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Research Article

Meat yield and meat quality characteristics of backcrossed Sonali chicken compared to Aseel♂ × Sonali♀ and Hilly♂ × Sonali♀ crossbreds

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Abstract

The experiment was conducted to assess the meat yield and meat quality characteristics of backcrossed Sonali chicken compared to Aseel♂ × Sonali♀ and Hilly♂ × Sonali♀ crossbreds during 0, 15 and 30 days of storage. Therefore, 6 male birds from each of 4 genotype i.e. RIR♂ × Sonali♀, Fayoumi♂ × Sonali♀, Aseel♂ × Sonali♀ and Hilly♂ × Sonali♀ around 1.2 kg of body weight were slaughtered, eviscerated and dissected to compare meat yield and meat quality characteristics during 0, 15 and 30 days of storage period. The results showed that there were no significant differences among the genotypes on meat yield, proximate, physio-chemical and biochemical characteristics of backcrossed Sonali chicken compared to Aseel♂ × Sonali♀ and Hilly♂ × Sonali♀ crossbreds. Drip loss, cooking loss, pH and CP% decreased, while DM%, EE%, ash%, peroxide value, free fatty acid value, thiobarbituric acid value increased with the increasing of storage time. The present study reveals that backcrossing had no demerits on meat quality and yield characteristics.

Introduction

White meat from local genetic resources has special attention to the consumers due to their unique taste, delicacy and flavor compared to the commercial one. Recently, chicken meat has gained much popularity among consumers (Azad et al., 2021; Ali et al., 2022; Hossain et al., 2021; Sarker et al., 2021). Scientists in the world are continuously backcrossing to get faster weight gain, higher meat yield and better quality. In Bangladesh, local chickens are termed as non-descriptive based on their variation mostly in morphological and production performances such as *Deshi*, Naked Neck, Hilly, Aseel and Jungle Fowl (Bhuiyan et al., 2005). Hilly chicken is one of the most important native chickens of Hilly areas of Bangladesh that is reared for local consumption of meat and eggs. Meat of Hilly chicken has unique taste, delicacy and popularity among consumers in Bangladesh. Local non-descript colored chicken is a vital source of tasty meat and eggs with more acceptable to rural people (Barua and Howlider, 1990). The local people always try to find the indigenous (*Deshi*) cockerel for its toughness and special taste (Ali and Ahmed, 2007). The heavier body size of the Hilly and Aseel chickens compared to other native birds indicates that it can be used as slow growing meat type chicken in Bangladesh.

Department of Livestock Services (DLS) introduced a dual purpose crossbred (RIR♂ × Fayoumi♀) named Sonali to increase village level meat and egg production considering their higher adaptability and productivity under semi-scavenging/scavenging system. By this time, Sonali has achieved popularity as replacement of slow growing indigenous chickens in Bangladesh. This crossbred genotype has been reared commercially for the last two decades. At present, many private entrepreneurs' have already established commercial Sonali hatchery in the northern part of the country. Recently, the poultry farmers of Northern regions of Bangladesh are trying to practice backcrossing between Sonali female and RIR male for greater emphasis on meat production with the advantages of plumage color and better weight gain. But no investigation has yet been made to observe whether increasing or decreasing the inheritance of either of the two parental breeds by backcrossing of Sonali with RIR or Fayoumi could produce a genotype with better weight gain with better meat yield and quality. On the other hand, as the farmers are practicing backcrossing of Sonali with RIR male for better weight gain, whether this type of birds may be superior to the crosses of Sonali with other available local birds in Bangladesh. As backcrossing is beefing up in Bangladesh, and no systematic research has carried out to test the quality and yield characteristics of those genotype, the present study will assess the meat yield and quality parameters during different storage period of backcrossed Sonali chicken compared to Aseel♂ × Sonali♀ and Hilly♂ × Sonali♀ crossbreds.

Materials and Methods

The birds of four genotypes namely Sonali (RIR♂ × Fayoumi♀), Aseel♂ × Sonali♀ and Hilly♂ × Sonali♀ crossbreds were reared up to 14 weeks of age at Bangladesh Agricultural University poultry farm. After that 6 male birds of each genotype weighing 1.2 kg (1200g±50g) body weight were slaughtered, bled, plucked and eviscerated. The carcasses were stored at -20°C temperature for 30th days and meat yields characteristics were analyzed on 0, 15th and 30th day. During 0 day, 15th day and 30th day of storages, the breast meat were collected from the carcass and analyzed for different proximate, physic-chemical and biochemical parameters.

Proximate composition

Proximate composition such as Dry Matter (DM), Ether Extract (EE), Crude Protein (CP) and Ash were carried out according to the standard procedures of (AOAC, 2005). All determination was done in triplicate and the mean value was reported.

pH determination

The pH of raw breast meat homogenate was determined by blending 10g of sample with 50ml of distilled water using an Ultra Turrax T25 tissue homogenizer (Janke and Kunkel, IKA Labortechnik, Staufen, Germany) at 8,000 rpm for 1 min. The pH of the suspension was recorded by dipping combined glass electrode of Elico digital pH meter, Model LI 127 (Elico Limited, Hyderabad, India).

Cooking Loss

To determine cooking loss, weighed 5±1g samples and wrapped in a heat-stable foil paper and kept in water bath at 80°C for 30 minutes. Samples surface are dried and weighed. Cooking loss was calculated as the percentage of the loss weight of the cooked sample (Farzana*et al*., 2017). Cook loss was calculated after draining the drip coming from the cooked meat.

$$\text{Cook loss (\%)} = \frac{(\text{Weight before cooking of sample} - \text{weight after cooking})}{\text{Weight before cooking of sample}} \times 100$$

TBARS Analysis

Lipid oxidation was assessed in triplicate using the 2-thiobarbituric acid (TBA) method described by Schmedes and Holmer (1989). Chicken breast meat sample (5 g) were blended with 25 ml of 20% trichloro acetic acid solution (200 g/L of tricholoro acetic acid in 135 ml/L phosphoric acid solution) in a homogenizer (IKA) for 30 s. The homogenized sample was filtered with Whatman filter paper number 4, and 2 ml of the filtrate was added to 2 ml of 0.02 M aqueous TBA solution (3 g/L) in a test tube. The test tubes were incubated at 100° C for 30 min and cooled with tap water. The absorbance was measured at 532 nm using a UV-VIS spectrophotometer (UV-1200, Shimadzu, Japan). The amounts of TBARS were expressed as milligrams of malonaldehyde per kilogram of meat.

Free fatty acid analysis

Free fatty acid value (FFA) was determined according to Rukunudin et al. (1998). Five grams of sample was dissolved with 30 mL chloroform using a homogenizer (IKA T25 digital Ultra-Turrax, Germany) at 10000 rpm for 1 min. The sample was filtered under vacuum through Whatman filter paper number 1 to remove meat particles. After that, five drops of 1% ethanolicphenolphthalein were added as indicator to filtrate and then the solution was titrated with 0.01 N ethanolicpotassium hydroxide.

FFA (%) = ml titration× Normality of KOH × 28.2/g of sample

Peroxide value

Peroxide values of the nugget samples were determined according to AOAC (2005). One gram of sample was accurately weighed into 250 ml conical flask. Thirty ml of a mixture of glacial acetic acid and chloroform (3:2) were added to the conical flask. One gram of saturated solution of potassium iodide was added. The flask was vigorously shaken for 1 min. and kept away from the light for exactly 5min. then titrated with accurately standardized solution of 0.01N sodium thiosulphate. Titration continued until the yellow color almost disappeared. A 0.05 ml of starch indicator solution was added. Titration was performed with continuous shaking till the end point. A drop of thiosulphate was added until the blue color has just disappeared. PV was calculated as shown below:

POV %= {(A-B) ×N×100}/S

Where; B= reading of blank in ml, A= reading of sample ml, S=weight of oil sample, N= normality of sodium thiosulphate

Statistical analysis

Data of this experiment was analyzed by analysis of variance procedure of 4×3 factorial design of 4 different sources of genotype meat and 3 different storage times (SAS, 2002).

Results and Discussion

Meat yield characteristics

This experiment was conducted to evaluate the meat yield characteristics and different physico-chemical and biochemical characteristics of backcrossed Sonali chicken compared to Aseel♂ × Sonali♀ and Hilly♂ × Sonali♀ crossbred. The overall percentage of carcass weight, dressing percentage, head weight, shank weight, neck weight, wing meat weight, wing bone weight, thigh meat weight, thigh bone weight, drumstick meat weight, drumstick bone weight, breast meat weight and breast bone weight (Table 1 and 2) of four different genotypes did not show significant differences. The overall carcass weight (%) and dressing (%) were ranged between 62.93±0.50% to 63.59±1.08% and 54.39±0.58% to 55.49±0.96% respectively, while the thigh meat (%), drumstick meat (%) and breast meat (%) varied between 8.10±0.41% to 8.87±0.67%, 6.16±0.31% to 6.72±.56% and 10.58±.073% to 11.41±0.96% respectively in 4 genotypes .

The mean values of all meat yield parameters observed from 0, 15th and 30th days indicates that there were no significant differences ($p>0.05$) were found among these three days of observation. The mean carcass weight (%) and dressing (%) ranged between 62.54±0.88% to 64.52±1.54% and 54.18±0.63% to 55.99±1.61%, while the mean of thigh meat (%), drumstick meat (%) and breast meat (%) were 8.12±0.31% to 8.81±0.78%, 6.20±0.32% to 6.66±.36% and 10.36±1.08% to 11.60±1.31% respectively in 3 days of observation.

The carcass yield of 4 crossbreds of this study was slightly lower than that reported for Italian local chickens (De Marchi et al., 2005) and Benin local chickens (Youssao et al., 2012) and markedly lower than that reported for commercial broilers (Zhang et al., 2010; Panda et al., 2010). Nielsen et al. (2003) reported that slow-growing chickens were characterized by a significantly lower breast yield, but higher yield of thigh and drumstick muscles than fast-growing chickens.

Table 1. Carcass, dressing, head, shank and neck weight percentage compare to live weight of Sonali derived crossbred chicken during different storage time

Parameters	Storage time	Sonali derived crossbred and backcrossed					Level of Significance		
		RIR♂ x Sonali♀	Fayoumi♂ x Sonali♀	Aseel♂ x Sonali♀	Hilly♂ x Sonali♀	Mean	G	D	G*D
Live weight	0	1205.5±9.5	1200.5±14.5	1197.5±12.5	1208.0±8.0	**1202.9±11.13**	0.74	0.28	0.84
	15	1178.0±22.0	1203.0±13	1193.0±7.0	1200.5±5.5	**1193.6±11.88**			
	30	1187.50±7.5	1184.5±8.5	1192.5±12.5	1193.5±6.5	**1189.5±8.75**			
	Mean	**1190.3±13**	**1196.0±12**	**1194.3±10.7**	**1200.7±6.7**				
Carcass weight%	0	65.52±2.38	63.01±0.39	65.35±1.60	64.19±1.78	**64.52±1.54**	0.93	0.06	0.66
	15	62.44±0.63	63.10±0.91	61.75±0.78	62.85±1.21	**62.54±0.88**			
	30	62.26±0.24	62.69±0.21	62.50±0.70	63.72±0.25	**62.79±0.35**			
	Mean	**63.41±1.08**	**62.93±0.50**	**63.20±1.03**	**63.59±1.08**				
Dressing %	0	57.5±1.71	54.51±0.81	56.48±2.06	55.46±1.84	**55.99±1.61**	0.64	0.11	0.71
	15	54.85±0.29	54.89±0.69	53.89±0.78	55.1±1.28	**54.68±0.76**			
	30	54.12±0.88	53.76±0.24	53.72±0.66	55.11±0.72	**54.18±0.63**			
	Mean	**55.49±0.96**	**54.39±0.58**	**54.70±1.17**	**55.22±1.28**				
Head weight%	0	4.16±0.59	3.43±0.18	3.62±0.38	3.80±0.87	**3.75±0.51**	0.56	0.23	0.94
	15	3.84±0.55	3.13±0.08	3.51±0.11	3.40±0.30	**3.47±0.26**			
	30	3.16±0.09	3.18±0.30	3.42±0.18	3.21±0.32	**3.25±0.22**			
	Mean	**3.72±0.41**	**3.25±0.19**	**3.52±0.22**	**3.47±0.50**				
Shank weight%	0	4.29±0.40	4.51±0.47	4.26±0.56	4.26±0.64	**4.33±0.52**	0.84	0.71	0.99
	15	3.89±0.12	4.30±0.06	4.26±0.91	3.79±0.53	**4.06±0.41**			
	30	4.02±0.45	4.31±0.41	3.96±0.17	4.16±0.43	**4.11±0.37**			
	Mean	**4.07±0.32**	**4.37±0.31**	**4.16±0.55**	**4.07±0.53**				
Neck weight%	0	3.14±0.00	3.33±0.22	2.77±0.05	3.69±0.24	**3.23±0.13**	0.08	0.06	0.48
	15	3.07±0.28	2.95±0.00	2.73±0.14	2.99±0.19	**2.94±0.15**			
	30	2.98±0.39	3.06±0.27	2.66±0.16	2.79±0.13	**2.87±0.24**			
	Mean	**3.06±0.22**	**3.11±0.16**	**2.72±0.11**	**3.16±0.19**				

Values indicate mean ± SE, D=Day of intervals, G= Genotype, G*D=Interaction of Genotype and Day of Intervals

Table 2. Wing meat and bone, thigh meat and bone, drumstick meat and bone, and breast meat and bone percentage compare to live weight of Sonali derived crossbred chicken during different storage time

Parameters	Storage time	Sonali derived crossbred and backcrossed					Level of Significance		
		RIR♂ x Sonali♀	Fayoumi♂ x Sonali♀	Aseel♂ x Sonali♀	Hilly♂ x Sonali♀	Mean	G	D	G*D
Wing meat%	0	3.67±0.08	3.87±0.07	3.82±0.36	3.36±0.01	**3.68±0.13**	0.72	0.22	0.88
	15	3.64±0.16	3.69±0.16	3.46±0.31	3.55±0.62	**3.59±0.31**			
	30	3.08±0.36	3.52±0.36	3.20±0.31	3.43±0.24	**3.31±0.32**			
	Mean	**3.46±0.20**	**3.69±0.20**	**3.49±0.33**	**3.45±0.29**				
Wing bone%	0	2.33±0.19	2.83±0.07	2.46±0.13	2.55±0.14	**2.54±0.13**	0.12	0.13	0.28
	15	2.41±0.05	2.59±0.05	2.33±0.01	2.39±0.04	**2.43±0.04**			
	30	2.42±0.08	2.35±0.12	2.42±0.20	2.33±0.00	**2.38±0,10**			
	Mean	**2.39±0.11**	**2.59±0.08**	**2.40±0.11**	**2.42±0.06**				
Thigh meat%	0	9.33±0.96	9.08±0.97	8.30±0.52	8.50±0.68	**8.81±0.78**	0.27	0.27	0.98
	15	9.15±0.23	8.86±0.59	8.28±0.72	8.14±0.38	**8.61±0.48**			
	30	8.09±0.51	8.66±0.46	8.05±0.11	7.66±0.16	**8.12±0.31**			
	Mean	**8.86±0.56**	**8.87±0.67**	**8.21±0.45**	**8.10±0.41**				
Thigh bone%	0	2.51±0.63	2.43±0.46	2.08±0.04	2.07±0.07	**2.27±0.12**	0.67	0.22	0.95
	15	2.21±0.26	2.04±0.20	1.95±0.22	1.91±0.19	**2.03±0.22**			
	30	1.84±0.05	2.02±0.16	1.87±0.28	1.98±0.08	**1.93±0.14**			
	Mean	**2.19±0.31**	**2.16±0.27**	**1.97±0.18**	**1.99±0.11**				
Drumstic meat%	0	6.90±1.25	6.89±0.59	6.38±0.32	6.48±0.27	**6.66±0.36**	0.57	0.49	0.99
	15	6.61±0.36	6.42±0.09	6.29±0.89	6.13±0.30	**6.36±0.41**			
	30	6.65±0.07	6.23±0.55	6.05±0.29	5.86±0.36	**6.20±0.32**			
	Mean	**6.72±.56**	**6.51±0.41**	**6.24±0.50**	**6.16±0.31**				
Drumstick bone%	0	2.83±0.32	2.92±0.03	2.88±0.16	2.66±0.35	**2.82±0.22**	0.89	0.41	0.99
	15	2.77±0.31	2.67±0.03	2.82±0.01	2.67±0.10	**2.73±0.11**			
	30	2.50±0.31	2.59±0.36	2.66±0.44	2.56±0.14	**2.58±.31**			
	Mean	**2.70±0.31**	**2.73±0.14**	**2.79±0.20**	**2.63±0.20**				
Breast meat %	0	12.86±2.70	10.91±0.24	11.90±1.10	10.72±1.20	**11.60±1.31**	0.86	0.36	0.67
	15	10.48±0.66	10.66±0.96	10.92±1.12	12.97±0.13	**11.26±.72**			
	30	10.10±0.62	10.18±0.99	10.62±1.23	10.54±1.54	**10.36±1.08**			
	Mean	**11.15±1.33**	**10.58±.073**	**11.15±1.15**	**11.41±0.96**				
Breast bone (%)	0	2.36±0.03	2.25±0.39	2.33±0.29	2.43±0.19	**2.34±0.23**	0.93	0.24	0.99
	15	2.05±0.05	2.10±0.26	2.19±0.19	2.08±0.01	**2.11±0.13**			
	30	2.16±0.07	2.04±0.20	2.20±0.32	2.06±0.11	**2.12±0.18**			
	Mean	**2.19±0.05**	**2.13±0.28**	**2.24±0.27**	**2.19±0.10**				

Values indicate mean ± SE, D=Day of intervals, G= Genotype, G*D=Interaction of Genotype and Day of Intervals

Proximate analysis

Analyzed values of proximate components are shown in Table 3.

Dry Matter (DM)

The overall observed DM content of different genotypes was ranged from 27.21±0.34% to 27.45±0.71%. However, the highest DM content was observed at Hilly♂ × Sonali♀ and the lowest DM content was noticed in RIR♂ × Sonali♀ genotype (p>0.05). On the other hand, the range of different days of intervals of DM content was ranged from 26.33±0.44% to 28.42±0.46%. The mean values was observed at 0, 15th and 30th days of observation were found highly significant (p<0.01) difference. The lowest DM content was noticed at day 0 and the highest DM content was found at 30th days of storage. The DM content increased with the progression of storage period because of moisture loss. The interaction between genotype and storage duration (days) did not have significant difference (p>0.05) on DM content. Tougan et al. (2013) showed that the highest dry matter and protein contents were recorded in Holli ecotype (P<0.01), whereas the highest fat content was found in Fulani ecotype. The free range chickens showed the highest protein content (P <0.001), whereas chickens from confinement breeding had the highest fat content (P<0.05). Protein content was higher in breast than in thigh (P <0.001), while dry matter, ash and fat contents were higher in thigh meat than in breast meat (P <0.001). The dry matter content decreased with age (P <0.001), while the fat content increased (P<0.01). This result is similar to Tougan et al. (2013).

Table 3. Proximate composition of Sonali derived crossbred chicken breast meat during different storage time

Parameters	Storage time	Sonali derived crossbred and backcrossed					Level of Significance		
		RIR♂ x Sonali♀	**Fayoumi♂ x Sonali♀**	**Aseel♂ x Sonali♀**	**Hilly♂ x Sonali♀**	**Mean**	**G**	**D**	**G*D**
DM%	0	26.00±0.25	26.18±0.05	26.62±0.11	26.50±1.35	**26.33±0.44**^{c}	0.94	0.0002	0.63
	15	27.01±0.53	26.77±0.24	27.33±0.41	27.55±0.32	**27.17±0.38**^{b}			
	30	28.63±0.23	28.86±0.34	27.88±0.08	28.29±0.46	**28.42±0.46**^{a}			
	Mean	**27.21±0.34**	**27.27±0.21**	**27.28±0.19**	**27.45±0.71**				
CP%	0	22.37±0.43	23.94±0.14	22.70±0.00	23.60±0.29	**23.15±0.22**^{a}	0.15	0.02	0.54
	15	22.19±0.10	22.79±0.18	22.56±0.61	22.33±0.71	**22.47±0.40**^{b}			
	30	22.00±0.79	22.13±0.22	22.09±0.35	22.49±0.31	**22.18±0.42**^{b}			
	Mean	**22.19±0.44**	**22.95±0.18**	**22.45±0.32**	**22.81±0.44**				
EE%	0	1.05±0.05	1.19±0.04	1.24±0.02	1.06±0.06	**1.14±0.04**^{c}	0.29	0.0001	0.11
	15	1.76±0.01	1.75±0.15	1.25±0.25	1.93±0.08	**1.67±0.12**^{b}			
	30	2.08±0.18	2.23±0.08	2.05±0.25	2.05±0.10	**2.10±0.15**^{a}			
	Mean	**1.63±0.08**	**1.72±0.09**	**1.51±0.17**	**1.68±0.08**				
Ash%	0	1.03±0.03	1.11±0.03	1.12±0.04	1.11±0.06	**1.09±0.04**^{c}	0.18	0.0003	0.43
	15	1.09±0.05	1.12±0.03	1.23±0.03	1.22±0.02	**1.17±0.03**^{b}			
	30	1.26±0.03	1.28±0.01	1.24±0.02	1.27±0.03	**1.260±0.02**^{a}			
	Mean	**1.13±0.04**	**1.17±0.02**	**1.20±0.03**	**1.20±0.04**				

Values indicate mean ± SE, mean in each column/row having different superscript varies significantly at values *P < 0.05; **P<0.01. D=Day of intervals, G= Genotype, G*D=Interaction of Genotype and Day of Intervals

Crude Protein (CP)

The ranges of overall CP content at different treatments were 22.19±0.44% to 22.95±0.18%. However, the lowest CP content was observed in RIR♂ × Sonali♀ genotype whereas the highest value was observed in Fayoumi♂ × Sonali♀ genotype. The CP content was ranged between 22.18±0.42% to 23.15±0.22% during the storage period. The mean values observed from 0, 15th and 30th days of observation indicates that there were significant (p<0.05) differences found among these three days of observation. The CP content was decreased with the advancement of storage period. The highest CP content was observed at day 0 and the lowest CP content was at 30th days. The interaction between genotype and number of days of storage did not have a significant difference (p>0.05) on CP content. Kandeepan and Biswas (2007) showed a decrease in protein content of buffalo meat with increase in storage period while studying effect of low temperature preservation on quality and shelf life of buffalo meat and support the present findings

Ash

The overall ash content in different genotypes was ranged from 1.13±0.04 to 1.20±0.04%. Of the four genotypes, lowest ash content was noticed in RIR♂ × Sonali♀ genotype. The ash content of Aseel♂× Sonali♀ genotype and Hilly♂ × Sonali♀ genotype is similar and their value represents highest ash content. On the other hand, the overall observations at different days of intervals for ash content were ranged from 1.09±0.04 to 1.260±0.02%**.** The mean values observed from 0, 15th and 30th days of observation indicated highly significant (p<0.01) differences among these three days of observation. The lowest ash content was noticed at 0 day and the highest ash content was found at 30th days of storage. The ash content increased with the increase in storage period. The interaction between genotype and number of storage days did not have significant difference (p>0.05) on ash content. Mbaga et al. (2014) showed that ash content were similar in the two sexes. Breast meat had higher (P<0.05) CP and ash content than meat cuts from the leg and is inconsistent to the present study.

Ether Extract (EE)

The EE content of different genotypes with days of intervals are shown in the Table 3. The range of overall observed EE content at different treatments were 1.51±0.17 to 1.72±0.09%. Observation from four genotypes, the mean values indicated that there were no significant (P >0.05) differences of EE content. Among four genotypes, the lowest EE content was observed at Aseel♂ × Sonali♀ genotypeand the highest EE content was observed at Fayoumi♂ × Sonali♀ genotype. The range of overall observed EE content at different days of intervals was 1.14±0.04 to 2.10±0.15%. The mean values observed from 0, 15th and 30th days of observation indicated that there were significant differences (P <0.01) among these three days of observation. The EE content was increased with the increase storage period. The lowest EE content was observed at 0 day and the highest EE content at 30th days. The interaction between genotypes and number of days it was stored had non-significant difference (P >0.05) on EE content. The variability of fat content of chicken meat among genotypes was reported by Longeran et al. (2003), who found that breast meat without skin from fast-growing broilers had higher lipid content than from slow-growing ones. Furthermore, Havenstein et al. (2003) showed that modern 2001 Strain of chicken had more fat content than older 1957 Strain of chicken. Sirri et al. (2011) and Fanatico et al. (2007) who reported that the fast-growing birds had higher lipid content than the slow-growing birds.

Table 4. Physio-chemical propertiesof Sonali derived crossbred chicken breast meat during different storage time

Parameters	Storage time	Sonali derived crossbred and backcrossed					Level of Significance		
		RIR♂ x Sonali♀	**Fayoumi♂ x Sonali♀**	**Aseel♂ x Sonali♀**	**Hilly♂ x Sonali♀**	**Mean**	**Genotype**	**Day**	**G*D**
Cooking Loss %	0	23.59±0.42	23.46±0.45	23.21±0.47	23.29±0.20	**23.39±0.39**^{a}	0.44	0.001	0.97
	15	23.07±0.62	22.11±0.05	22.29±0.20	22.53±0.42	**22.50±0.32**^{b}			
	30	22.09±0.39	21.74±1.06	21.47±0.51	21.32±0.19	**21.66±0.45**^{c}			
	Mean	**22.92±0.48**	**22.44±0.52**	**22.32±0.39**	**22.38±0.27**				
pH	0	6.00±0.03	6.16±0.07	6.21±0.10	6.17±0.01	**6.14±0.05**^{a}	0.16	0.0003	0.44
	15	5.97±0.06	6.08±0.01	6.05±0.05	6.06±0.01	**6.04±0.03**^{b}			
	30	5.93±0.03	5.88±0.07	5.95±0.03	5.91±0.08	**5.92±0.05**^{c}			
	Mean	**5.97±0.04**	**6.04±0.05**	**6.07±0.06**	**6.05±0.03**				

Values indicate mean ± SE, mean in each column/row having different superscript varies significantly at values *P < 0.05; **P<0.01. D=Day of intervals, G= Genotype, G*D=Interaction of Genotype and Day of Intervals

Physio-chemical properties

Analyzed values of physio-chemcial components are shown in Table 4.

Cooking loss

The range of overall observed cooking loss at different genotypes was 22.32±0.39 to 22.92±0.48%. Observation from four genotypes, the mean values indicated that there were no significant (P >0.05) differences of cooking loss. Among four genotypes, the highest cooking loss was observed at RIR♂ x Sonali♀ genotype and the lowest cooking loss was observed at Aseel♂xSonali♀ genotype.

The range of overall observed of different days of intervals of cooking loss were 21.66±0.45 to 23.39±0.39%. The mean values observed from 0, 15th and 30th days of observation indicated that there were highly significant differences (P <0.01) among these three days of observation. The data show that the amount of cooking loss was decreased among the genotypes after 30 days of storage. The highest cooking loss was observedat 0 day and the lowest cooking loss was at 30th days. The interaction between genotypes and number of days it was stored had no significant difference (P >0.05) on cooking loss. Major components of cooking losses are thawing, dripping and evaporation. The lowest amount of cooking loss indicates this product is most preferable for consumers' choices than other groups. The cooking loss was significantly changed with the increased storage period. The cell structure could be destructed and particularly shrinkage of the connective tissue during the cooking losses (Tornberg, 2005). Furthermore, cooking loss in meats depend on ultimate pH (Mushiet et al., 2009) and intramuscular fat content (Safari, 2010).

pH value

The range of overall observed pH at different genotypes was 5.97±0.04 to 6.07±0.06%. Observation from four genotypes, the mean values indicated that there were non-significant (p>0.05) differences of pH. Among four genotypes, the highest pH was observed in Aseel♂xSonali♀ genotype while the lowest pH was observed in RIR♂ x Sonali♀ genotype. The range of overall observed pH in different days of intervals was 5.92±0.05 to 6.14±0.05%. The mean values observed at 0, 15th and 30th days of observation indicated that there were highly significant differences (p<0.01) among these three days of observation. The pH was decreased with the increase of storage period. The highest pH was observed at 0 day and the lowest pH was at 30th days. The interaction between genotypes and number of days it was stored had non-significant difference (p>0.05) on pH.Verma et al. (2015) showed that pH value decreased with the increase of storage period while studying the effect of storage on nutritional, physico-chemical, microbial, texture profile and sensory quality of chicken meat incorporated noodles at ambient temperature. This finding is consistent with the present study.

Table 5. Biochemical analysis of Sonali derived crossbred chicken breast meat during different storage time

Parameters	Storage time	Sonali derived crossbred and backcrossed					Level of Significance		
		RIR♂ x Sonali♀	Fayoumi♂ x Sonali♀	Aseel♂ x Sonali♀	Hilly♂ x Sonali♀	Mean	G	D	G*D
POV (meq/kg)	0	0.63±0.01	0.61±0.01	0.61±0.05	0.66±0.01	**0.63±0.02**^{c}			
	15	0.65±0.01	0.65±0.00	0.69±0.00	0.66±0.00	**0.66±0.00**^{b}	0.16	<.0001	0.67
	30	1.05±0.06	1.03±0.05	1.07±0.00	1.10±0.03	**1.06±0.04**^{a}			
	Mean	**0.78±0.03**	**0.76±0.02**	**0.79±0.02**	**0.81±0.01**				
FFA (%)	0	0.43±0.05	0.45±0.03	0.46±0.06	0.40±0.05	**0.44±0.05**^{c}			
	15	1.04±0.02	1.00±0.04	1.05±0.01	1.11±0.05	**1.05±0.03**^{b}	0.41	<.0001	0.37
	30	1.17±0.04	1.16±0.00	1.14±0.03	1.26±0.06	**1.18±0.03**^{a}			
	Mean	**0.88±0.04**	**0.87±0.02**	**0.88±0.03**	**0.92±0.05**				
TBARS (mg MA/kg)	0	0.12±0.01	0.13±0.01	0.14±0.01	0.13±0.02	**0.13±0.01**^{c}			
	15	0.18±0.03	0.18±0.02	0.17±0.01	0.15±0.01	**0.17±0.02**^{b}	0.72	<.0001	0.54
	30	0.20±0.02	0.21±0.00	0.21±0.00	0.22±0.01	**0.21±0.01**^{a}			
	Mean	**0.13±0.02**	**0.18±0.01**	**0.17±0.01**	**0.17±0.01**				

Values indicate mean ± SE, mean in each column/row having different superscript varies significantly at values *P < 0.05; **P<0.01. D=Day of intervals, G= Genotype, G*D=Interaction of Genotype and Day of Intervals

Biochemical analysis

There are three types of biochemical properties investigated in this study. These are Peroxide Value (POV-meq/kg), Free Fatty Acid value (FFA %), Thiobarbituric Acid value (TBARS-mgMA/kg). These parameters indicate the good or bad quality of meat.

Peroxide Value (POV-meq/kg)

The mean values observed from four genotypes indicated that there were no significant differences (P >0.05) among the genotypes. The range of overall observed peroxide value at different genotypes was 0.76±0.02 to 0.81±0.01. The mean values observed at 0, 15th and 30th days of observation indicates that there were significant differences (P<0.01) found among these three days observations. The highest value was observed at 30th days and the lowest value was observed at 0 day of storage. But the interaction between genotypes and number of days it was stored had significant difference (P >0.05) on the level of peroxide value. Other studies have also reported an increasing peroxide value over storage time in products. The present findings are consistent with the findings of Das et al. (2008) who reported a significant increase in peroxide value of the meat samples during refrigerated storage.

Free Fatty Acid Value (FFA%)

The range of overall observed FFA value at different genotypes were 0.88±0.03 to 0.92±0.05. The RIR♂ × Sonali♀, Fayoumi♂ × Sonali♀ and Aseel♂ × Sonali♀ genotypes had almost similar FFA value whereas Hilly♂ × Sonali♀ had comparatively higher FFA value. Thus, genotype had non-significant difference (P>0.05) for this parameter. On the other hand, the range of overall observed of FFA value of at different days of intervals was 0.44±0.05 to 1.18±0.03 %. The mean values observed in 0, 15th and 30th days of observation indicated that there were significant (p<0.01) differences among these three days of observation. The FFA value was increased with the increase of storage period. The highest FFA value was observed at 30th days of observation, whereas the lowest FFA was noticed in 0 day of observation. The interaction between genotypes and storage period did not have a significant difference (P >0.05) on the level of FFA. Verma et al. (2015) showed that FFA value increased with the increase of storage period while studying the effect of storage on nutritional, physico-chemical, microbial, texture profile and sensory quality of chicken meat incorporated noodles at ambient temperature. This finding is in agreement with the present study.

Thiobarbituric Acid Value (TBARS) (mg malonaldehyde/kg sample)

The range of overall observed TBARS value at different genotypes was 0.13±0.02 to 0.18±0.01. The mean values observed from the treatment groups indicated that there were no significant differences (P >0.01) among four genotype groups. The range of overall observed of different days of intervals of TBARS value were 0.13±0.01 to 0.21±0.01. The mean values observed from 0, 15th and 30th days of observation indicated that there were significant differences (P <0.01) found among these three days observation. The interaction between treatments and number of days of storage had no significant differences on TBARS value. The TBARS values increased significantly (p<0.01) during storage in all treatments. Verma et al. (2015) showed that TBARS value increased with the increase of storage period. The above stated findings are in agreement with the present results.

Conclusion

There were no significance differences among the genotypes of meat yield characteristics, physico-chemical and biochemical characteristics of backcrossedSonali chicken compared to Aseel♂× Sonali♀ and Hilly♂× Sonali♀ crossbreds but effect on day intervals.

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