Meat Research
Vol 3, Issue 2 Article 52
ISSN: 2790-1971
https://doi.org/10.55002/mr.3.2.52 http://www.bmsa.info/meatresearch

[1]Department of Poultry Science, Bangladesh Agricultural University, Bangladesh

[2]Graduate Training Institute**,** Bangladesh Agricultural University, Bangladesh

[3]Department of Animal Science, Bangladesh Agricultural University, Bangladesh

***Corresponding author:**

MS Ali
E- mail: mdshawkatali.ps@bau.edu.bd

Keywords:

Pigeon
Quail
Meat yield
Quality attributes

Article Info:

Received: 09 March 2023
Accepted: 16 April 2023
Published online: 30 April 2023

Research Article

Comparison of meat yield and quality characteristics between pigeon and quail

M Muraduzzaman[1], M Ahammed[1], M. Habib[2], MAK Azad[3], MA Hashem[3] and MS Ali[1*]

Abstract

A respective number of pigeon and quail were purchased from Churkhai Bazar, Mymensingh at their marketing weight to compare their yield and quality characteristics of meat. The birds were then slaughtered and the meat yield characteristics were compared against their live weight. The samples of breast, thigh and drumstick kept at 4°C for 24 hours. Findings reveal that thigh, drumstick, breast, head, liver, gizzard, heart, neck and shank% were significantly higher in quail meat compare to pigeon but feather and skin% were significantly higher in pigeon. No differences were found in dressing percentage, blood weight and wing weight % between pigeon and quail. Pigeon meat expressed higher ether extract values compared to quail meat. Significantly higher pH of breast and thigh was found in quail compare to pigeon. Cooking loss was significantly higher in pigeon breast compare to quail breast but no differences found in thigh of both species. Drip loss% had no variation in pigeon meat and quail meat. Water holding capacity% was significantly higher in pigeon breast compare to quail breast but no variation in thigh of both species. L* was significantly higher in pigeon breast, thigh and drumstick at 2 hours and in drumstick at 24 hours of postmortem compare to quail. Redness (a*) was significantly higher in pigeon drumstick at 24 hours of postmortem than quail. There was no variation of a* in breast, thigh and drumstick at 2 hours and in breast and thigh at 24 hours after postmortem of both species. There was no variation of b* of breast, thigh and drumstick at 2 hours and 24 hours after postmortem in both pigeon and quail. In conclusion, pigeon meat is better due to have higher breast meat fat content and WHC as compared to quail meat.

Introduction

Poultry meats are widely available in Bangladesh. It meets the animal protein. Of all types of meat consumed in the world, chicken continues to be the cheapest and its consumption is expected to increase by 34% by 2018 (Jung et al., 2011). Fast growing commercial broiler strains & few indigenous chicken breeds fulfill the demand of chicken meat over the years (Akhter et al., 2022; Ali et al. 2022; Azad et al., 2021 and 2022; Jaturashitha et al., 2008). This increase can be adduced to the fact that poultry meat is cheaper with good nutritional quality, easy to prepare and it is well suited for quick menus. But now-a-days, for various reason people are searching alternative to chicken meat. As a result of increasing per capita income in Bangladesh, people want more variation in meat consumption. From this aspect quail meat & pigeon meat may be the best alternative. Quail attains maturity and come to first lay between 5-6 weeks of age and produce 200-300 eggs in their first year of lay (Bagh et al., 2016). Japanese quail also known as common quails is mainly raised for meat and egg production. It attains a market weight of 140-180g between 5-8 weeks of age. Pigeon is hardy and less susceptible to many diseases of poultry birds. They are gentle, strong and swift flier. Pigeon is easy to raise and requires fewer capital outlays in terms of housing, management and health care. Consumers' acceptance of pigeon and quail meat depends on its quality, which is influenced by a number of factors ranging from physical and chemical properties and processing and handling of meat (Alvarado and Sams, 2004). Modern consumers seek meat that is low fat, tender, juicy with good flavor and aroma (Bithi et al., 2020; Boby et al., 2021; Das et al., 2022; Disha et al., 2020; Dyubele et al., 2010). Carcass characteristics of various breeds and strains of poultry have been extensively studied (Becker et al., 1984; Orr and Hunt, 1984; Li et al., 2006). Those studied have emphasized comparisons at a set point of time. Chronological age as a standard for comparison has been a commonly acceptable method to examine differences in growth and carcass characteristics (Chambers, 1990). However, for strains or breeds known to have large disparity in growth pattern and mature body weight, comparison at marketing weight of different poultry species might be a better measure than age.

Data regarding meat yield and quality characteristics comparing pigeon and quail of Bangladesh are scanty. Therefore, the objective of the present research is to compare the meat yield characteristics and meat quality parameters between pigeon and quail at marketing weight.

Materials and Methods

Total 10 birds (5 pigeons and 5 quails) were purchased randomly irrespective of sex at their marketing weight from Churkhai Bazar, Mymensingh Sadar, Mymensingh. The approximate marketing weight of pigeon and quail was 220±10g and 140±10g respectively. The live birds were

immediately transferred to Bangladesh Agricultural University Poultry Farm. Then all the birds were weighted before slaughter and were slaughtered (slaughter was done by cutting jugular veins with the help of a sharp knife), bled, plucked, weighted to determine blood and feather loss. The carcass was eviscerated and dissected manually. Each eviscerated carcass was dissected into neck, wings, breast, thigh, drumstick and the remainder of the carcass. The dissected carcass components were weighed accurately using digital weighing balance. Meat samples (breast, thigh and drumstick) were collected from the slaughtered birds. After that instrumental color (CIE *L* a* b**) was taken from breast, thigh and drumstick meat samples at 2 hours of postmortem. Then the meat samples were stored for 24 hours at 4°C temperature in the refrigerator. After refrigerating for 24 hours the breast, thigh and drumstick meat samples were analyzed for proximate composition, pH, color, water holding capacity, cooking loss and drip loss.

Proximate composition of Pigeon and Quail meat

Four samples (two breasts and two thighs) from quails and four samples (two breast and two thigh) from pigeons were analyzed for Dry mater, Crude Protein, Ether Extract and Ash by the standard procedures of AOAC (2005).

Physicochemical Properties of Pigeon meat and Quail meat

pH measurement

In this study, the pH was taken from the pigeon and quail after 24 hours of slaughtering. After 24 hours of slaughtering, the pH of breast (pectorals major muscle) and leg (thigh muscle) was measured with the help of an automatic pH meter (model 210, HANNA).

Color

Instrumental color (CIE *L* a* b**) was taken from breast, thigh and drumstick meat samples at 2 hours of postmortem. Then the meat samples were refrigerated for 24 hours at 4°C temperature and the color of breast, thigh and drumstick meat was individually measured using Konica Chroma Meters CR-410 (Konica Minolta Inc., Tokyo, Japan).

Cooking loss

To evaluate the cooking loss of the breast and thigh meat samples were weighted. The samples were put in a polythene bag and placed in a water bath at 80°C for 30 minutes. After that the samples were removed from the water bath and kept for 30 minutes in a room temperature (Ali et al., 2007). Cooking loss was calculated by expressing cooked sample weight as a percentage of precooked samples weight.

Cooking loss (%) = [(Initial wt-cooked wt) / (Initial wt)] × 100

Drip loss

Drip loss was determined on the samples of breast (pectoralis major muscle). Sample was weighed with the help of digital weighing balance and placed separately in a pot to allow meat juice to drain out. To prevent contact between the draining juice and the meat sample, special care has been taken during placing the sample into the pot. The samples were then kept in a refrigerator and stored at 4°C for 24 hours. After that time, the meat samples were reweighed. Drip loss was calculated from the difference in weight before and after chilling and expressed in percent.

Drip loss (%) = [(Initial wt.-chilled wt.) / (Initial wt.)] × 100

Water Holding Capacity

The Water Holding Capacity of breast and thigh were measured by centrifugation assay. About 1g breast and 1g thigh sample were cut into cubes from each replication and kept in a centrifuge tube and then centrifuged at 10000 RCF at 4°C for 10 minutes. WHC was determined by the amount of exudate water via the following formula:

$$\text{WHC (\%)} = \frac{\text{Sample weight after centrifugation}}{\text{Sample weight before centrifugation}} \times 100$$

Statistical analysis:

In this experiment the data were analyzed by t-test using Statistical Analysis Systems Institute (SAS, 2002).

Results and Discussion

Meat Yield Characteristics

The data obtained from this experiment are presented in Table 1.

Table 1. Meat Yield Characteristics of Pigeon and Quail

Parameter	Pigeon	Quail	P value
	Mean + SEM	Mean + SEM	
Live weight (g)	226.00±3.74	145±3.79	0.0001
Dressing (%)	68.12±0.88	71.87±1.82	0.1010
Blood (%)	4.88±0.46	4.11±0.41	0.2524
Feather + Skin (%)	5.75±0.40	1.38±0.03	0.0001
Thigh (%)	12.37±0.43	22.12±0.57	0.0001
Drumstick (%)	10.24±0.57	19.36±0.52	0.0001
Breast (%)	21.26±0.96	26.89±0.67	0.0014
Wing (%)	19.45±0.59	19.37±1.04	0.9514
Head (%)	7.59±0.35	11.86±0.17	0.0001
Liver (%)	6.01±0.27	9.94±0.51	0.0001
Gizzard (%)	5.65±0.41	9.37±0.14	0.0001
Heart (%)	4.41±0.34	8.01±0.33	0.0001
Neck (%)	5.86±0.45	8.55±0.22	0.0007
Shank (%)	5.47±0.25	8.60±0.51	0.0006

Data are Mean ± SEM.

The data obtained from this experiment indicate that there were significant variations in almost all parameter. Feather and skin were significantly higher in pigeon meat compare to quail meat ($p<0.01$), while thigh%, drumstick%, breast%, head%, liver%, gizzard%, heart%, neck% and shank% were significantly higher in quail compare to pigeon ($p<0.01$). No significant differences were found ($p >0.05$) in dressing%, blood%, wing% of both species ($p>0.05$). Omojola et al. (2007) reported that dressing%, breast%, thigh%, drumstick%, wing% of pigeon 65.15, 38.3, 6.35, 5.65, 19.20, respectively. In this study dressing% and wing% of pigeon are similar with that report but others parameters are higher. Hasan et al. (2016) reported that head%, heart%, liver%, gizzard%and shank% of pigeon at market weight were 4.94, 1.09, 8.96, 5.19, 1.84 respectively. In this study gizzard% is similar, liver% is lower but others parameters are higher than that report. Abang et al. (2017) reported that dressing%, head%, neck%, breast% and drumstick% of quail 70.74, 5.77, 5.87, 22.35 and 17.34 respectively. In this study breast%, dressing% and drumstick% are closely similar with that report while others parameters are higher.

Proximate Analysis

The values of proximate components of breast and thigh of pigeon and quail are shown in Table 2.

Table 2. Proximate Composition of Breast and Thigh of Pigeon and Quail

Meat type	Parameter	Pigeon	Quail	P value
		Mean±SEM	Mean±SEM	
Breast	Dry Matter	25.10±0.49	27.27±2.50	0.4851
	Moisture	74.89±0.49	72.73±2.50	0.4851
	Ash	1.29±0.04	1.38±0.01	0.2064
	Crude Protein	19.18±1.23	24.40±5.08	0.4237
	Ether Extract	3.47±0.07	1.86±0.01	0.0022
Thigh	Dry Matter	24.38±1.58	31.14±0.59	0.0570
	Moisture	75.62±1.58	68.85±0.59	0.0570
	Ash	1.9±0.02	1.24±0.02	0.2869
	Crude Protein	21.82±1.09	20.55±1.64	0.5865
	Ether Extract	4.15±0.15	3.75±0.25	0.3037

Data are Mean ± SEM

The data obtained from this experiment indicate that significantly higher ether extract in pigeon breast compare to quail breast meat ($p<0.01$). No variations were found in dry matter, moisture, crude protein and ash of breast and thigh meat of both species ($p>0.05$).

Dry Matter

The dry matter content of pigeon and quail is shown in Table 2. The overall observed dry matter content at pigeon breast and thigh meat were 25.10% and 24.38% respectively. On the other hand, dry matter of quail in breast and thigh were 27.27% and 31.14% respectively. Dry matter of Breast and thigh meat had no variation ($p >0.05$). Hossain et al. (1994) stated that dry matter of pigeon meat ranges from 26-28%. This research result is closely related with that. Genchev et al. (2008) reported that dry matter of quail ranges from 30-32%. This research result is similar with that.

Crude Protein

The CP content of pigeon and quail is shown in Table 2. The observed CP content at pigeon breast and thigh were 19.18% and 21.82% respectively whereas CP content of quail breast and thigh were 24.40% and 20.55% respectively. There was no variation ($p>0.05$) of CP in breast and thigh meat of both species. Jahanian and Edriss (2015) reported that CP% of quail ranges from 22-24% which agreed my present research work. Apata et al. (2015) stated that CP% in pigeon meat ranges from 19-20% which agree my research result.

Ether Extract

The ether extract content of pigeon and quail is shown in Table 2. The ether extract content at breast in pigeon was 3.47% and at thigh in pigeon was 4.15%. On the other hand, EE at breast and thigh in quail meat were 1.86% and 3.75% respectively. Results showed that ether extract was significantly higher in pigeon breast meat compare to quail breast meat ($p<0.01$) while no variation was found in thigh meat of both species ($p>0.05$). Bostami et al. (2021) showed that EE% of pigeon 6.41% which is higher than my present research work. Fakolade (2015) reported that EE% of breast and thigh meat of quail were 3.4% and 4.00% respectively whereas this research reported 1.86% and 3.75% respectively which is less than that report.

Ash

The ash content of pigeon and quail is shown in Table 2. The observed ash content at breast and thigh of pigeon meat was 1.29% and 1.9% respectively. The ash content of breast and thigh in quail meat was 1.38% and 1.24% respectively. There was no variation of ash content between pigeon and quail ($p>0.05$). Pomianowski et al. (2009) reported that ash content of breast and thigh meat of pigeon 1.48% and 1.36% respectively. In my research work ash content of breast waslessand thigh was higher than that report. Boni et al. (2010) stated that ash content of quail was 1.44%. My research work value was almost similar with that statement.

pH

pH of pigeon and quail is shown in Table 3. The observed pH at breast and thigh of pigeon meat was 6.09 and 6.36 respectively. pH of breast and thigh in quail were 6.26 and 6.89 respectively. Significantly higher pH was found in quail breast and thigh compare to pigeon breast and thigh ($p<0.01$). Apata et al. (2014) stated that pH of pigeon meat 6.86 whereas my research showed less than that. Genchev et al. (2008) reported that pH of quail breast 6.17 which agree my research work.

Table 3: pH (after 24 hours of postmortem) of breast and thigh from Pigeon and Quail

Meat type	Pigeon	Quail	P value
	Mean ± SEM	Mean ± SEM	
Breast	6.09±0.00	6.26±0.30	0.0006
Thigh	6.36±0.05	6.89±0.04	0.0001

Data are Mean ± SEM.

Cooking loss, drip loss and water holding capacity

The cooking loss of pigeon and quail is shown in Table 4. The overall observed cooking loss at breast and thigh of pigeon meat 32.46% and 23.74% respectively. On the other hand, cooking loss of breast and thigh of quail were 21.53% and 19.53% respectively. Significantly higher cooking loss was found in pigeon breast meat compare to quail breast meat ($p<0.01$) while no variation was found in thigh meat of both species ($p>0.05$). Omojola et al. (2012) stated that cooking loss of pigeon breast meat 28.74% which is slightly lower than my research work. Karakaya et al. (2005) stated that cooking loss of quail meat 24.9% which is higher than my present study.

The drip loss of pigeon and quail is shown in Table 4. The overall drip loss at breast meat of pigeon is 3.02% and breast meat of quail is 2.99%. There was no variation of drip loss in breast meat between two species ($p>0.05$). Awan et al. (2017) stated that drip loss in quail ranges from 1.84-3.98% which agreed my result. Apata et al. (2015) reported that drip loss of pigeon meat is 4.65% which is higher than my present work. Water holding capacity of pigeon and quail is shown in Table 4. Water holding capacity at breast and thigh of pigeon meat is 98.01% and 97.82% respectively. On the other hand, water holding capacity at breast and thigh meat of quail is 96.65% and 99.06% respectively. Significantly higher ($p<0.05$) water holding capacity of breast meat was found in pigeon compare to quail breast meat ($p<0.05$). No variation was found in thigh meat of both species ($p>0.05$).

Table 4: Cooking, drip loss and water holding capacity of breast and thigh from Pigeon and Quail

Meat type	Parameter	Pigeon	Quail	P value
		Mean ± SEM	Mean ± SEM	
Breast	Cooking loss (%)	32.46±0.12	21.53±0.23	0.0006
	Drip loss (%)	3.02±0.62	2.99±0.08	0.9664
	Water holding capacity (%)	98.01±0.02	96.65±0.18	0.0173
Thigh	Cooking loss (%)	23.74±0.64	19.53±2.25	0.2147
	Water holding capacity (%)	97.82±0.88	99.06±0.53	0.3528

Data are Mean ± SEM.

Color

The value of L*(lightness) of breast of pigeon and quail with hour of time interval (2 hours and 24 hours after post mortem) are shown in Table 5. The observed value of L* at breast of pigeon were 59.83 (2 hours) and 44.90 (24 hours) and in quail were 41.54 (2 hours) and 45.49 (24 hours). Significantly higher lightness in pigeon breast at 2 hours compare to quail breast ($p<0.05$) but no variation at 24 hours in pigeon and quail ($p>0.05$). Value of L* at thigh of pigeon was 51.00 (2 hours) and 57.58 (24 hours) and of quail was 36.04 (2 hours) and 44.18 (24 hours). Significantly higher L* in pigeon thigh was found at 2 hours of postmortem compare to quail thigh ($p<0.05$) but no variation of thigh at 24 hours of postmortem of both species ($p>0.05$). Value of L* at drumstick of pigeon was 59.45 (2 hours) and 52.35 (24 hour) and of quail was 46.06 (2 hours) and 40.86 (24 hours). Significantly higher lightness was found in pigeon drumstick at 2 and 24 hours of postmortem compare to quail drumstick ($p<0.05$). L* value is deteriorated which is supported by Fletcher (1999).

Table 5. The color (CIE L*, a*, b*) values of breast, thigh and drumstick (with skin) of Pigeon and Quail (after 2hours and 24 hours of post mortem)

Time	Meat type	Color value (CIE)	Pigeon	Quail	P value
			Mean ± SEM	Mean ± SEM	
2 hours after postmortem		*L**	59.83±4.01	41.54±4.12	0.0130
	Breast	*a**	12.31±2.87	12.46±1.03	0.9621
		*b**	10.56±4.50	6.45±1.09	0.4017
		*L**	51.00±3.47	36.04±4.35	0.0277
	Thigh	*a**	9.21±0.40	10.52±1.43	0.4060
		*b**	14.14±3.38	7.72±0.84	0.1033
		*L**	59.45±4.07	46.06±2.48	0.0230
	Drumstick	*a**	9.37±2.28	9.89±1.30	0.8467
		*b**	7.96±1.49	7.26±1.05	0.7097
24 hours after postmortem		*L**	44.90±7.60	45.49±2.87	0.9439
	Breast	*a**	7.53±1.13	10.93±1.23	0.0770
		*b**	8.38±4.73	8.73±1.72	0.9457
		*L**	57.58±5.97	44.18±2.94	0.0791
	Thigh	*a**	8.25±1.29	7.93±0.75	0.8334
		*b**	21.12±7.07	7.09±1.36	0.0874
		*L**	52.35±3.97	40.86±1.14	0.0241
	Drumstick	*a**	9.99±1.08	3.88±1.31	0.0072
		*b**	9.32±1.08	5.20±2.19	0.1309

Data are Mean ± SEM.

The value of a* (redness) at breast of pigeon and quail with hour of time interval (2 hours and 24 hours after post mortem) are shown in Table 5. The observed value of a* at breast of pigeon was 12.31 (2 hours) and 7.53 (24 hours) and of quail was 12.46 (2 hours) and 10.93 (24 hours). There was no variation of a*in breast at 2 hours and 24 hours after postmortem in both species ($p>0.05$). This result is supported by Ngoka and Froning (1982). Value of a* of thigh of pigeon was 9.21 (2 hours) and 8.25 (24 hours) and of quail was 10.52 (2 hours) and 7.93 (24 hours). There was no variation of a* in thigh at 2 hours and 24 hours after postmortem of both species ($p>0.05$). a* value is deteriorated with the increase of storage time. Same report was submitted by Ngoka and Froning (1982). Value of a* at drumstick of pigeon was 9.37 (2 hours of postmortem) and 9.99 (24 hours of postmortem) and of quail was 9.89 (2 hours of postmortem) and 3.88 (24 hours of postmortem). Significantly higher redness in pigeon drumstick at 24 hours of postmortem compare to quail drumstick ($p<0.01$) but no variation was found at 2 hours of postmortem in both species ($p>0.05$).The value of b* (yellowness) at breast of pigeon and quail with hour of time interval (2 hours and 24 hours after post mortem) are shown in table 5. The observed value b* of breast of pigeon was 10.56 (2 hours) and 8.38 (24 hours) and of quail was 6.45 (2 hours) and 8.73 (24 hours). There was no variation of b* in breast at 2 hours and 24 hours of postmortem in both species ($p>0.05$).Value of b* of thigh of pigeon was 14.14 (2 hours) and 21.12 (24 hours) and of quail was 7.72 (2 hours of postmortem) 7.09 (24 hours of postmortem). There was no variation of b* in thigh at 2 hours and 24 hours of postmortem in pigeon and quail ($p>0.05$).Value of b* of drumstick of pigeon was 7.96 (2 hours of postmortem) and 9.32 (24 hours of postmortem) and of quail was 7.26 (2 hours of postmortem) and 5.20 (24 hours of postmortem). There was no variation of b* of drumstick at 2 and 24 hours of postmortem in both species ($p>0.05$).

Conclusion

Between two types of meat, significantly higher fat% was observed in pigeon breast meat compare to quail breast meat. Cooking loss and water holding capacity were significantly higher in pigeon breast meat and drip loss had no variation in pigeon and quail breast meat.

References

Abang FB, Oko OK, Yelwa JT. 2017. Carcass and organ characteristics of growing Japanese quails (*Coturnixcoturnix japonica*) fed sun-dried mango (*Mangiferaspp*) kernel meal as a replacement for maize. Annual Research & Review in Biology, 20: 1-7.

Akter R, Hossain MA, Khan M, Rahman MM, Azad MAK, Hashem MA. 2022. Formulation of value-added chicken meatballs by addition of Centella leaf (*Centella asiatica*) extracts. Meat Research, 2: 2, Article No. 18. https://doi.org/10.55002/mr.2.2.18

Ali MD, Kang GH, Yang HS, Jeong JY, Hwang YH, Park GB, Joo ST. 2007. A comparison of meat yield characteristics between duck and chicken breast. Asian-Australian Journal of Animal Sciences, 20: 1002-1006.

Ali MS, Rahman MM, Habib M, Kabir MH, Hashem MA, Azad MAK, Rahman MM. 2022. Quality of spent hen sausages incorporated with bee honey. Meat Research, 2: 1, Article 9. https://doi.org/10.55002/mr.2.1.9

Azad MAK, Rahman MM, Hashem MA. 2022. Meat microbiota: A conceptual review. Meat Research, 2: 2, Article No. 20. https://doi.org/10.55002/mr.2.3.20

Azad MAK, Kikusato M, Zulkifli I, Rahman MM, Ali MS, Hashem MA, Toyomizu M. 2021. Comparative study of certain antioxidants - electrolyzed reduced water, tocotrienol and vitamin E on heat-induced oxidative damage and performance in broilers. Meat Research, 1: 1, Article 7. DOI: https://doi.org/10.55002/mr.1.1.7

Alvarado CZ, Sams AR. 2004. Early postmortem injection and tumble marination effects on broiler breast meat tenderness. Poultry Science,83**:** 1035-1038.

AOAC. 2005. Official Methods of Analysis (18th edition). Association of Official Analytical, Chemists International, Maryland, USA.

Apata ES, Koleoso IM, Tijani LA, Obi OO, Okere IA 2015: Effect of sex on meat quality attributes of pigeon birds (Columba livia) in Abeokuta metropolis. International Journal of Agricultural Sciences and Natural Resources **2:** 19-23.

Awan FN, Shah AH, Soomro AH, Barahm GS, Tunio SG 2017: Carcass yield and physicchemical characteristics of Japanese quail meat. Pakistan Journal of Agriculture, Agricultural Engineering and Veterinary Sciences,**33:** 111-120.

Bagh J, Panigrahi B, Panda N, Pradhan CR, Mallik BK, Majhi B and Rout SS. 2016. Body weight, egg production, and egg quality traits of gray, brown, and white varieties of Japanese quail (*Coturnixcoturnix japonica*) in coastal climatic condition of Odisha. Veterinary world, 9: 832–836.

Becker WA, Spencer JV, Mirosh LW, Verstrate JA. 1984. Genetic variation of abdominal fat, body weight and carcass weight in a female poultry line. Poultry Science, 63: 607-611.

Bithi MAA, Hossain MA, Rahman SME, Rahman MM, Hashem MA. 2020. Sensory, nutritive, antioxidant and antimicrobial activity of Telakucha (Coccinia cordifolia) leaves extract in broiler meatball. Journal of Meat Science and Technology, 8: 23-31.

Boby F, Hossain MA, Hossain MM, Rahman MM, Azad MAK, Hashem MA. 2021. Effect of long coriander leaf (eryngium foetidum) extract as a natural antioxidant on chicken meatballs during at freezing temperature. SAARC Journal of Agriculture, 19(2): 271-283.

Boni I, Nurul H, Noryti I 2010: Comparision of meat quality characteristics between young and spent quails. International Food Research Journal**,**17**:**661-666.

Bostami AR, Yang CJ, Hossain MD, Islam MR, Ajoy MK, Rahman MM, Sultana A. 2021. Carcass traits, blood parameters and meat composition of quail and pigeon available in Bangladesh. Meat Research,1: 2.

Chambers JR. 1990. Genetics of growth and meat production in chickens. In: poultry breeding and genetic (Ed. R. D. Crawford), Elsevier, Amsterdam. pp. 559-643.

Das A, Hashem MA, Azad MAK, Rahman MM. 2022. Edible oil marination in broiler meat for short term preservation. Meat Research, 2: 3, Article 22.https://doi.org/10.55002/mr.2.3.22

Disha MNA, Hossain MA, Kamal MT, Rahman MM, Hashem MA. 2020. Effect of different levels of lemon extract on quality and shelf life of chicken meatballs during frozen storage. SAARC Journal of Agriculture, 18(2): 139-156.

Dyubele NL, Muchene V, Nkukwana TT, Chimonyo M. 2010. Consumer sensory characteristics of broiler and indigenous chicken meat: A South African example. Food Quality and Preference**,** 21: 815-819.

Hasan MK, Mahbub AS, Hasnath MR, Beg MA, Ahmed T. 2016. Effects of age and live weight on meat yield characteristics of Giribaj squab (Doctoral dissertation, Faculty of Animal Science and Veterinary Medicine, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh).

Fakolade PO 2015: Effect of age on physico-chemical, cholesterol and proximate composition of chicken and quail meat. African Journal of Food Science,9: 182-186.

Fletcher DL. 1999. Broiler breast meat color variation, pH and texture. Poultry Science, 78, 1323-1327.

Genchev A, Mihaylova G, Ribarski S, Pavlov A, Kabakchiev M 2008: Meat and composition in Japanese quails. *Trakia Journal of Sciences* **6** 72-82.

Hossain MJ, Uddin MS, Jalil Mia, Yasmin T, Paul DC, Chanda GC 1994: Meat composition of indigenous pigeons as influenced by sex, age and seasons. Asian-Australian Journal of Animal Sciences**7:**321-324.

Jahanian R, Edriss MA. Metabolizable energy and crude protein of two quail species (*Coturnix japonica and Coturnixypsilophorus*). 2015.The Journal of Animal and Plant Sciences 25: 603-611.
Jaturasitha S, Kayan A, Michael W. 2008. Carcass and meat characteristics of male chickens between Thai indigenous compared with improved layer breeds and their crossbred. Arch TierzDummerstorf, 51**:** 283-294.
Jung YH, Jeon J, Jung S, Choe H, Lee JH, Heo KN, Kang BS, Jo C. 2011. Comparison of quality traits of thigh meat from Korean native chickens and broilers. Korean Journal of Food Science and Animal Resource,31**:** 684-692.
Li CC, Li K, Li J, Mo DL, Xu RF, Chen GH, Quiangba YZ, Ji SL, Tang XH, Fan B, Zhu MJ, Xiong TA, Guan X and Liu B. 2006. Polymorphism of Ghrelin gene in twelve Chinese indigenous chicken breeds and its relationship with chicken growth traits. Asian-Australian Journal of Animal Science**,** 19: 153-159.
Karakaya M, Saricoban C, Yilmaz MT 2005: The effect of various types of poultry pre and post-rigor meats on emulsification capacity, water holding capacity and cooking loss. European Food Research and Technology**,** 220**,** 283-286.
Ngoka, D. A., and G. W. Froning, 1982. Effect of free struggle and preslaughter excitement on color of turkey breast muscles. Poultry Sci. 61:2291–2293
Omojola AB, Isa MA, Jibir M, Ajewole BT, Garba S, Kassim OR, Omotoso AB, Adeyemo OA, Akinleye SB. 2012. Carcass characteristics and meat attributes of pigeon (*Columbia livia*) as influenced by strain and sex. Journal of Animal Science Advances,2:475-480.
Orr HL, Hunt EC. 1984. Yield of carcass, parts, meat, skin, and bone of eight strains of broilers. Poultry Science**,** 63**:** 2197-2200.
Pomianowski JF, Mikulski D, Pudyszak K, Cooper RG, Angowski M, Jozwik A, Horbanczuk JO 2009: Chemical composition, cholesterol content, and fatty acid profile of pigeon meat as influenced by meat-type breeds. Poultry Science,88: 1306-1309.
SAS. 2002. SAS Software for PC. SAS Institute Inc., Cary, NC, USA.