (Fig - 1). In contrast, the birds in the semi-intensive system, fed commercial diets blended with grains or brans, and those in the backyard system exclusively fed grains, showed lower levels of crude protein, crude fat, copper and zinc (Mondal *et al*., 2016) [13].

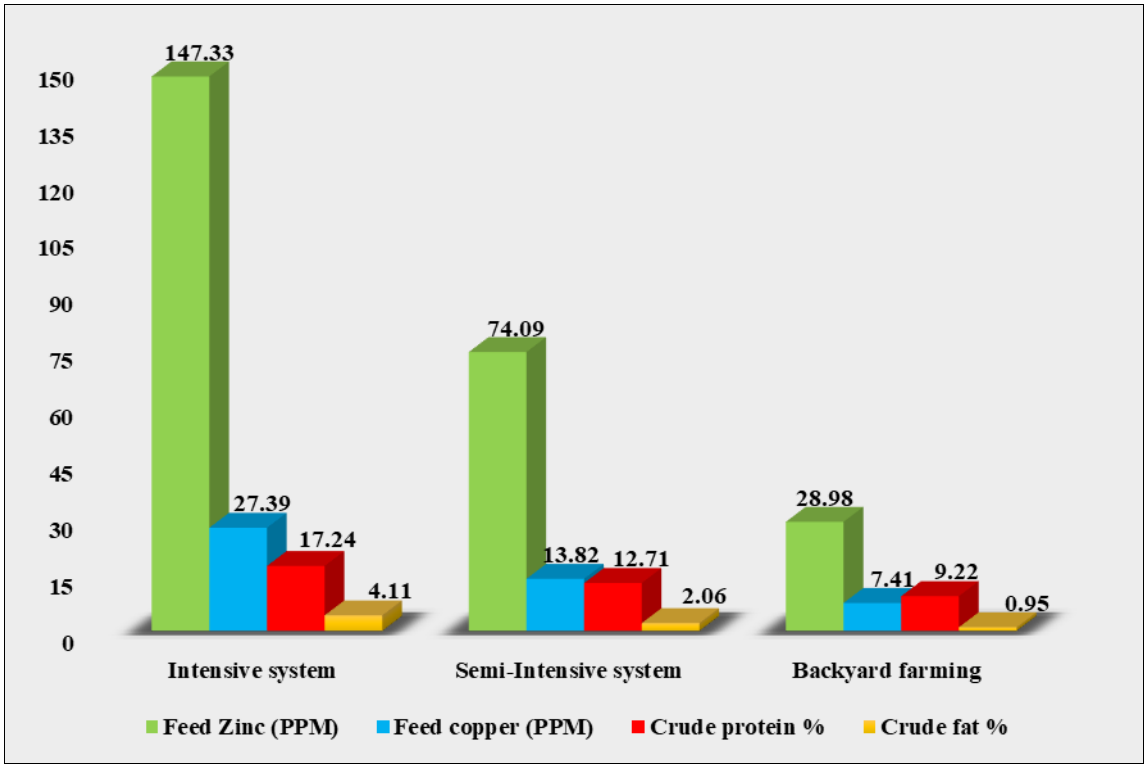

Fig 1: Composition of diets under different system of rearing

Carcass characteristics
Aseel chickens reared in intensive system showed significantly higher dressing percentage and liver weight ($p<0.05$) as compared to those raised in semi-intensive and backyard systems. However, there were no significant differences noted in the weight of giblets (gizzard, spleen, and heart). The carcass characteristics and cut up parts yield are presented in Table 1 and 2. Similar to the present findings, Bai *et al*. (2022) [3] found that farm reared native chicken had higher dressing percentage when compared to backyard

reared native chickens of Karnataka, whereas no difference was noticed on heart, spleen and gizzard weight percentage between the treatments. Likewise, carcass characteristics and liver weight were significantly improved in cage reared Lohmann Brown-Elite spent laying hens as compared to the birds reared in free range system (Semwogerere *et al*., 2018) [18].

Dressing percentage decreased in back yard reared Aseel chicken as the birds mature, there is typically a decrease in dressing percentage, primarily attributed to the natural shrinkage of muscle tissue (Li *et al*., 2017) [10]. Based on these observations, it can be inferred that the age at slaughter plays a pivotal role in determining both dressing percentage and the weights of carcass components. Mondal *et al.* (2007) [12] reported 77.57 to 80.77 percent dressing percentage in Aseel crosses at 12 weeks of age whereas in the present study the dressing percentage of Aseel chicken ranged from 68.19 to 71.94 in different system of rearing.

Table 1: Effect of rearing system on carcass characteristics in Aseel chicken

System of rearing	Dressing percentage	Percent of live body weight			
		Liver %	Gizzard %	Spleen%	Heart%
Intensive system	71.94^{a} ±0.37	2.34^{a}±0.11	2.91±0.13	0.17±0.01	1.06±0.03
Semi-intensive system	69.90^{b}±0.31	2.03^{b}±0.09	3.09±0.13	0.17±0.01	1.02±0.04
Backyard system	68.19^{c}±0.40	2.07^{b}±0.07	2.95±0.17	0.19±0.01	1.13±0.05
F	26.72	3.43	0.42	1.87	1.72
P value	0.00**	0.03*	0.65	0.16	0.18

Each value is a mean of twenty-four observations
Means in a column bearing different superscripts vary significantly ** (p<0.01) *(p<0.05)

Patel *et al*. (2014) [15] observed that the dressing percentage, both with and without giblets, and female giblet percentage of Gramapriya birds remained unaffected by the rearing systems, including deep litter, semi-intensive, and backyard management systems. Likewise, the carcass traits of meat-type Hubbard JA57 birds at 78 days of age were not affected by whether they were grown in conventional or free-range systems (Davoodi and Ehsani, 2020) [5]. Whereas, Magala *et al*. (2012) [11] conducted a study to investigate the influence of management systems (free-range, run, and deep litter systems of rearing) on carcass characteristics. The authors found that dressing percentages were higher in the run system compared to the other rearing systems. However, no significant difference was observed in dressing percentages between the free-range and deep litter systems in Uganda local chicken.

Cut up parts yield: The cut-up parts yield such as neck, wing, back, breast and leg percentage were not (p>0.05) affected by different systems of rearing in Aseel chicken. Similarly, Patel *et al*. (2014) [15] indicated that the cut-up parts yield of male Gramapriya remained unchanged across different rearing systems, including deep litter, semi-intensive, and backyard methods. The cut-up parts such as breast muscle, wing and legs percentage of slow growing Hubbard JA57 strain were not affected by the conventional or free-range rearing system (Davoodi and Ehsani, 2020) [5]. In this study, a higher breast yield percentage of 21% was recorded whereas Lariviere *et al*. (2009) [9] reported a breast yield of 18% in naked neck chickens at 11 weeks of age. Sanka and Mbaga, (2014) [16] also stated that there was no significant difference between thigh and drumstick percentage of Tanzanian local chicken reared under intensive and semi-intensive systems. The percentages of cut-up parts (back, thighs, drumsticks, wings, and neck) in native chicken did not exhibit any significant differences (P > 0.05) between the cage and deep litter systems of rearing. (Bhimraj *et al*., 2018) [4]. In the present study also, there was no significant difference in the yield of cut-up parts of Aseel chicken between intensive, semi-intensive and back yard system of rearing. This suggests that changes in feeding pattern did not significantly influence the yield of cut-up parts in Aseel chicken. In contrast, Fu *et al*. (2015) [6] reported that percentage of breast and leg muscle were significantly higher in Chinese local chickens reared in battery cages as compared to birds reared in free range system. Similarly, Akhtar *et al*. (2012) [1] found that thigh length in indigenous chickens reared under intensive systems was significantly greater when compared to those reared in backyard systems.

Table 2: Effect of rearing system on cut -up parts in Aseel chicken

System of rearing	Percent of live body weight				
	Neck %	Wing %	Back %	Breast %	Leg %
Intensive system	5.45±0.14	10.47±0.20	14.51±0.38	21.32±0.27	20.09±0.45
Semi-Intensive system	5.41±0.17	10.05±0.29	13.97±0.46	20.93±0.40	19.71±0.30
Backyard system	5.06±0.18	9.86±0.23	13.22±0.27	20.35±0.28	19.79±0.42
F	1.75	1.67	2.89	2.30	0.25
P value	0.18	0.19	0.06	0.10	0.77

Each value is a mean of twenty-four observations
Means in a column bearing different superscripts vary significantly

Conclusion

The present study demonstrated that feeding concentrate feed containing high levels of protein (17.4%), fat (4.11%), copper (27.39 ppm), and zinc (147.33 ppm) significantly enhanced the dressing percentage and liver weight of Aseel chickens raised under intensive system as compared to those in semi-intensive and backyard systems on farmers' fields. It can be concluded the provision of optimal nutrients to Aseel chickens enhances their meat output percentage for farmers engaged in rearing them.

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How to Cite This Article
Murali P, Vasanthakumar P, Natarajan A, Balasubramaniam A, Vasanthakumar T. Effect of different system of rearing on carcass characteristics in Aseel chicken at farmer's field. International Journal of Veterinary Sciences and Animal Husbandry. 2024;9(4):74-77.