Evaluation of Carcass Characteristics in Kadaknath, Narmada Nidhi and Rhode Island Red Breeds of Poultry

Nitin Mohan Gupta[1]*, Satyendra Singh Tomar[2], Amit Kumar Jha[1], Anjani Kumar Mishra[3] and Rajesh Kumar Vandre[1]

[1]*Department of Animal Genetics & Breeding, College of Veterinary Science & Animal Husbandry, Rewa, M.P., INDIA*
[2]*Department of Animal Genetics & Breeding, College of Veterinary Science & Animal Husbandry, Jabalpur, M.P., INDIA*
[3]*Department of Livestock Production Management, College of Veterinary Science & Animal Husbandry, Rewa, M.P., INDIA*

*Corresponding author: NM Gupta; E-mail: vetnitin@gmail.com

ABSTRACT

Poultry meat, as source of high-quality animal proteins, is important for sustaining health and nutrition of ever growing human population. Carcass traits are economically important for the chicken industry. The present study was planned to evaluate the carcass traits among Kadaknath, Narmada Nidhi and Rhode Island Red birds. The birds were kept in deep litter in identical conditions and were fed with the same standard commercial broiler diet. Twenty birds from each genetic group were sacrificed at 12 weeks of age for obtaining data pertaining to carcass traits namely live weight, carcass weight, dressing percentage, breast muscle weight, wings, drumstick weight and thigh muscle weight. The statistical analysis was done by analysis of variance using SPSS 20.0 package and means were compared by DMRT. The study revealed that body weight of Narmada Nidhi was higher than Rhode Island Red and Kadaknath, and within breed males grew faster than females. The results showed that carcass parameters viz., live weight, carcass weight, dressing percentage, wings, drumstick weight and thigh muscle weight of Narmada Nidhi and Rhode Island Red birds were significantly (P<0.05) higher than that of Kadaknath birds. Breast muscle weight differed significantly among these three genetic groups (P<0.05). However, the differences in dressing percentage among three genetic groups were found to be non-significant (P>0.05). The result indicated that these three breeds of different genetic groups differed in various carcass traits. Narmada Nidhi birds were found to be superior followed by Rhode Island Red as compared to Kadaknath for carcass traits.

HIGHLIGHTS

⊙ Comparative evaluation of Carcass characteristics in Kadaknath, Narmada Nidhi and Rhode Island Red birds.
⊙ The effect of genetic group was observed to be significant on carcass traits in the study.
⊙ Narmada Nidhi birds were found superior among all the three genetic groups.

Keywords: Carcass traits, chicken, Kadaknath, Narmada Nidhi, Rhode Island Red

Poultry industry has witnessed the fastest growth amongst agriculture and allied sectors in India. The production of agricultural crops has been rising at a rate of 1.5-2 % per annum while broilers production is growing at a rate of 8-10 % per annum. As per the Basic Animal Husbandry statistics, 2019 released by the Department of Animal Husbandry, the poultry meat production was reported to be 4.06 million tons in 2019-20, registering an increase of 7.8% over the previous year. The total Poultry in the country was 851.81 million in 2019, witnessing an increase by 16.8% over previous Census. The total Commercial Poultry in the country was 534.74 million in 2019, showing an increase of 4.5% over previous Census

(20th Livestock Census). Chicken meat is the cheapest source of animal protein and is the most preferred meat across the world (Rajkumar *et al.,* 2016). Indigenous chicken breeds in developing countries have diverse benefits to rural economy as a source of high-quality animal protein. Kadaknath is a native breed of poultry mainly found in Jhabua and Dhar districts in Western part of Madhya Pradesh. The meat of Kadaknath chicken from Jhabua district has also acquired a Geographical Indication (GI) tag recently in the year 2018. The meat and eggs are reckoned to be a rich source of protein (25.47% in flesh) and iron. This is the only poultry breed having black flesh which is considered not only a delicacy of distinctive taste, but also said to have aphrodisiac value. In tribal and rural India, Kadaknath breed is frequently employed for both meat and egg production. The black flesh is very delicious, popular among tribal's and used for the treatment of diseases by them, which needs proper scientific intervention.

Narmada Nidhi is a better location-specific variety of chicken. It is dual purpose colored bird suitable for rural and tribal areas of poultry farming in Madhya Pradesh. It has been developed in such a way that terminal cross has 25% inheritance of Kadaknath breed and 75% inheritance of Jabalpur color variety. Rhode Island Red is a dual purpose domestic chicken breed from the United States. Due to egg laying abilities and hardiness, it is popular choice for backyard flocks. In modern broilers, selections for fast growth and high yield have pushed muscle fibers to their maximum functional size and have negatively impacted the sensorial and functional qualities of the meat. Pure line chickens, including indigenous and foreign strains, were used to create crossbreds for free range poultry production (Padhi *et al.,* 2016; Rajkumar *et al.,* 2019). Furthermore, customer preferences for quality over quantity of meat create potential for marketing meat and meat products derived from native free-range birds. However, the comparative studies on carcass traits of Kadaknath, Narmada Nidhi and Rhode Island Red birds are very limited and scattered. Hence, the present investigation was undertaken to evaluate the carcass characteristics of Kadaknath, Narmada Nidhi and Rhode Island Red breed of poultry.

MATERIALS AND METHODS

The present investigation was conducted at Instructional Poultry unit of College of Veterinary Science and Animal Husbandry, Rewa, M.P. All trials were duly approved by the Institutional Animal Ethical Committee. Birds of three genetic groups' viz., Kadaknath (indigenous breed), Narmada Nidhi (synthetic line) and Rhode Island Red (exotic breed) were included in the study. Kadaknath and Narmada Nidhi were procured from Poultry farm of College of Veterinary Science and Animal Husbandry, Rewa, M.P. and Rhode Island Red from Government Poultry farm, Rewa, M.P. All chickens were feed *ad-libitum* with the standard commercial grower diet containing 11.5 MJ/ME kg DM and 21% crude protein until 12 weeks of age. Birds had free access to drinking water round the clock. Identical management and rearing conditions were provided to all the three genetic groups in deep litter system during the entire period of experiment.

Twenty birds from each genetic group were sacrificed on 12 weeks of age for obtaining the data on carcass traits. The birds were kept off fed overnight, weighed before slaughter and then slaughtered by cervical dislocation, bled, plucked and weighed to determine blood and feather losses. After the carcasses were eviscerated and dissected manually, the weights of different organs were recorded with sensitive digital balance after cutting the organs as per the standard procedures (Sams, 2005). The weights of various cut-up parts, along with live weight, dressed weight, breast, thigh and wings were recorded separately for each bird. Dressing percentage was calculated as the ratio between the carcass weight and live body weight after fasting. The data generated on various carcass traits were subjected to one way ANOVA using SPSS 20.0 (IBM, USA) software to find the significant differences among different breeds, if any (Snedecor and Cochran, 1994; Duncan, 1995).

RESULTS AND DISCUSSION

Analysis of variance revealed significant effect (P<0.05) of genetic groups on live weight of birds at 12 weeks of age. Narmada Nidhi birds recorded highest live weight followed by Rhode Island Red and Kadaknath. The mean live weight of Kadaknath, Narmada Nidhi and Rhode Island Red were 813±36.89 g, 1138.88±62.70 g and 1049.83±21.69 g, respectively (Table 1). There was non-significant difference in live weight between Narmada Nidhi and Rhode Island Red birds and these two genetic

groups weighed significantly higher than Kadaknath birds (Table 2). The present findings are in line with the Rajkumar *et al.* (2021) in two way cross produced by improved Aseel birds.

The mean carcass weights of Kadaknath, Narmada Nidhi and Rhode Island Red birds were calculated to be 521.83±26.02 g, 722.27±37.81 g and 668.94±15.54 g, respectively (Table 1). The effect of genetic group on this trait was significant (P<0.05) (Table 2). Narmada Nidhi birds recorded highest carcass weight followed by Rhode Island Red and Kadaknath. There was non-significant difference in carcass weight between Narmada Nidhi and Rhode Island Red birds while they differ significantly (P<0.05) from Kadaknath birds (Table 1). The findings recorded in the present study were comparable to the reports of Iqbal *et al.* (2009) in different chicken breeds.

Analysis of variance revealed that the effect of genetic groups on dressing percentage was non-significant (P>0.05). The mean of dressing percentages in Kadaknath, Narmada Nidhi and Rhode Island Red birds were found to be 63.95±0.52, 63.53±0.80 and 63.67±0.38, respectively (Table 1). Present findings are in consonance with the mean values for dressing percentage as reported by Devatkal *et al.* (2018) in white commercial broiler, Aseel (ASL) and Indbro Aseel. Contrary to the present findings higher value of dressing percentage was reported by Rajkumar *et al.* (2021) in Improved Aseel which might be attributed to pre-slaughter handling of birds.

The mean weight of breast muscle in Kadaknath, Narmada Nidhi and Rhode Island Red birds were found to be 134.05±6.7 g, 198.66±9.52 g and 176.72±4.1 g,

respectively (Table 1). Analysis of variance revealed significant effect (P<0.05) of genetic groups on this trait in these birds (Table 2). Narmada Nidhi birds recorded highest mean breast muscle weight followed by Rhode Island Red and Kadaknath. Significant difference was found among three genetic groups of birds. The breast muscle proportion was higher in the present study compared to the Aseel and normal broilers as reported by Rajkumar *et al.* (2016), which might be attributed to the selection criterion as the commercial broilers were selected for broader breast resulting in higher breast proportion.

Analysis of variance revealed significant effect (P<0.05) of genetic groups on wings muscle weight (Table 2). Narmada Nidhi birds recorded (Table 1) highest mean wing muscles weight (89.72±4.7 g) followed by Rhode Island Red (83.72±2.1 g) and Kadaknath (63.05±3.3 g). There was non-significant difference in mean wings muscle weight between Narmada Nidhi and Rhode Island Red birds and these two genetic groups differed significantly (P<0.05) from Kadaknath birds (Table 1).

The mean drumstick muscle weight of Kadaknath, Narmada Nidhi and Rhode Island Red birds were calculated to be 80.88±4.65 g, 120.88±7.6 g and 109.83±2.69 g, respectively (Table 1). Analysis of variance revealed significant effect (P<0.05) of genetic groups on drumstick muscle weight (Table 2). Narmada Nidhi birds recorded highest drumstick muscle weight followed by Rhode Island Red and Kadaknath birds. There was non-significant difference in mean drumstick muscle weight between Narmada Nidhi and Rhode Island Red birds while these two breed groups differed significantly from

Table 1: Carcass traits (g) of Kadaknath, Narmada Nidhi and Rhode Island Red Birds at 12th weeks of age (Mean±SE)

Parameters	Kadaknath	Narmada Nidhi	Rhode Island Red
N	20	20	20
Live Weight	813 [a] ±36.89	1138.88 [b] ±62.70	1049.83 [b] ±21.69
Carcass Weight	521.83 [a] ±26.02	722.27 [b] ±37.81	668.94 [b] ±15.54
Dressing Percentage	63.95±0.52	63.53±0.80	63.67±0.38
Cut up parts			
Breast	134.05 [a] ± 6.7	198.66 [c] ±9.52	176.72 [b]±4.1
Wing	63.05 [a] ±3.3	89.72 [b] ±4.7	83.72 [b] ±2.1
Drumstick	80.88 [a] ±4.65	120.88 [b] ± 7.6	109.83 [b] ±2.69
Thigh	66.16 [a] ±4.54	88.0 [b] ±9.18	94.33 [b] ±2.85

a, b: Means with different superscripts differ significantly (P≤0.05) within a row; N: Number of birds slaughtered.

Table 2: Analysis of Variance for different Carcass Traits

Trait	Source of Variation	Degree of Freedom	Mean Square	F
Live weight	Between Groups	2	510673.4	14.7*
	Within Groups	57	34579.8	
Carcass weight	Between Groups	2	193992.296	13.7*
	Within Groups	57	14094.4	
Dressing Percentage	Between Groups	2	0.815	0.12NS
	Within Groups	57	6.4	
Breast	Between Groups	2	19429.7	21.1*
	Within Groups	57	919.9	
Wing	Between Groups	2	3522.6	15.2*
	Within Groups	57	230.2	
Drumstick	Between Groups	2	7680.0	14.7*
	Within Groups	57	520.7	
Thigh	Between Groups	2	3930.5	5.7*
	Within Groups	57	678.7	

* Significant ($P<0.05$); NS: Non-significant.

Kadaknath birds (Table 1). The difference may be due to the fact that body weight is directly proportional to weight of body muscle and bones. As the Narmada Nidhi birds attained higher weight among the studied groups which reflected in drumstick weight in these groups. A lower value of drumstick muscle weight was reported by Pathak *et al.* (2015) which may be due to differences in slaughter age.

Analysis of variance for thigh muscle weight showed significant effect ($P<0.05$) of genetic groups (Table 2). Rhode Island Red birds recorded highest mean thigh muscle weight followed by Narmada Nidhi and Kadaknath birds. The mean weight of thigh muscle of Kadaknath, Narmada Nidhi and Rhode Island Red birds were estimated to be 66.16±4.54 g, 88.0±9.18 g and 94.33±2.85 g, respectively (Table 1). There was non-significant difference in thigh muscle weight between Narmada Nidhi and Rhode Island Red birds and these two breed groups differed significantly from Kadaknath birds (Table 1). The higher thigh muscle weight in Narmada Nidhi birds may be due the fact of having positive correlation between breast weight and thigh weight with the live weight of birds.

CONCLUSION

The result of present study indicated that these three birds of different genetic groups differed in various carcass traits. Narmada Nidhi birds were found to be superior followed by Rhode Island Red as compared to Kadaknath for carcass traits. The study concluded that birds with higher carcass weight may be propagated in rural and tribal areas for fetching more returns. Further, genetic characterization of the above genetic groups of birds for growth candidate genes viz., Chicken Growth Hormone (cGH) and Insulin like Growth Factor-1 (IGF-1) will ascertain polymorphism and their association with growth and carcass traits.

REFERENCES

Devatkal, S.K., Vishnuraj, M.R., Kulkarni, V.V. and Kotaiah, T. 2018. Carcass and meat quality characterization of indigenous and improved variety of chicken genotypes. *Poult. Sci.*, **1**: 1–10

Duncan, D.B. 1995. New multiple range and ''F'' test. *Biometrics*, **11**: 1-42.

Iqbal. S., Pampori, Z.A. and Hasin, D. 2009. Carcass and egg characteristics of indigenous chicken of Kashmir (Kashmir Favorella). *Indian J. Anim. Res*., **43**(3): 194-196.

Livestock Census 20th report. 2019. Ministry of Fisheries, Animal Husbandry & Dairying. Government of India.

Padhi, M.K., Chatterjee, R.N., Rajkumar, U., Niranjan, M. and Haunshi, S. 2016. Evaluation of three way cross chicken developed for backyard poultry in respect to growth,

production and carcass quality traits under intensive system of rearing. *J. Appl. Anim. Res.,* **44**: 390-394

Prajwalita, P., Dubey, P.P., Dash, S.K. and Chaudhary, M.L. 2015. Studies on growth and carcass traits of Aseel and Kadaknath chicken. *Indian J. Poult. Sci.*, **50**(3): 327-328

Rajkumar, U., Haunshi, S., Paswan, C. and Reddy, B.L.N. 2019. Evaluation of two way cross developed for rural poultry under farm and free range conditions. *Indian J. Anim. Sci.,* **89**: 652-657.

Rajkumar, U., Muthukumar, M., Haunshi, S., Niranjan, M., Raju, M.V.L.N., Rama Rao, S.V. and Chatterjee, R.N. 2016. Comparative evaluation of carcass traits and meat quality in native *Aseel* chickens and commercial broilers. *Br. Poult. Sci.*, **57**: 339-347.

Rajkumar, U., Prince, L.L.L., Haunshi, S., Paswan, C. and Muthukumar, M. 2021. Evaluation of Growth, Carcass and Meat Quality of a Two-way Cross Developed for Rural Poultry Farming. *Indian J. Anim. Res.*, **55**(5): 498- 502.

Sams, A.R. 2005. Poultry Meat Processing. CRC Press. London.

Snedecor, G.W. and Cochran, W.G. 1994. Statistical Methods, 7th Edn., Oxford and IBH Publishing Co., New Delhi, pp. 312-317.