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Original Research Article

Physicochemical Properties and Sensory Evaluation of Naked Neck and Non-Descriptive Deshi Chicken Meat

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Abstract

The purpose of the study was to evaluate the physicochemical and sensory properties of non-descriptive deshi and naked neck chicken meat. A total of 40 male and female mature Naked neck chicken (NNC) and non-descriptive deshi chicken (NDDC) were purchased and the chickens were randomly allocated to a 2 (Sex) × 2 (Breed) factorial arrangement in a completely randomized design. The carcass properties of the NNC and NDDC thigh, drumstick were alike (P>0.05) except for breast muscle. Sex affected on all physicochemical properties of carcass. Breed, sex and post slaughter time interactions effects on color attributes of drumstick and thigh meat except for breast meat CIE redness (a*) and CIE yellowness (b*) values. The pH value differed significantly (P<0.05) among the breeds, sex and post slaughter time. The sensory traits evaluations of the chicken breeds were alike (P>0.05). Fatty acid profiles of the chickens were not affected (P>0.05) by sex or breed. The ratios of omega-6 (n-6) and omega-3 (n-3) fatty acids were significantly lower in both breeds which are anticipated in reducing the risk of many heart-related illness. Therefore, the results obtained from this study could be contribute to stimulate the production of naked neck and non-descriptive deshi chickens as well as increases the consumer's consciousness for healthier meat choices.

Keywords: Breed, Carcass quality traits, Meat color, Meat pH, Fatty acids, Sex.

INTRODUCTION

The demand for indigenous native chickens has been increasing day by day due to its meat color, texture and intense flavor (Pavlovski *et al*., 2013). Now a days consumers have become aware about their dietary saturated fatty acids intake. Scientific evidence has uncovered a substantial association between the overall intake and composition of dietary fat and a number of physical health problems such as coronary heart disease (CHD) and diabetes (Ayerza *et al*., 2002). Presently diets have enormous amounts of omega-6 (n-6) fatty acids and are scarce in omega-3 (n-3) fatty acids. Jaturasitha *et al*. (2008) stated that white meat such as chicken meat is considered virtuous in health as opposite to red meat due to its low fat, cholesterol and iron contents. Shahin and Elazeem (2005) shown that genetic factors like as breed, strain, age and sex of chicken plays a significant role in carcass fatness. These genetic elements also stimulates the chicken meat quality. Physicochemical properties (Color/ appearances, texture and chemical composition) influence the consumer preference and acceptability of white meat and red meat (Packard, 2014). Meat color is one of the vital attribute that maximum consumers notice at the time of decisive whether or not to buy a meat product (Fanatico *et al*., 2007). Consumers have a tendency to discard the products if the color differs from the predictable standard (Qiao *et al*., 2001). pH values of white meat are also of greatest impact on meat quality as it stimulate the meat color and myofibril structure. (Dyubele *et al*., 2010). Wattanachant *et al*., (2004) indicated that the Thai native chicken muscles had a firmer texture with a greater protein content but lesser amount of ash and fat contents when compared to conventional broilers. Meat obtained from poultry have a tendency to differ in chemical composition between muscle types as well as breed. Nutritional concern about dietary saturated fatty acids has been prompted the production of chicken with lean meat (Jaturasitha, 2008) and this stimulates the chicken meat consumers' willingness to pay for this products (Wattanachant, 2005). Meat quality is an important commercial traits in chicken. The most important meat quality determinants comprises tenderness, toughness, juiciness and flavor (Mekchay *et al*., 2010). The other meat quality determinants are genetics, nutrition and environment (Guan *et al*., 2013). Castellini *et al*. (2008) state that poultry meat quality is pompous by genotype, diet, age at slaughter and muscular movement of birds, and their acclimation and adaptation to outdoor production. These elements incorporate integrate to give provide an overall appraisal of meat quality by the consumer. Meat quality attributes of poultry consists of physical properties such as pH, color, water holding capacity, texture, sarcomere length etc and chemical properties such as proteins, total lipids, minerals etc (Petracci and Baeza, 2011). Poultry meat consumers frequently choose native chicken breeds over commercial breeds due to their meat qualities (Sheng *et al*., 2013). There is an escalate demand for organic meat that has been produced without use of antibiotics, feed additives and chemicals, Hence, the importance of native chickens, which can be produced without any supplementary feeding, has amplified impressively (Muchenje *et al*., 2008). The purpose of rearing native non-descriptive deshi and naked neck chickens to a countryside farmer is chiefly for providing eggs and meat to the household's consumption and to a smaller extent, income generation from sales of these products (Norris and Ngambi, 2006). Indigenous Native chicken meat and eggs are important foodstuffs that boost up the nutritional requirements of malnourished children across countryside of Bangladesh (Bett *et al*., 2013), and they are affordable to most of the rural households those who rear native chicken. Their availability in country side areas not only play a starring role in poverty alleviation (Pica-Ciamarra and Dhawan, 2010) but also their consumption improve the health status is associated with less diet related health diseases. The consumer acceptance of meat is based on numerous properties like as sensory attributes, functional dietary values and its effect on their health Muchenje *et al*., (2008). There are a lot of factors that affects the sensory properties of meat such meat color, pH, cooking methods, bleeding, exposure to chemicals and methods of storage and packaging (Fletcher, 2002). Consideration of the factors that affect the carcass properties as well as the meat quality of chicken is significant in upgrading native chicken production. Unfortunately, the information about the effect of intrinsic and extrinsic elements of non-descriptive deshi and naked neck chicken in Bangladesh is inadequate. Therefore, the objectives of the study was determination of physicochemical and sensory properties of non-descriptive deshi and necked neck chicken meat.

MATERIALS AND METHODS

Study location, collection of birds, slaughter and meat sample preparation

The study was carried out at Livestock production and management laboratory of Sylhet Agricultural University, Sylhet, Bangladesh. The ambient temperatures around the study area ranged between 28 and 34°C during summer and between 19 and 26°C in winter. Sylhet Agricultural University lies approximately at latitude 24°53′56″ N, and longitude 91°52′19″ E with an average elevation of 26 m (85ft) above sea level and the average annual rainfall is 3876 mm. The experiment was approved by the Animal Ethics Committee of the Sylhet Agricultural University, Sylhet, Bangladesh. A total 40 birds at 24 weeks of age (10 males and 10 females from naked neck and non-descriptive deshi chicken) were collected from local market near Sylhet Agricultural University, Sylhet, Bangladesh. Live weight was recorded after starving the birds for eight hours. The birds were slaughtered by conventional neck cut, bled for 2 min, defeahter, and eviscerated. The eviscerated carcass was chilled using water immersion method and subsequently cut and deboned. The breast, thigh and drumstick muscles from the left and right sides of carcasses was separated. Visible skin, excess fat and connective tissue were trimmed from the breast, thigh and drumstick. Then, take the weight of breast, thigh and drumstick. The right breast, thigh, drumstick and wing meat was vacuum packed and stored at 4°C for 24 hours and the chilled carcass weight (CCW) was recorded. Dressing percentage was calculated as proportion of carcass weight to body weight of each bird.

Determination of meat color and pH

Three color (L*, a*, and b*) coordinates measurements of breast, thigh and drumsticks meat were measured at three different locations on the bloomed cut surface at 30 minutes, 24 hours and 48 hours post mortem with D65 illuminant and 10^0 observers via a film lid using a Konica Minolta spectrophotometer (CM-2500d; Milton, Keynes, UK). Color was expressed according to the Commission International de l'Eclairage (CIE) system and reported as CIE L* (lightness), CIE a* (redness), and CIE b* (yellowness). Measurement of the pH of the meat samples was measured in duplicates using a portable pH meter (Orion model 301; Orion, Beverly, MA, USA) following the procedure of Bendall (1973).

Sensory Evaluation

A total of 20 participants were used for consumer sensory evaluation of indigenous chicken meat. The participants were students and staff (male and female) from Sylhet Agricultural University. An assessment form recording the sensory properties of each sample was given to each participant and recording of scores was elucidated. A five scale point expressive scales were used as described below for tenderness, juiciness, taste, aroma, flavor and overall acceptability: 1=dislike extremely, 2=dislike, 3=neither like nor dislike, 4=like and 5=like extremely.

Determination of fatty acid profile

Fatty acid composition of breast muscle was analyzed by the method of Jung *et al* (2010). Fatty acid composition was analyzed by a gas chromatograph (GC- 2010, Shimadzu, Tokyo, Japan) and a 100-m capillary column (SP-2560, Supelco, Bellefonte, PA, USA) with a split ratio of 100:1. The ramped oven temperature was 140° C for 2 min and gradually increased to 225° C at 5° C/min and maintained for 45 minutes; the inlet temperature and detector temperature was 240° C. The injection volume was 1 ul and the carrier gas was nitrogen. The fatty acid methyl esters (FAMEs) were identified by comparing the retention times to standard FAME mixture of Supelco 37 component FAME mixture, Sigma Aldrich, USA. Fatty acids were expressed as the proportion of each individual fatty acid to the total of all fatty acids present in the sample. The fatty acid arrangements were calculated: omega-3 (n-3) fatty acids, omega-6 (n-6) fatty acids, total saturated fatty acids (SFA), total monounsaturated fatty acids (MUFA), polyunsaturated fatty acids (PUFA), PUFA/SFA ratio (P/S) and n-6/n-3 ratio.

Statistical Analysis

Data were analyzed using the GLM procedure of SAS Version 9.3 (SAS Institute, Cary, NC, USA) for a model with treatments (genotype and sex and their interaction). Significant differences in mean values were determined by Tukey's test ($p < 0.05$).

RESULTS AND DISCUSSION

Carcass yield

Bangladeshi native chicken (BNC) naked neck and non-descriptive deshi chicken had no effect ($p > 0.05$) on carcass yield (Table-1). However, body weight, chilled and non-chilled carcass weights, dressing percentage, breast yield, wing and drumstick weights of males from both BNC were higher ($p < 0.05$) than in female indigenous chickens. The thigh weights of the female breeds were heavier ($p < 0.05$) than their male counterparts. At 24 weeks of age BNC did not affect carcass characteristics of the selected indigenous chickens, which is steady with Packard (2014) who specified that alike carcass traits were detected between indigenous chickens. However, Isidahomen *et al*., (2012) revealed significant variances in the carcass properties of Nigerian indigenous chicken genotypes used in their research. Carcass yield is affected by body weight, sex, feed, slaughtering condition and genetic Brickett *et al*., (2007). Moreover, Moujahed and Haddad (2013) stated that low carcass yield is associated with low body weight. The fowls used in this experiment had similar body weight gain, therefore, the low carcass yield and parts could be contributed to low live weight of chicken. Sex affected the body weight, hot and chilled carcass weight of BNC. Bangladeshi native Male chickens had mostly heavier body weight, hot and chilled carcass weights than their counterparts. These findings were analogous Isidahomen *et al*., (2012) who observed that male indigenous chickens had a bizarrely and superior carcass attributes than female chickens. Male chickens regardless of strain had better live and carcass weights compared to their females (Abudulla *et al*., 2010). The differences detected between male and female chickens may be as a consequence of sexual dimorphisms which have a tendency to favour males over females in chicken (Ilori *et al*., 2010). Some reports recommended that the sex differ might be due to physiological action and assertiveness particularly when both sexes are raised together (Ilori *et al*., 2010; Isidahomen *et al*., 2012). The assertiveness of males over the females placed the females at a hindrance for feed and water intake.

Table-1: Slaughter carcass characteristics of indigenous chickens depending on sex and genotypes (Mean ± SE)

Carcass parameters	Sex		P- Value	Chicken genotypes		P- Value
	Male	Female		NNC	NDDC	
Pre-slaughter LBW (g)	$1990.60^{a} \pm 50.95$	$1630.70^{b} \pm 41.44$	< 0.0001	1729.0 ± 61.34	1703.2 ± 60.54	0.7880
HCW (g)	$1448.08^{a} \pm 43.42$	$1190.39^{b} \pm 39.40$	< 0.0001	1279.4 ± 43.14	1298.3 ± 42.45	0.7268
CCW (g)	$1311.21^{a} \pm 41.44$	$1179.29^{b} \pm 38.60$	< 0.0001	1260.0 ± 44.32	1279.7 ± 44.09	0.6706
Dressing %	$68.6^{a} \pm 1.95$	$64.22^{b} \pm 1.75$	0.0220	65.1 ± 1.82	66.4 ± 1.84	0.2044
Thigh weight (g)	$24.9^{b} \pm 5.21$	$32.2^{a} \pm 5.08$	< 0.0001	216.2 ± 5.30	213.9 ± 5.16	0.0850
Breast weight (g)	$305.3^{a} \pm 7.16$	$260.8^{b} \pm 6.87$	< 0.0001	251.3 ± 6.97	254.0 ± 6.85	0.0760
Drumstick weight (g)	$218.11^{a} \pm 6.11$	$198.54^{b} \pm 6.16$	< 0.0001	249.6 ± 6.05	223.3 ± 6.11	0.6508

a, b means within rows with different superscripts differ significantly at $p < 0.05$, SE: Standard Error, NNC: Naked-neck chicken, NDDC: Non-descriptive deshi chicken, LBW: Live body weight, HCW: Hot carcass weight, CCW: Cold carcass weight

Table-2: Meat color profile of indigenous chickens (Mean ± SE)

Variable		Muscle								
		Thigh			Breast			Drumstick		
		CIE L*	CIE a*	CIE b*	CIE L*	CIE a*	CIE b*	CIE L*	CIE a*	CIE b*
Sex	Male	37.54^{b} ± 0.128	15.89^{a}± 0.160	9.70^{b} ±0.303	46.52^{b} ± 1.40	10.96^{a}± 1.41	16.98 ±1.38	38.38^{b} ±0.04	14.87^{a} ±0.05	10.46^{b} ±0.29
	Female	45.92^{a} ± 0.129	11.14^{b} ± 0.163	13.55^{a} ± 0.302	52.92^{a} ± 1.41	4.30^{b} ±1.39	16.21 ±1.40	45.28^{a}± 0.06	11.14^{b}±0.06	12.99^{a} ±0.31
Genotype	NNC	41.65 ±0.126	13.36 ± 0.128	9.23^{b} ±0.302	51.20 ±1.40	5.70 ±1.42	14.09^{b} ±1.40	44.60^{a} ±0.05	11.91^{b} ±0.04	11.25^{b} ±0.02
	NDDC	42.29 ±0.127	13.65 ± 0.130	14.04^{a} ±0.304	48.20 ±1.41	9.50 ±1.41	19.10^{a} ±1.41	39.04^{b} ±0.05	14.06^{a} ±0.03	12.12^{a}±0.03
PS Time (h)	0.5	46.11^{a} ± 0.197	10.01^{b} ± 0.160	10.02^{b} ± 0.368	50.30 ± 1.760	6.05^{b} ± 1.740	13.09^{b} ± 1.760	46.45^{a} ±0.061	10.61^{b} ±0.040	11.18^{b}±0.036
	24	39.40^{b}± 0.195	15.25^{a} ± 0.158	11.00^{b} ± 0.369	46.48 ± 1.759	11.79^{a} ± 1.741	19.03^{a} ± 1.759	39.98^{b} ±0.063	14.16^{a} ±0.041	11.17^{b}±0.037
	48	39.56^{b} ± 0.198	15.19^{a} ± 0.162	13.80^{a} ± 0.370	52.23 ± 1.761	5.02^{b} ± 1.739	17.68^{a} ± 1.761	38.92^{b} ±0.060	14.22^{a} ±0.039	12.77^{a} ±0.40
Effects	P-Values									
	Sex	0.1560	0.0684	0.0208	<0.0001	0.1120	<0.0001	<0.0001	<0.0001	<0.0001
	Breed	0.0045	0.0027	0.6801	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Breed*sex	0.0345	0.0730	0.0980	<0.0001	<0.0001	0.4708	<0.0001	<0.0001	<0.0001
	Time	0.0795	0.0234	0.0612	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Breed*Time	0.0137	0.4910	0.4580	<0.0001	<0.0001	0.0621	<0.0001	<0.0001	<0.0001
	Sex*Time	0.0104	0.1167	0.1390	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Breed*Sex*Time	0.0360	0.1336	0.3454	<0.0001	<0.0001	0.0005	<0.0001	<0.0001	<0.0001

a, b means within rows with different superscripts differ significantly at $p < 0.05$, SE: Standard Error, NNC: Naked-neck chicken, NDDC: Non-descriptive deshi chicken, PS: Post slaughter, L* = Lightness, a* = Redness, b* = Yellowness.

Table-3: Effects of sex, genotype and postmortem time on meat pH of indigenous chickens (Mean ± SE)

Variable		Muscles		
		Thigh	Breast	Drumstick
Sex	Male	5.75^{a} ± 0.013	5.52 ± 0.040	5.83 ± 0.025
	Female	5.65^{b} ± 0.014	5.49 ± 0.045	5.77 ± 0.023
Genotype	NNC	5.72 ± 0.027	5.55^{a} ± 0.047	5.78 ± 0.031
	NDDC	5.73 ± 0.025	5.46^{b} ± 0.049	5.85 ± 0.032
PS time (h)	0.5	5.68^{b} ± 0.019	5.45^{c} ± 0.021	5.78 ± 0.032
	24	5.73^{a} ± 0.017	5.54^{a} ± 0.019	5.85 ±0.034
	48	5.74^{a} ± 0.015	5.51^{b} ± 0.022	5.84 ±0.036
Probabilities				
Effects	Sex	0.0003	0.0801	0.2101
	Breed	0.5948	<0.0001	0.0103
	Breed*sex	0.9393	0.8450	0.9540
	Time	0.0196	<0.0001	0.1462
	Breed*Time	0.0022	0.0611	0.3764
	Sex*Time	0.4547	0.3505	0.4375
	Breed*Sex*Time	0.8450	0.2140	0.8050

a, b, c means in column with different superscripts differ significantly at $p < 0.05$, SE: Standard Error, NNC: Naked-neck chicken, NDDC: Non-descriptive deshi chicken, PS: Post slaughter

Table-4: Breast muscle fatty acid composition of indigenous chickens (Mean ± SE)

Elements	Sex		P-Value	Genotype		P-Value
	Male	Female		NNC	NDDC	
SFA						
C14: 0	0.210^{b}± 0.0204	0.340^{a} ± 0.0201	0.0058	0.302 ± 0.0303	0.255 ±0.0302	0.270
C15: 0	0.029 ± 0.001	0.034 ± 0.003	0.6836	0.036 ± 0.0085	0.028 ± 0.0084	0.5318
C16: 0	22.302^{b} ± 0.4321	24.524^{a} ± 0.4220	0.0040	23.275 ± 0.4322	23.649 ± 0.4321	0.5743
C17: 0	0.790^{a} ± 0.0876	0.570^{b} ± 0.0856	0.0990	0.580 ± 0.0876	0.785 ± 0.0875	0.1242
C18: 0	13.470^{a} ± 0.0047	10.978^{b} ± 0.0046	0.0047	11.604 ± 0.5092	12.847 ± 0.5094	0.1110
C20: 0	16.750^{a} ± 0.0479	11.740^{b} ± 0.0477	0.0479	13.229 ± 1.5908	15.260 ± 1.6059	0.3902
C22: 0	0.056 ±0.0117	0.037 ±0.0116	0.2093	0.031 ± 0.0116	0.063 ± 0.0117	0.0649
MUFA						
C16: 1	1.197^{b} ±0.2210	2.104^{a} ±0.2110	0.0136	1.938 ±0.2214	1.363 ±0.2114	0.0924
C18: 1n9c	21.310^{b} ±1.4838	27.510^{a} ±1.4834	0.0120	25.801 ±1.4339	23.019 ±1.4834	0.2101
C18: 1n11	3.890 ±0.1820	4.141 ±0.1819	0.3638	4.195 ±0.1820	3.845 ±0.1819	0.2012
C20: 1n9	0.160 ±0.0214	0.161 ±0.0214	0.9810	0.155 ±0.0214	0.164 ±0.0213	0.7670
PUFA						
C18:2	15.404 ±0.7720	14.778 ±0.7710	0.5770	15.384±0.7721	14.794±0.7719	0.0613
C18:3n3	0.134 ±0.0293	0.194 ±0.0292	0.1724	0.195±0.0290	0.132±0.0289	0.1791
C18:3n6	0.020 ±0.0127	0.061 ±0.0125	0.0286	0.052±0.0126	0.031±0.0125	0.2842
C20:2n6	0.314^{a} ±0.0322	0.148^{b} ±0.0313	0.0034	0.196±0.0323	0.265±0.0324	0.1534
C20:4	0.136^{a}±0.0150	0.043^{b} ±0.0148	0.0009	0.097±0.0150	0.081±0.0147	0.4923
C20:5n3	0.043^{a} ±0.0108	0.008^{b} ±0.0106	0.0428	0.033±0.0108	0.017±0.0106	0.3237
C22:5n3	1.217^{a} ±0.1451	0.592^{b} ±0.1452	0.0103	0.816±0.1454	0.993±0.1453	0.4072
C22:6n3	1.766 ±0.1960	1.309 ±0.1957	0.1252	1.432±0.1963	1.642±0.1960	0.4610
Total						
SFA	53.607 ±1.567	53.628 ±1.576	0.1132	49.057±2.6877	52.887±2.6878	0.0664
MUFA	26.557 ±1.9082	33.916 ±1.9080	0.1541	32.089 ±1.9086	28.391 ±1.9068	0.2707
PUFA	19.034^{a} ±1.2131	17.133^{b} ±1.2132	0.9606	18.205^{a} ±1.2135	17.955^{b} ±1.2136	0.3622
Omega-6	2.10^{a}±0.2409	1.518^{b}±0.2395	0.95016	1.68±0.2412	1.938±0.2409	0.3421
Omega-3	1.394^{a} ± 0.1852	0.794^{b} ±0.185	0.9307	1.044^{b}±0.1852	1.142^{a}±0.1848	0.3620
PUFA: SFA	0.355±0.774	0.319±0.769	0.9708	0.366±0.451	0.344±0.451	0.3719
Omega-6: Omega-3	1.506456± 1.106371	1.911839±1.294595	0.95061	1.609195±1.302376	1.697023 ± 1.303571	0.3562

a, b means in rows with different superscripts differ significantly at $p < 0.05$, SE: Standard Error, NNC: Naked-neck chicken, NDDC: Non-descriptive deshi chicken, SFA: Saturated fatty acid, MUFA: Monounsaturated fatty acid, PUFA: polyunsaturated fatty acid.

Table-5: Sensory evaluation of indigenous male and female chicken breast meat (Mean ± SE)

Sensory traits	Sex			Chicken genotype		
	Male	Female	p-value	NNC	NDDC	p-value
Tenderness	3.03 ± 0.165	3.09 ± 0.165	0.3515	2.91 ± 0.160	2.70 ± 0.163	0.3505
Juiciness	2.94 ± 0.188	3.06 ± 0.186	0.5780	2.97 ± 0.181	3.01 ± 0.180	0.8521
Taste	3.11 ± 0.170	3.14 ± 0.167	0.8369	3.16 ± 0.167	3.09 ± 0.166	0.6805
Aroma	2.70 ± 0.180	3.01 ± 0.178	0.7710	2.89 ± 0.187	2.81 ± 0.186	0.2882
Flavor	2.97 ± 0.165	3.03 ± 0.162	0. 8369	3.07 ± 0.170	2.96 ± 0.164	0.5980
Overall acceptance	3.33 ± 0.176	3.21 ± 0.174	0.5570	3.40 ± 0.178	3.11 ± 0.176	0.2418

SE: Standard Error, NNC: Naked-neck chicken, NDDC: Non-descriptive deshi chicken

Meat color and pH

Results of meat color of thigh, drumstick and breast of BNC are presented in Table 2. After slaughter color development of Lightness (L), redness (a) and yellowness (b) of breast, thigh, and drumstick meat were chicken type, sex and time dependent. However, redness and yellowness of the breast meat were not affected by breed, sex and time of BNC. The effects of breed, sex and time on meat pH of BNC muscles are shown on Table 3. The breast meat of the naked neck chicken had higher ($p < 0.05$) pH values than those of the non-descriptive deshi chickens. Meat storage period had an effect ($p<0.05$) on pH value of breast meat. A 24 hours post mortem period of breast meat resulted higher ($p<0.05$) pH values than the 0.5 and 48 hours post mortem storage time. However, a post mortem ageing of 0.5 hours resulted in lower ($p < 0.05$) pH values than 48 hours post-mortem. For the thigh meat, the female chickens had lower pH than the male chickens. Post mortem aging period did not affect ($p > 0.05$) on pH value of non-descriptive deshi chicken thigh muscle while in naked neck chicken thigh muscle meat aged for 0.5 hours shown lower ($p < 0.05$) pH values than the meat aged for 48 hours. For drumstick meat of non-descriptive deshi chicken had higher ($p< 0.05$) pH values than the naked neck chicken. Physical properties of muscle such as colour are one of the major attributes perceive by consumers and thus a standard of meat qual determined by consumers at the time of purchase meat (Fanatico *et al*., 2007). The L* values of meat indicates the lightness of meat, meat with a high L* values connected with poor meat quality (Holownia *et al*., 2003; Wattanachant *et al*., 2004). In the current study, genotype, sex and postmortem aging time interlink age were noticed in drumstick and thigh muscle meat. The naked neck chicken thigh, breast and drumstick were more yellow (b*) than the non-descriptive deshi chicken. These results are supported by Packard (2014) which shown that lower b* values were documented for. Kücükyilmaz *et al*., (2012) detected that breast and thigh meat of slow-growing fowls retained intensive and grownup under the natural production system were redness and yellowness when compared with first growing fowls. Furthermore, Gordon and Charles (2002) found that slow-growing birds have a more red meat colour than fast-growing birds because slow-growing birds are typically older, while Fanatico *et al*., (2007) observed that the slow-growing birds were less red (lower a*) than the fast-growing birds. The slow-growing fowls were less redness (a*) meat than the fast growing fowls Fanatico *et al*., (2007). Non-descriptive deshi and naked neck female chickens had lightness meat (L*) than the male counter parts. Myoglobin is the principal protein for meat colour, with haemoglobin and cytochrome C also playing a role (Mancini and Hunt, 2005; Fanatico *et al*., 2007b) for meat color. More active muscles have higher amounts of myoglobin. Therefore, as a consequence thigh muscles tend to have a higher myoglobin content as a result of dark color meat.

The inclination of male chickens to have darker meat as detected in the current study might be connected with greater physical muscular movements (Wattanachant, 2004, Packard, 2014). Meat pH of breast, thigh and drumsticks was different between the chicken breeds. Higher pH values were recorded for the naked neck chicken breast meat whilst the drumstick meat of non-descriptive deshi chickens had higher pH. According to Castellini *et al*., (2002) and Muchenje *et al*., (2009) a pH drop pattern is usually observed in BNC muscles over a post- mortem aging period. The pH drop is due to the fact that glycogen in the slaughtered chickens' muscles is broken down into glucose, which go through glycolysis process where lactic acid is formed without ogygen and that lactic acid causes drops the muscles pH when muscles converted to meat. The lesser pH of meat might also be due to the superior welfare conditions of chickens that reduce the pre-slaughter stress and thus deployment of glycogen (Castellini *et al*., 2002). Woelfel *et al*., (2002) stated that muscle pH declines after slaughter, and a lower amount pH can obstruct Water Holding Capacity (WHC) and other muscular activities. Though, higher pH also adversely affects meat quality, because it forms a more suitable atmosphere for bacterial growth (Fanatico *et al*., 2007). In the present study, the extent of pH24h values were 5.554 to 5.837 in the two chicken, and falls drops within the usual range as reported by Xiao (2007). In the present study, pH of the drumstick and breast muscles of and drumstick of both BNC rise, hit a peak and then declined. Contrasting to the other muscles estimated in the present study, naked neck chicken thigh muscle pH increased with an increase in muscle post slaughter aging period.

Sensory Properties

Meat Sensory evaluation of naked neck and non-descriptive deshi chicken meat are shown in Table 5. There were no deviation ($p >0.05$) revealed in juiciness, taste, aroma, flavor and overall acceptance among naked neck and non-descriptive deshi chicken meat. There were no significant ($p < 0.05$) differences among male and female chicken meat. Though meat from indigenous female chickens shown better scored in sensory evaluation of meat. In the current study tenderness, juiciness, aroma, flavor and overall acceptability of naked neck and non-descriptive deshi chicken meat were alike. When indigenous chickens were compared with commercial broiler chicken, the broiler chicken shown higher sensory scores (Dyubele *et al*., 2010). The present study naked neck and non-descriptive deshi chicken were used to explain consumer sensory score that was the alike for fatty acid profile.

Fatty acid profile

The fatty acid component of male and female naked neck and non-descriptive deshi chicken breast meat is shown in Table-4. The relationships among sex and breed effects were not ($p >0.05$) significant. Naked neck chicken breast muscles had higher ($p <0.05$) saturated and eicosatreienoic fatty acid contents than the non-descriptive deshi chicken breast muscles. Female chicken had higher ($p < 0.05$) palmitic (C16:0), palmitoeic (C16:1c9), heptadecenoic (C17:1c10), myristic (C14:0) and oleic acid (C18:1c9) content in their muscles than the male indigenous chickens. However, male chicken muscles had higher arachidonic acid (C20:4c5,8,11,14 (n-6)), arachidic acid (C20:0), stearic acid (C18:0), Y-linolenic acid (C18:3c6,9,12 (n-3)), eicosedienoic acid (C20:2c11,14 (n-6) and eicospentaenoic acid (C20:5c5,8,11,14,17 (n-3)) than the muscles of female indigenous chicken. Male chicken muscles had higher ($p < 0.05$) omega-3, omega-6, and polyunsaturated fatty acid: saturated fatty acid ratio than female indigenous chickens. Female chicken muscles had higher ($p < 0.05$) polyunsaturated fatty acid and monounsaturated fatty acid contents than the muscles of male indigenous chicken counterpart. For human health aspects the proportion of omega -3 (n-3), Omega-6 (n-6) fatty acid, TUFA, and the ratio of omega-6 and Omega-3 (n-6/n3) fatty acids in diet are significance with regards to. Diets contains excessive amounts of omega-6 fatty acids which is considered and believed to stimulate the pathogenesis of several cardiovascular and autoimmune diseases (Simopoulos). Wattanachant *et al* (2004) stated that indigenous chicken muscles contain numerous fatty acid. Fatty acid constituents in chicken meat are stimulate by several factors such as rearing system, species of the chicken, sex, anatomical position of the muscles, diet and dietary fat in the feed (Polak *et al*., 2002). Indigenous chicken have a tendency to intake selective feed materials while searching and scratching the feed than the broiler chicken which may affect the fatty acid components in muscles (Van Marle-Koster and Webb, 2000). Female chicken had higher polyunsaturated and mono unsaturated fatty acids than the male chicken. Though, omega 3 and omega 6 fatty acids were higher for male chicken than the female chickens. The omega 3 fatty acid have possibility to prevent and treatment of cardiovascular diseases, autoimmune disease, metabolic diseases like diabetes and different type of cancer. Moreover, the ratio of omega 6 and omega 3 fatty acids is a significant element of health. To reduce the risk of different diseases a lesser ratio of omega 6 and omega 3 fatty acids in the diet is desirable (Simopoulos, 2002). In the current study the ratio of omega 6 and omega 3 fatty acid was lower than the broiler chicken meat.

CONCLUSION

The carcass properties of the NNC and NDDC thigh, drumstick were alike except for breast muscle. Sex affected on all physicochemical properties of carcass. Breed, sex and post slaughter time interactions effects on color attributes of drumstick and thigh meat except for breast meat. The pH value differed significantly among the breeds, sex and post slaughter time but the sensory traits of the chicken breeds were similar. Fatty acid profiles of the chickens were not affected by sex or breed. The ratios of omega-6 (n-6) and omega-3 (n-3) fatty acids were significantly lesser in both breeds/genotype which are anticipated in reducing the risk of many cardiovascular diseases. Therefore, the study results would be contribute to encourage the production of naked neck and non-descriptive deshi chickens as well as rises the consumer's consciousness for healthier meat selections.

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