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Impact of Parental Age on Carcass Characteristics and Dressing Percentage of Progeny in Naked Neck Chickens

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Abstract

The current research was carried out to examine how the age of parents affected carcass traits of progeny in three varieties of Naked Neck chicken. The birds used in carcass assessment were 36 birds chosen at the age of 20 weeks out of three varieties (light brown, black and dark brown) produced out of two age groups (45 and 55 weeks). The carcass characteristics, such as the live body weight at slaughter, dressed weight, dressing percentage, relative organ weights, cut-up parts yield, and intestinal characteristics, were taken. The findings showed that the age of the parents had a great effect on the live body weight, dressed weight, and dressing percentage ($P \leq 0.05$). The progeny of parents that were 45 weeks old showed a greater percentage of dressing in comparison to the progeny of parents that were 55 weeks. Dressed weight and some parts of the cut-up had varietal differences, with the black variety having better carcass yield. The age and diversity of parents had a great influence on the desired carcass characteristics. The conclusion was that the age of parents has a major influence on the nature of the carcass of Naked Neck chicken offspring, and the optimal breeder age can enhance meat production in native chickens.

Keywords: Parental Age, Carcass Traits, Dressing Percentage, Naked Neck Chicken, Indigenous Poultry

1. Introduction

The carcass traits are one of the most significant economic properties in poultry production that directly affect the outcome in terms of meat yield, processing performance, and market value. Live body weight at slaughter, dressed weight, dressing percentage, and relative yield of edible parts are some of the common traits used to determine the potential of the poultry breeds in meat production [1]. The attributes of the carcass play a significant role in indigenous poultry production systems, as consumers are more concerned with the quality of meat, the size of the portion, and the customary slaughter [2].

Some of the factors that affect the development of the carcass in poultry include genetics, nutrition, management practices, parental characteristics, and so on. The age of the breeder stock has been identified as one of the parental factors that influence yield and composition of progeny in the form of carcass [3]. Age of the parent also has effects on the egg traits, embryo growth, and eventual growth of muscles and other organs that could have an impact on the carcass traits at the stage of market growth. Several research works done on commercial broiler strains have indicated mixed effects of breeder age on carcass yield, dressing percentage, and cut-up parts. Findings of commercial strains, however, cannot be directly extrapolated to indigenous poultry breeds because there are differences in growth patterns and the makeup of body composition [4, 5].

Naked Neck chickens are a valuable indigenous genetic stock source because of their ability to adapt to hot climates, withstand harsh environments, and fit the rural and semi-intensive production systems [6]. Na gene presence helps decrease the feather cover, enhance heat loss, and modify body composition, which could reflect on carcass attributes. The Naked Neck chickens in Pakistan occur in various phenotypic forms, some of which are light brown, black, and dark brown, which may vary in carcass yield and distribution of edible parts, owing to genetic variation [7].

Although the carcass characteristics are important in the production of indigenous poultry, little is known about how the age of the parents contributes to the carcass characteristics of Naked Neck chicken progeny [8]. Moreover, there is a lack of comparative data of varietal differences and the effects of interaction between parental age and variety on carcass characteristics. The production of this kind of information is necessary to manage breeders optimally and enhance the efficiency of meat production of native poultry [9].

Thus, the current research was developed in order to assess the effect of parental age on carcass traits as well as dressing percentages of progeny of three varieties of Naked Neck chickens at 20 weeks. This study will provide insights on how indigenous poultry can be used to produce meat, and thus, the findings are likely to aid in enhancing the knowledge base on the potential of indigenous chickens in meat production and the design of sustainable breeding management.

2. Materials and Methods

2.1 Experimental Site

The present study was conducted at the Indigenous Chicken Genetic Resource Center (ICGRC), Department of Poultry Production, University of Veterinary and Animal Sciences (UVAS), Pakistan. Birds were reared under standard management conditions up to 20 weeks of age, as described in the thesis.

2.2 Experimental Birds and Design

36 Naked Neck chicken chicks of three phenotypic varieties (light brown, black, and dark brown) and hatched from parents of two age groups (45 and 55 weeks) were originally reared. In the case of the carcass assay, birds were chosen at the age of 20 weeks. Three males and three females were selected from each variety and each parental age group, randomly making them equal in sex, variety, and parental age.

2.3 Pre-slaughter Management and Slaughter Procedure

The birds that were selected were starved (without feed) 5-6 hours before slaughter to clear the gut, although access to drinking water was not limited. The weight of each bird at slaughter was measured using the electronic weighing balance with a minimum count of 0.1g. The slaughtering of birds was done in a normal manner as dictated by halal. De-feathering, evisceration, and carcass assessment of birds were done after slaughtering as per the normal poultry meat evaluation procedure.

2.4 Carcass Measurements

The following carcass traits were recorded:

- Live body weight (g): Recorded prior to slaughter
- Dressed weight (g): Weight of eviscerated carcass without skin
- Dressing percentage (%): Calculated as (dressed weight / live body weight) × 100

2.5 Organ and Cut-up Parts Evaluation

After evisceration, internal organs and carcass parts were separated and weighed individually. The following parameters were recorded and expressed as a percentage of live body weight:

- Heart weight (%), Liver weight (%), Gizzard weight (%)
  Breast weight (%), Thigh weight (%), Drumstick weight (%)
  Neck weight (%), Wings weight (%), Ribs and back weight (%)

2.6 Intestinal Traits

Intestinal traits were evaluated by recording:

- Intestinal weight (%): Expressed as a percentage of live body weight
- Intestinal length (cm): Measured using a measuring tape

2.7 Statistical Analysis

Carcass data were analyzed using two-way analysis of variance (ANOVA) through PROC GLM in SAS software (version 9.1). The statistical model included the effects of variety, parental age, and their interaction. Mean comparisons were performed using Tukey's Honestly Significant Difference (HSD) test at a significant level of $P \leq 0.05$. Each bird was considered an experimental unit for carcass analysis.

3. Results

3.1 Live Body Weight, Dressed Weight, and Dressing Percentage

Mean values of live body weight at slaughter, dressed weight, and dressing percentage of Naked Neck chicken progeny at 20 weeks of age are presented in Table 3.1.

Table 3.1. Effect of two Parental Ages on Progeny live body and dressed weight and dressing% (20 weeks) among three varieties of Naked Neck chickens

Variety		Live body weight		Dressed weight		Dressing %	
		Male	**Female**	**Male**	**Female**	**Male**	**Female**
Light Brown		1364.67± 48.45	1068.00±32. 73	793.00±45 .37	594.00^{b} ±34.43	58.30± 3.46	55.57±2. 71
Black		1403.67±46. 67	1230.67 ±60.38	800.33±21 .59	706.97^{a} ±24.94	57.20±1. 74	57.68±1. 41
Dark Brown		1364.00±40. 93	1170.00± 56.25	759.67 ±13. 81	672.67^{ab}±30 .43	55.89±1. 61	57.92±2. 89
Parental age group							
45 weeks		1308.22^{b}±23 .20	1130.22±27. 13	791.78 ±29.25	693.76^{a} ±18.52	60.51^{a} ±1.93	61.38^{a} ±0.75
55 weeks		1446.67^{a}±30 .55	1182.22±59. 20	776.89±18 .44	622.00^{b} ±32.14	53.75^{b} ±1.01	52.73^{b} ±1.55
Variety × Parental age group							
Light Brown	45 weeks	1289.33± 48.25	1056.00±16. 65	828.00±87 .87	646.67±23. 67	63.95±5. 03	61.20±1. 33
	55 weeks	1440.00± 61.10	1080.00±70. 24	758.00 ±36. 66	541.33±50. 92	52.65±1. 64	49.95±1. 80
Black	45 weeks	1334.00±51. 59	1194.67±41. 07	782.67±28 .85	712.60±32. 96	58.85±3. 14	59.61±1. 19
	55 weeks	1473.33±58. 12	1266.67±123 .47	818.00±34 .43	701.33±44. 64	55.56±1. 60	55.75±2. 20
Dark Brown	45 weeks	1301.33±30. 60	1140.00±44. 60	764.67 ±25. 46	722.00±28. 00	58.73±0. 69	63.33±0. 09
	55 weeks	1426.67±59. 25	1200.00±113 .72	754.67±16 .75	623.33±37. 56	53.05±2. 11	52.50±3. 52
***P*-value**							
Variety		0.6957	0.1548	0.6364	0.0298	0.6880	0.4544
Parental age		0.0072	0.4335	0.6908	0.0370	0.0108	0.0002
Variety × Parental age		0.9713	0.9509	0.5171	0.4031	0.3592	0.1551

[a-b]Superscripts on different means within column show significant difference ($P \leq 0.05$)

Parental age significantly influenced live body weight at slaughter ($P \leq 0.05$). Progeny derived from 55-week-old parents exhibited significantly higher live body weight compared to progeny

from 45-week-old parents. Dressed weight was significantly affected by variety, with black Naked Neck chickens showing higher dressed weight than light brown and dark brown varieties.

Dressing percentage was significantly influenced by parental age ($P \leq 0.05$). Progeny from 45-week-old parents exhibited a higher dressing percentage compared to progeny from 55-week-old parents. Varietal differences for dressing percentage were non-significant. The interaction between parental age and variety for dressing percentage was also non-significant.

3.2 Relative Organ Weights

Relative weights of heart, liver, and gizzard expressed as a percentage of live body weight are presented in Table 3.2. Parental age did not significantly affect relative liver and gizzard weights in either sex. However, heart weight percentage was significantly higher ($P \leq 0.05$) in female progeny derived from 45-week-old parents compared to those from older parents. Varietal differences and interaction effects between parental age and variety for relative organ weights were generally non-significant.

Table 3.2. Effect of two Parental Ages on Progeny relative giblets weight% (20 weeks) among three varieties of Naked Neck chickens

Variety		Heart weight %		Liver weight %		Gizzard weight %	
		Male	**Female**	**Male**	**Female**	**Male**	**Female**
Light Brown		0.61±0.04	0.55±0.01	2.17±0.16	2.47±0.19	1.83±0.09	1.77±0.15
Black		0.59±0.03	0.54±0.05	2.06±0.15	2.07±0.11	1.70±0.09	1.72±0.11
Dark Brown		0.68±0.06	0.63±0.02	1.83±0.06	2.72±0.19	1.58±0.21	1.86±0.11
Parental age group							
45 weeks		0.63±0.04	0.61[a]±0.03	2.00±0.13	2.49±0.17	1.79±0.12	1.89±0.08
55 weeks		0.63±0.04	0.53[b]±0.03	2.04±0.10	2.35±0.15	1.61±0.10	1.68±0.09
Variety × Parental age group							
Light Brown	45 weeks	0.62±0.02	0.57±0.01	2.03±0.28	2.65±0.37	1.76±0.05	1.96±0.20
	55 weeks	0.59±0.10	0.53±0.00	2.30±0.21	2.29±0.03	1.90±0.18	1.58±0.18
Black	45 weeks	0.59±0.07	0.62±0.07	2.23±0.25	2.06 ±0.15	1.76±0.17	1.85±0.16
	55 weeks	0.59±0.02	0.47±0.05	1.89±0.13	2.08±0.20	1.63±0.06	1.58±0.11
Dark Brown	45 weeks	0.66±0.12	0.64±0.04	1.74±0.11	2.75±0.25	1.85±0.39	1.86±0.13
	55 weeks	0.70±0.03	0.61±0.01	1.92±0.03	2.68±0.36	1.31±0.02	1.86±0.19
***P*-value**							
Variety		0.4146	0.1083	0.2228	0.0714	0.4495	0.6957
Parental age		0.9710	0.0435	0.8301	0.5241	0.2857	0.1337
Variety × Parental age		0.8739	0.2916	0.2523	0.7419	0.2478	0.5216

[a-b]Superscripts on different means within column show significant difference ($P \leq 0.05$)

3.3 Cut-up Parts Yield

Relative yields of breast, thigh, and drumstick are presented in Table 3.3, while yields of neck, wings, ribs, and back are shown in Table 3.4.

Table 3.3. Effect of two Parental Ages on Progeny breast, thigh and drumstick weight% (20 weeks) among three varieties of Naked Neck chicken

Variety		Breast weight %		Thigh weight %		Drumstick weight %	
		Male	Female	Male	Female	Male	Female
Light Brown		12.05±0.74	13.23±0.40	10.85 ±0.36	9.34±0.50	9.69± 0.45	8.31±0.49
Black		13.16±0.60	14.03±0.97	10.58±0.33	9.91±0.36	10.11±0.33	8.86±0.19
Dark Brown		11.97±0.58	13.41±0.57	11.01 ±0.30	9.88±0.50	9.99±0.14	8.69±0.30
Parental age group							
45 weeks		12.47±0.50	12.95±0.60	10.71±0.28	9.54±0.36	9.76±0.32	8.66±0.24
55 weeks		12.31±0.58	14.16±0.42	10.92±0.25	9.88±0.37	10.10±0.20	8.57±0.32
Variety × Parental age group							
Light Brown	45 weeks	13.09±0.64	12.51±0.54	10.95±0.72	9.34±0.88	9.42±0.89	8.91±0.70
	55 weeks	11.02±1.13	13.94±0.10	10.75±0.35	9.34 ±0.68	9.96±0.39	7.72±0.58
Black	45 weeks	4.85±0.34	12.69±1.60	10.13±0.28	9.63±0.32	9.67±0.50	8.70±0.14
	55 weeks	14.06±0.29	15.36±0.64	11.04±0.52	10.19±0.69	10.56±0.31	9.02±0.38
Dark Brown	45 weeks	12.07±1.19	13.66±1.03	11.05±0.33	9.63±0.83	10.19±0.08	8.39±0.35
	55 weeks	11.87±0.52	13.17 ±0.71	10.97±0.58	10.12±0.70	9.78±0.23	8.98±0.47
***P*-value**							
Variety		0.3297	0.6566	0.6846	0.6714	0.6603	0.5146
Parental age		0.8241	0.1265	0.6068	0.5619	0.3974	0.8180
Variety × Parental age		0.1171	0.2472	0.4839	0.9111	0.3938	0.1679

Parental age significantly affected the relative yield of certain cut-up parts ($P \leq 0.05$). Progeny from 45-week-old parents exhibited a higher relative yield of edible portions compared to progeny from older parents. Varietal differences were observed for breast and thigh yield, with black Naked

Neck chickens showing significantly higher values than light brown and dark brown varieties. The interaction between parental age and variety for most cut-up parts was non-significant, indicating a consistent effect of parental age across varieties.

Table 3.4. Effect of two Parental Ages on Progeny neck, wings, ribs, and back weight % (20 weeks) among three varieties of Naked Neck chickens

Variety		Neck weight %		Wings weight%		Ribs and back weight%	
		Male	**Female**	**Male**	**Female**	**Male**	**Female**
Light Brown		3.69 ±0.13	3.24±0.21	5.41±0.23	5.14±0.14	11.92^{a}±0.39	11.42±0.56
Black		3.87±0.11	3.35±0.15	5.56±0.19	5.48±0.17	10.21^{b}±0.17	12.12±0.31
Dark Brown		3.95±0.10	3.29±0.14	5.38±0.08	5.43±0.27	11.42^{ab}±0.62	12.00±0.65
Parental age group							
45 weeks		3.79±0.11	3.34±0.15	5.48±0.16	5.41±0.12	11.53±0.51	12.52^{a}±0.31
55 weeks		3.88±0.08	3.25±0.11	5.42±0.12	5.29±0.20	10.83±0.27	11.17^{b}±0.39
Variety × Parental age group							
Light Brown	45 weeks	3.58±0.28	3.41 ±0.40	5.68±0.40	5.31 ±0.22	12.52±0.58	12.43±0.60
	55 weeks	3.80±0.04	3.08±0.19	5.13±0.14	4.98±0.15	11.31 ±0.24	10.40±0.40
Black	45 weeks	3.75±0.10	3.45±0.23	5.37±0.32	5.47±0.09	10.30±0.08	12.24± 0.56
	55 weeks	3.99±0.19	3.25±0.23	5.75±0.22	5.49±0.38	10.12±0.36	12.00±0.40
Dark Brown	45 weeks	4.05±0.05	3.17±0.23	5.38±0.11	5.45±0.33	11.78±1.21	12.90±0.62
	55 weeks	3.84±0.18	3.42±0.17	5.38±0.15	5.40±0.49	11.07±0.55	11.10 ±0.95
***P*-value**							
Variety		0.3050	0.9131	0.7390	0.5261	0.0457	0.4956
Parental age		0.5365	0.6582	0.7781	0.6538	0.1909	0.0195
Variety × Parental age		0.3446	0.5026	0.2087	0.8378	0.7127	0.3247

3.4 Intestinal Traits

Mean values of intestinal weight percentage and intestinal length are presented in Table 3.5. Parental age significantly influenced intestinal length ($P \leq 0.05$). Progeny from 55-week-old parents exhibited longer intestines compared to progeny from 45-week-old parents. Intestinal weight percentage was not significantly affected by parental age or variety. No significant interaction effects were observed for intestinal traits.

Table 3.5. Effect of two Parental Ages on Progeny intestinal weight% and intestinal length (20 weeks) among three varieties of Naked Neck chickens

Variety		Intestinal weight%		Intestinal length (cm)	
		Male	Female	Male	Female
Light Brown		4.53±0.39	5.06±0.35	58.65±2.23	55.65±3.26
Black		4.34±0.35	4.53±0.47	58.30±1.44	56.22±4.48
Dark Brown		4.04±0.18	5.22 ±0.34	55.00±1.30	55.58±3.14
Parental age group					
45 weeks		4.31±0.28	4.37[b]±0.28	57.97±1.49	51.97±1.23
55 weeks		4.29±0.24	5.50[a] ±0.24	56.67±1.40	59.67±3.42
Variety × Parental age group					
Light Brown	45 weeks	4.13±0.70	4.62±0.64	55.97±4.03	52.30±1.19
	55 weeks	4.93±0.36	5.49±0.12	61.33±1.20	59.00±6.35
Black	45 weeks	4.85±0.34	3.78±0.16	60.27±2.23	51.77±2.35
	55 weeks	3.82±0.48	5.28±0.72	56.33±1.20	60.67±8.67
Dark Brown	45 weeks	3.96±0.37	4.71±0.47	57.67±0.93	51.83±3.35
	55 weeks	4.13±0.16	5.73±0.31	52.33±0.67	59.33±4.91
***P*-value**					
Variety		0.5382	0.3316	0.1898	0.9908
Parental age		0.9575	0.0113	0.4541	0.0907
Variety × Parental age		0.1406	0.7876	0.0914	0.9767

[a-b] Superscripts on different means within column show significant difference ($P \leq 0.05$)

4. Discussion

The current research has shown that the age of parents significantly impacts the carcass properties of Naked Neck chicken offspring. The difference identified in live body weight, dressing percentage, and parts cut up indicates that the age of the parent influences the development of the carcass and meat distribution in indigenous poultry. These results show the value of breeder age in defining the efficiency of the Naked Neck chicken in producing meat [8, 10].

The increased live body weight in progeny at slaughter that was observed with 55-week-old parents can be explained by improved embryo development and better nutrient availability with increased breeder age [11]. The higher mass of eggs and the increased levels of nutrients contained in the eggs of older parents can contribute to more muscle deposition and accumulation of body mass at the market age, leading to higher live body weight [12].

Although the live body weight of progeny of older parents was higher, dressing percentage was significantly greater in progeny of parents at 45-weeks. This would imply that a more favorable proportion of edible portions in relation to the total body weight might be found in the younger stock of parent stock. Body structure variations, including proportions of muscle mass, fat, and inedible parts, could possibly be treated as the sources of the deviation of dressing percent between parental age groups [13].

Observed varietal differences in dressed weight and cut-up parts in the current study suggest the genetic variation in Naked Neck chicken varieties. The black type had a better-dressed weight and higher yields of some edible parts, implying that it had better muscle deposition and carcass conformation. This genetic variation can be utilized in breeding initiatives that will enhance the meat production of native poultry [14].

Parental age and variety did not affect relative organ weights generally, and this showed that there were no variations in the internal organ development in the treatment groups. Nevertheless, an increase in the percentage of heart weight in the female progeny of younger parents can be a sign of physiological differences related to the age and sex of parentage. Also, the longer intestinal length of the progeny of older parents can be related to the higher level of feed intake and the ability to digest more food [15].

The low level of interaction of parental age and parental variety on the carcass traits indicates that parental age does not affect carcass traits in different Naked Neck Chicken varieties in a significantly different way. The results are consistent with the literature on poultry carcass characteristics and offer new data regarding indigenous Naked Neck chicken carcass characteristics. Overall, the findings of this experiment give interesting data about the impact of parental age on the carcass traits of Naked Neck chicken offspring. The results highlight the importance of optimizing the breeder age in indigenous poultry production systems to have better meat production and processing.

5. Conclusion

The conclusion of the study is that parental age has a strong influence on carcass traits of Naked Neck chicken offspring. The descendants of 55-week-old parents had a high slaughter weight of the live body, and the progeny of 45-week-old parents had better dressing percentage and relative edible parts yield. Carcass variations were also accounted for in the carcass trait, whereby black Naked Neck chicken exhibited superior dressed weight and cut-up parts than light brown and dark brown types. There was no significant change in parent age on internal organ weights, and intestinal length was longer in offspring of older parents. The results have shown that optimization of parental age, as well as taking into account varietal differences, can lead to higher efficiency of meat production of indigenous Naked Neck chickens under local production systems

Conflict of Interest

The authors declare no conflict of interest.

Author`s Contribution

All authors contributed equally.

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