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Original Article

Comparative study of growth performance of *Deshi*, Fayoumi, RIR and *Sonali* chicken reared under farm and semi scavenging condition

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A B S T R A C T

The objectives of the study to compare the growth performance of *Deshi*, Fayoumi, RIR and *Sonali* chicken reared under farm and semi scavenging**.** A total of 288 day-old chicks (72 from *Deshi*, 72 Fayoumi, 72 RIR and 72 *Sonali*) were used in this trial for a period of 20 weeks of age with 4 genotypes. 144 chicks were reared under farm condition and another144 chicks were under semi scavenging system. In farm, birds were fed ad libitum a commercial starter and grower feed. In semi scavenging at first 5 weeks, each chick was fed 10g balanced feed and maximum supplement was 50g up to the end of the experiment. This study revealed that day-old chick weight was the highest in RIR, intermediate and similar in *Sonali* and Fayoumi and the lowest in *Deshi* ($P<0.01$). Day-old chick weight did not differ between farm and semi scavenging ($P>0.05$). The highest live weight was found in RIR followed by *Sonali*, Fayoumi and *Deshi* at 20 weeks of age. All genotypes were heavier in farm than in those reared in semi scavenging except *Deshi*. Live weight gained at 20 weeks of age was the highest in RIR followed by *Sonali*, Fayoumi and *Deshi* ($P<0.01$). *Deshi* chicken was heavier in semi scavenging in comparison with in farm condition. Similar and higher survival rate was found in *Sonali*, Fayoumi and RIR and lower in *Deshi* ($P<0.01$). In farm condition, survivability was higher than in semi scavenging. Farm reared *Deshi* chicken tended to minimize survivability than those reared in semi scavenging. Feed intake was similar and higher in RIR and *Sonali*, intermediate in Fayoumi and the lowest in *Deshi* ($P<0.01$). Superior feed conversion was found in RIR followed by *Sonali*, Fayoumi and *Deshi*. Feed conversion was higher in semi scavenging than that in farm ($P<0.01$). From the study it is concluded that growth rate, survivability, feed intake and feed conversion ratio appeared to be the best in RIR, *Sonali* in intermediate and Fayoumi and *Deshi* are the worst in growth performance. Farm reared chicken had better potential than those in semi scavenging chicken. *Deshi* chicken had little difference in growth performance in two rearing systems.

Introduction

Bangladesh is an agriculture-based developing country in south-east Asia. Poultry is one of the most important agricultural sub-sectors in the country and about 87 per cent of rural household's rear poultry, with an average flock size of 6.9 birds (Alice, 2015; Sarkar *et al*., 2009). *Deshi* chicken production is common in rural resource poor households in developing countries. They play a vital role in the human livelihoods and contribute significantly to food security of the rural communities as chicken products have no cultural or religious taboos (Tadelle *et al.*, 2003). In Bangladesh, 95% chicken population are raised by the rural households under backyard system of production (BBS, 2017). This production system is generally described as low input low out-put, which is a characteristic of the rural households' enterprises. Although this production system is preferred due

to its low-input requirements, it exposes chicken to harsh conditions such as poor nutrition, uncontrolled breeding, predators, disease and parasite challenges (Abdelqader *et al*., 2007; Gondwe and Wollny, 2007). The traditional farms reared *Deshi* birds only and their productivity was very low. Intensive farms, On the other hand, reared exotic birds and their productivity was relatively high. Family poultry production systems are financially economic because even if the productivity of birds is low, some poultry meat and some eggs constitute almost a net profit for poultry keepers (Fattah, 2000; Buza and Mwamuhehe, 2001; Bithi *et al*., 2020; Disha *et al*., 2020; Islam *et al*., 2019).

Crossbreeding is one of the tools for exploiting genetic variation. The main purpose of crossing in chicken is to produce superior crosses (*i.e.* make use of hybrid vigor), improve fitness and fertility traits (Saadey *et al*., 2008). Ali *et al.* (1993) observed that ♂ RIR × ♀ Fayoumi chicks grew faster and utilized feed more efficiently than that of Fayoumi. Njenga (2005) revealed that the crossbred offspring of Rhode Island Red (RIR) and Fayoumi had the best level of body weight among the four different breeds under a semi-scavenging system of production in Kenya. Azharul *et al.* (2005) also found crossbred Sonali is performing slightly better compared to purebred Fayoumi under an intensive system in the village conditions of Bangladesh.

Growth is one of the major parameter directly related to poultry production in terms of meat and egg. It varied among different breeds/hybreds/strains in different environments. Growth is the cumulative results obtained from the harmonious activities of all tissues of animal body. Growth rate of *Deshi* chicken is the lowest than that of exotic breed. Slower growth rate of *Deshi* chicken as reported by Rao and Pillai (1986) and Paul *et al.* (1990), they started that *Deshi* chicken under scavenging grew at a slower rate than their genetic potentiality due to nutritional deficiency. *Deshi* chicken shows lower productivity because they are normally kept under traditional systems and village women have limited technical knowledge. The growth performance of native chickens may be improved significantly if they are reared in confinement with improved feeds (Chowdhury, 2013). Therefore, the present study has been undertaken with the objective of studying the growth performance of *Deshi*, Fayoumi, RIR and *Sonali* chicken reared under farm and semi scavenging condition.

Materials and methods

Study area and experimental birds

The research was conducted at poultry farm under the department of Veterinary and Animal Sciences, University of Rajshahi, Bangladesh. The area is situated about 5 km north of the University. A total of 288 day-old straight run chicks (72 from *Deshi*, 72 Fayoumi, 72 RIR and 72 *Sonali*) were used in a growth trial for a period of 20 weeks of age. A total of 144 chicks were reared under farm condition in 3 replications with 4 genotypes. Another, 144 day-old chicks were reared by broody hens and semi scavenging system in 3 replications with 4 genotypes. There were 12 straight run chicks in each replication (Table 1).

Table 1. Layout showing the distribution of chicks to treatment and replication.

Breed	System	Replication			Total
		1	2	3	
Deshi	FA	12	12	12	36
	SCA	12	12	12	36
Fayoumi	FA	12	12	12	36
	SCA	12	12	12	36
RIR	FA	12	12	12	36
	SCA	12	12	12	36
Sonali	FA	12	12	12	36
	SCA	12	12	12	36
Total		96	96	96	288

FA=Farm, SCA=Scavenging and RIR= Rhode Island Red

Preparation of experimental house

The house was properly cleaned with water and disinfected and kept for two weeks before placement of the experimental chicks. Phenol was used as disinfectant and dry rice husk was used as litter. The house was divided into 12 pens using bamboo.

Brooding of chicks

Chicks of all pens were brooded under brooder. The chicks were provided a temperature 35°C at first week of age, decreased gradually at the rate of 3°C every week until approximately dropped to 21°C. In semi scavenging, chicks were brooded by natural brooding with help of mother hens for a period of 2 weeks. One hen was allocated to brood each replicate of 12 Chicks. No extra temperature was provided to the chicks. Brooding and management systems of the experimental birds were shown in Photo 1 to Photo 8.

Floor space

The floor space allowed for each bird was 1350 cm^2 up to 20 weeks of age.

Feeder and water management

For the first 3 days, feed was given *ad libitum* to the birds on newspaper and water was supplied in round plastic drinkers. One round drinker was used for each replication of 12 birds. After three days, one trough feeder was provided for 12 birds. The feeders and drinkers were set properly so that birds were able to eat and drink conveniently. Drinkers were thoroughly cleaned and washed every day.

Watering

Fresh, clear and cold drinking water was made available all the times during the experimental period. Some water soluble vitamins and antibiotics were supplied to the birds with drinking water.

Feeding

In farm, the birds were fed *ad libitum* on commercial balanced starter (0-5 weeks) and grower (6-19 weeks) diet throughout the experiment period. Feed supplied thrice daily (at morning, at noon and at night). In village condition, first week each chick was supplied 10g balanced feed (5g in the morning and 5g in the afternoon). With the advancement of age, feed supplement were increased at the rate of 5g per week and maximum supplement were 50g up to the end of the experiment. Birds were allowed to move a freely outside the house for taking natural feeds in the homestead and surrounds area to pick up grains, insects, vegetables etc.

throughout the day time. Nutrient concentrations of supplied feed during different stages of age are shown in Table 2.

Table 2. Nutrient concentrations of supplied feed during different stages of age.

Nutrients	Starter ration (0-5 weeks)	Grower ration (6-19 weeks)
Water (%)	12.00	12.00
Crude Protein (%)	21.50	16.50
Metabolizable Energy (kcal/kg)	3000	2950
Crude fiber (%)	4.50	5.00
Crude fat (%)	5.50	5.50
Calcium (%)	1.10	1.10
Available phosphorus (%)	0.50	0.50
Lysine (%)	1.35	1.00
Methionine (%)	0.55	0.32
Ash (%)	6.50	6.50

Source: Teer poultry feed, City Poultry and Fish Feeds Ltd. Dhaka, Bangladesh

Photo 1. Day-old chicks with her *Deshi* mother.

Photo 2. Chicks with her broody mother in the bamboo basket.

Photo 3. Growing stage of Fayoumi chicken.

Photo 4. Growing stage of RIR chicken.

Photo 5. Growing stage of *Deshi*.

Photo 6. Growing stage of *Sonali.*

Photo 7. Pullet and cockerel of Fayoumi.

Photo 8. Pullet and cockerel of *Deshi.*

Temperature and relative humidity

Housing temperature and relative humidity were recorded every 4 hours during the experiment (6.00 AM, 10.00 AM, 2.00 PM, 6.00 PM and 10.00 PM) period.

Litter management

Fresh and dry rice husk was used as litter materials at a depth of 4cm. The old litter material was changed using new rice husk to prevent dampness. Poultry litter is also a good source of compost preparation that rich in macro and micro nutrients for plant growth (Alam *et al*., 2013). Vaccination, deworming and debeaking programmes of the experimental birds were shown in Table 3.

Table 3. Schedule for vaccination, deworming and debeaking programmes maintained for the experimental birds.

Age (days)	Vaccination	Deworming	Debeaking
5	BCRDV	-	-
7	-	-	Debeaking
14	IBDV	-	-
21	IBDV	-	-
28	BCRDV	-	-
35	F. Pox	-	-
45	F. Pox	-	-
50	-	Deworming	-
60	RDV	-	-
75	F. Cholera	-	-
95	F. Cholera	-	-
105	-	Deworming	-
130	RDV	-	-

BCRDV=Baby Chick Ranikhet Disease Vaccine, IBDV= Infectious Bursal Disease Vaccine, RDV= Ranikhet Disease Vaccine, F Pox=Fowl Pox, F Cholera=Fowl Cholera

Statistical analysis

Growth trial and the calculated variable were for a 4 (genotypes) × 2 (rearing system) factorial experiment in a Completely Randomized Design (CRD) with the help of a Computer package programme Genstat. Significant differences among the means were isolated by calculating Least Significant Differences (LSD).

Results and Discussion

The comparative study of growth performance of *Deshi*, Fayoumi, RIR and *Sonali* chicken reared under farm and semi scavenging condition is presented in Table 4.The day-old weight of the chicks were differed significantly ($P<0.01$) in the order of RIR > *Sonali* > Fayoumi> *Deshi* (Fig. 1). Day-old weight was the highest ($P<0.01$) in RIR, intermediate and similar ($P>0.05$) in *Sonali* and Fayoumi and the lowest in *Deshi*. Day old weight in *Sonali* was reduced by 11.98% in comparison with their parental genotypes (RIR and Fayoumi). Day-old weight of chicks of different

genotypes is the simply functions of eggs weight. Such a phenomina seems quite justified and has been supported by many researchers. Creswell and Gunawan (1982) reported that day-old weight in five different types of *Deshi* in Indonesia such as Kampung, Black Kedu, White Kedu, Nunukan and Pelung were 26.2 27.7, 25.5, 30.2 and 29.6g respectively. Mogesse *et al*. (2006) found that day-old weight of *Deshi* and RIR chicks were 27.1g and 35.2g respectively. Ndofor-Foleng *et al*. (2010) also reported that body weights of two *Deshi* chicken and their cross at day-old were 21.82g, 28.06g and 26.30g respectively. Genotype did not interact rearing system to alter (P>0.05) day old weight. It is evident from table 4 that if the live weight at 20 weeks of age are contrasted with their day old weight, it is simply that 20 weeks weight of different breeds (Fig. 2) are again simple appear to be the functions of day old weight. Live weight of different breeds and their relations with day old weight are quite logical and support by many researchers. Creswell and Gunawan. (1982) reported that day-old weight and 20 weeks of age in four different types of *Deshi* breeds in Indonesia such as Kampung, Black Kedu, White Kedu, Nunukan and Pelung was 26.2 27.7, 25.5, and 29.6g in day-old weight respectively and 1719, 1753, 1575, and 2290g in 20 weeks weight respectively. Mogesse *et al*. (2006) found that day-old weight of *Deshi* and RIR were 27.1 and 35.2g and body weight at the age of 20-22 weeks of age of *Deshi* and RIR chicken were 1054 and 13945g respectively. Ndofor-Foleng *et al*. (2010) reported that body weights of the birds at day-old were 21.82g, 28.06g, 26.30g; and at 20 weeks were 931.34g, 1196.67g, 950.00g for light, heavy and main cross chickens respectively. Unlike RIR, Fayoumi and *Sonali* higher live weight in *Deshi* chicken in semi scavenging than that farm may have been arisen for genotype and environment interaction.

Table 4. Growth performance of *Deshi*, Fayoumi, RIR and *Sonali* chicken at different ages in farm and semi scavenging.

Variables	Age (week)	Rearing system (RS)	Genotype (G)				Mean	SED and Significant		
			Deshi	Fayoumi	RIR	*Sonali*		G	RS	G×RS
Live weight (g/chick)	Day-old	Farm	21.93	27.75	37.39	29.86	29.23	0.604**	0.427 NS	0.854 NS
		SCA	22.94	25.70	38.39	28.78	29.95			
		Mean	22.44	28.72	37.89	29.32	29.55			
	20 weeks of age	Farm	795.40	1168.60	1372.20	1261.70	1149.50	5.83**	4.12**	8.25**
		SCA	873.90	1005.70	1162.70	1055.40	1024.40			
		Mean	834.60	1087.20	1267.40	1158.50	1086.90			
Live weight gained (g/chick)	20 weeks of age	Farm	783.40	1141.00	1335.00	1231.90	1122.80	15.19**	10.74**	21.49**
		SCA	858.00	1142.60	1088.1	1026.70	1003.90			
		Mean	820.70	1091.80	1211.60	1129.30	1063.30			
Feed intake (g/chick/d)	20 weeks of age	Farm	76.50	87.15	91.44	91.07	86.54	3.475**		
		SCA	38.75	38.75	38.75	38.75	38.75			
		Mean	57.63	62.95	65.10	64.91	62.65			
Feed conversion ratio (feed/live wt. gain)	20 weeks of age	Farm	8.22	6.42	5.75	6.21	6.65	0.147**	0.104**	0.207**
		SCA	6.32	5.21	5.0	5.28	5.45			
		Mean	7.27	5.82	5.37	5.75	6.05			
Survivability (%)	20 weeks of age	Farm	75.00	97.20	94.40	97.20	91.00	4.42**	6.24**	8.83**
		SCA	80.60	77.80	77.80	83.30	79.90	6.24**	4.92**	
		Mean	77.80	87.50	86.10	90.30	85.40			

** P< 0.01 = significant at 1% level, NS = Not-significant, SCA= Scavenging, RIR = Rhode Island Red

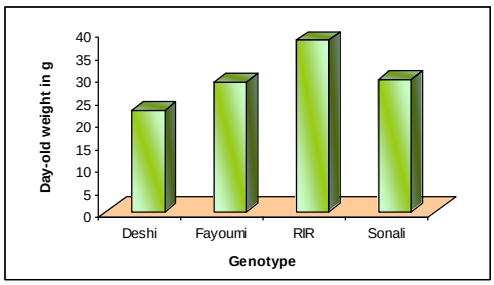

Figure 1. Day-old weight of different breeds.

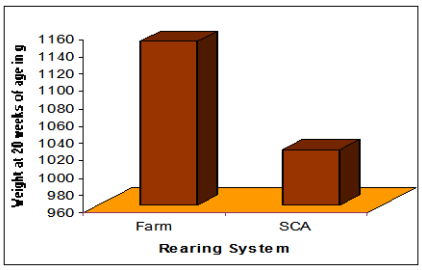

Figure 3. Live weight at 20 weeks of age of two rearing systems.

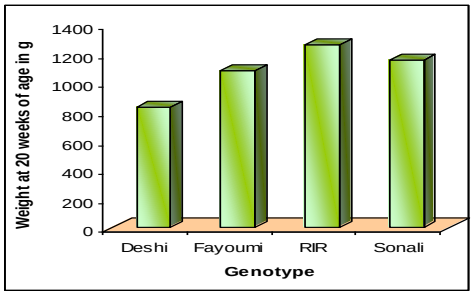

Figure 2. Live weight at 20 weeks of age of different breeds.

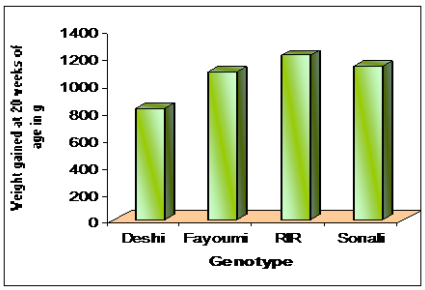

Figure 4. Live weight gained at 20 weeks of age of different breeds.

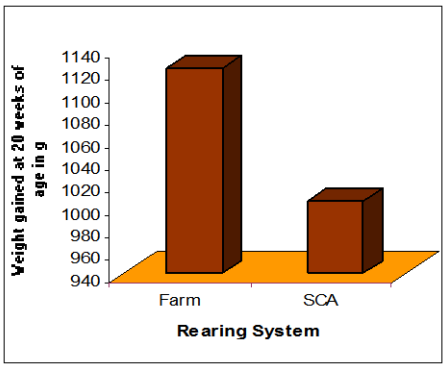

Figure 5. Live weight gained at 20 weeks of age of two rearing systems.

When different pure breeds and *Deshi* chicken were reared in farm there was big difference in live weight of *Deshi* chicken with their pure breed counterparts. But when they were reared in semi scavenging the different between pure breeds and *Deshi* was depleted. In this study, live weight of *Deshi* chicken was higher in semi scavenging than that in farm may have been arisen for improve adaptability under harsh environment and sub optimal nutrition supported by Panda *et al*. (2004). They reported at 20 weeks of age, the body weight of extensive reared birds was higher than the intensive reared birds (Fig 3).

The result shown in Table 4 that live weight gain of different breeds in farm and semi scavenging recorded had a similar tend with that of live weight except Fayoumi. (Fig. 4) Live weight gain of Fayoumi was almost similar under two rearing systems. Fayoumi being a non-descriptive breed produced for rearing under scavenging and semi scavenging in Egypt may be more adapted to non-sophisticated rearing environment and sub optimal nutrition. Mogesse *et al*. (2006) found that body weight gain at the age of 20-22 weeks of age of *Deshi* and RIR chicken to be 1027 and 1359g. Such a result disagreed with the present study. Dou *et al*. (2009) reported body weight gain of birds from free-range system to be significantly lowered than of those kept in indoor floor system which is supported by the present observations (Fig 5). Feed intake were the highest (P<0.01) in RIR followed by *Sonali*, Fayoumi and *Deshi* (Fig. 6). Feed intake was higher in farm in compare to semi scavenging system (Fig.7). This study revealed that feed conversion of RIR (5.37) was the lowest and the highest in *Deshi* (7.27) followed by *Sonali* (5.75) and Fayoumi (5.82) (Fig. 8). Better feed conversion in RIR than Fayoumi is supported by Haque and Howlider (2000). This result contradicts the findings of Ali *et al*. (1993) where they reported feed conversion of 4.73 in *Sonali*. Demeke (2003) found that feed conversion ratio of *Deshi* chicken was 7.0 which is supported by present study. The present finding of feed conversion is better than the results of Mogesse *et al*. (2006) where they reported feed conversion of *Deshi* and RIR chicken were 13.1 and 9.5 respectively. Feed conversion was higher in farm than semi scavenging system (Fig. 9).

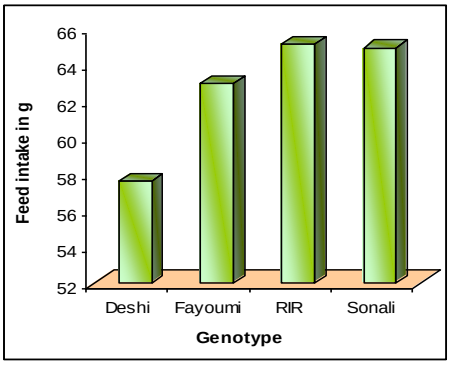

Figure 6. Feed intake of different breeds.

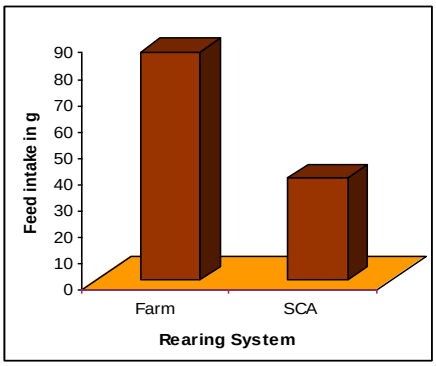

Figure 7. Feed intake of two rearing systems.

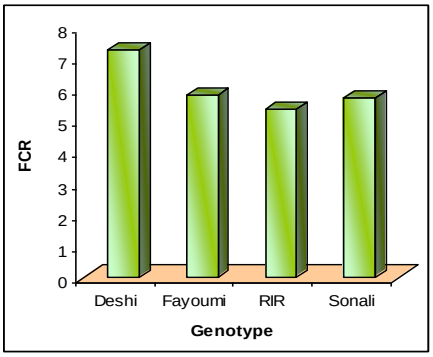

Figure 8. Feed conversion ratio of different breeds.

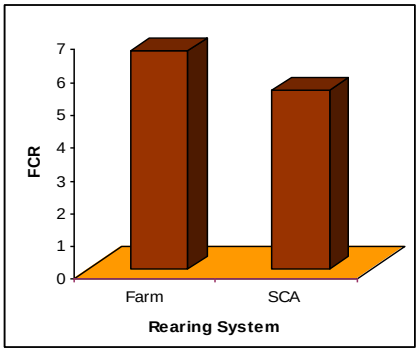

Figure 9. Feed conversion ratio of two rearing systems.

Increased survivability of *Sonali*, Fayoumi and RIR and lack of difference of *Deshi* between two rearing systems appeared to be clear cut gene environment interaction on survivability (Fig.10). Ambar *et al*. (1999) showed the highest livability (97.7%) in the RIR × Fayoumi cross compared to purebreds and the lowest in *Deshi* chicken which are similar to the present study. Azharul *et al*. (2005) reported a lower mortality was in *Sonali* (7.8%) compared to Fayoumi (9.8%) which is agreed with the present findings. Lemlem and Tesfay (2010) found the mortalities of pullets of Fayoumi,

RIR and *Deshi* chicken to be 22.4, 27.3 and 28.2%, respectively which is contradict with the present investigation. Survivability was higher in farm than that of semi scavenging (Fig. 11).

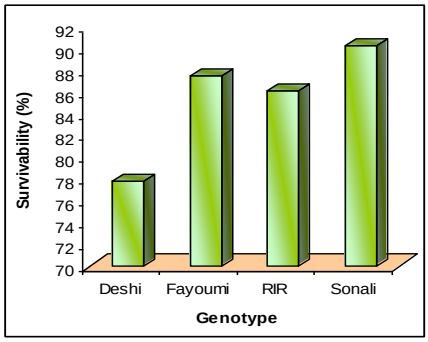

Figure 10. Survivability (%) of different breeds.

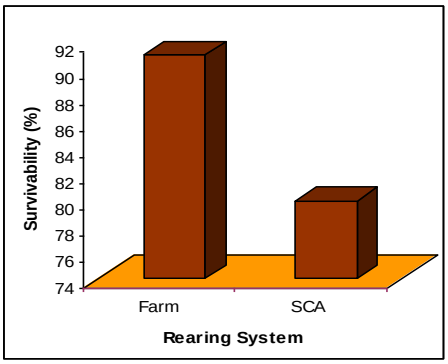

Figure 11. Survivability (%) of two rearing systems.

Conclusions

Growth rate is the best in RIR, *Sonali* in intermediate position and Fayoumi and *Deshi* are the worst in growth performance. Farm reared chicken had better potential than those in semi scavenging chicken. *Deshi* chicken had little difference in growth performance in two rearing systems. These results also signify the adaptability of the *Deshi* chicken in adverse environment and sub-optimal nutrition under semi scavenging condition.

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