



International Journal of Veterinary Sciences and Animal Husbandry



ISSN: 2456-2912

NAAS Rating (2025): 4.61

VET 2026; 11(5): 124-127

© 2026 VET

www.veterinarypaper.com

Received: 16-03-2026

Accepted: 19-04-2026

Ashok A

Ph.D., Professor, Department of
Poultry Science, Madras
Veterinary College, Chennai,
TANUVAS, Tamil Nadu, India

Pranav Bhalaji AS

BVSc & AH., MVSc Scholar,
Department of Poultry Science,
Madras Veterinary College,
Chennai, TANUVAS, Tamil
Nadu, India

Prasanth A

BVSc & AH., MVSc Scholar,
Department of Poultry Science,
Madras Veterinary College,
Chennai, TANUVAS, Tamil
Nadu, India

Corresponding Author:

Ashok A

Ph.D., Professor, Department of
Poultry Science, Madras
Veterinary College, Chennai,
TANUVAS, Tamil Nadu, India

Comparative characterization of carcass traits and physicochemical properties in market-age Kadaknath native chicken and commercial broiler chicken meat: A pilot study

Ashok A, Pranav Bhalaji AS and Prasanth A

DOI: <https://www.doi.org/10.22271/veterinary.2026.v11.i5b.3254>

Abstract

A pilot evaluation was undertaken to compare carcass characteristics and selected physicochemical attributes of market-age Kadaknath native chickens (25 weeks) and commercial broilers (6 weeks). Six birds per group were assessed under standardized slaughter conditions. Carcass traits, cut-up part weights, pH, water holding capacity (WHC), and Warner–Bratzler shear force value (SFV) were recorded. Given the limited sample size, two-sided exact permutation tests were used for inference. In the present dataset, broilers showed substantially higher breast weight and breast yield ($p=0.002$), whereas Kadaknath birds exhibited higher drumstick weight and leg yield ($p=0.030$ and $p=0.002$, respectively). Giblet weight was also higher in broilers ($p=0.009$). Shear force values were markedly elevated in Kadaknath ($p=0.002$), while pH and WHC remained comparable between groups. Taken together, these results reflect a market-age comparison in which genotype and physiological maturity are inseparable. The observed differences therefore likely arise from the combined effects of growth trajectory and age-dependent tissue development. Despite the small sample size, several traits showed very large effect magnitudes, indicating clear divergence in carcass partitioning and mechanical tenderness between the two production systems.

Keywords: Kadaknath, broiler, carcass traits, shear force, effect size, pilot study

Introduction

In recent years, there has been a noticeable shift in consumer preference toward native chicken meat in India, largely driven by perceptions of improved flavour, texture, and traditional value. Among indigenous breeds, Kadaknath occupies a distinct niche due to its pigmentation and perceived health attributes. However, its production profile differs markedly from that of commercial broilers, particularly in terms of growth rate and time to market. Commercial broilers, shaped by decades of intensive selection, achieve rapid body weight gain within a short production cycle. Selection emphasis on feed efficiency and muscle accretion has resulted in pronounced hypertrophy of the pectoralis major (Havenstein *et al.*, 2003) ^[1]. By contrast, Kadaknath follows a slower growth trajectory, typically reaching marketable size only after 24–28 weeks. From a biological standpoint, these differences are not limited to body weight alone. Muscle development, connective tissue organization, and metabolic properties evolve continuously with age. Consequently, when birds are compared at their respective market ages—as in the present study—the comparison inherently integrates both genetic differences and physiological maturity effects. This distinction is important. Traits such as tenderness, for instance, are influenced not only by genotype but also by age-dependent factors including collagen cross-linking, fiber architecture, and proteolytic activity (Dransfield and Sosnicki, 1999; Purslow, 2005) ^[2, 3]. Therefore, rather than attempting to isolate genotype alone, the present study adopts a market-age systems approach, which more closely reflects real production and consumption contexts.

Materials and Methods

Experimental Design

Six Kadaknath chickens (25 weeks) and six commercial broilers (6 weeks) were evaluated. Individual pre-slaughter live weights were recorded.

Slaughter and Carcass Evaluation

Birds were slaughtered by exsanguination, scalded (54 °C, 4 min), defeathered and eviscerated. The following were recorded:

- Pre-slaughter live weight
- New York dressed weight
- Eviscerated carcass weight
- Ready-to-cook weight
- Giblet weight

Carcasses were separated into breast, back, thigh, drumstick,

wing and neck.

Meat Quality Evaluation

Breast muscle was analysed for:

- pH (homogenization method)
- Water holding capacity (filter paper method)
- Warner–Bratzler shear force

Statistical Analysis

Given n=6 per group, two-sided exact permutation tests were used as the primary inferential method. Welch's t-tests were computed as supportive estimates. Effect sizes were calculated using Hedges' g and interpreted as: Small: 0.2 Moderate: 0.5 Large: 0.8 Very Large: >1.3 With n=6 per group, approximately 80% power is achieved only for very large effects ($d \approx 1.8$).

Results

Table 1: Carcass Traits of Market-Age Kadaknath and Broiler Chickens (Mean $\pm$ SE; n=6)

Trait	Kadaknath	Broiler	Exact permutation p
Pre-slaughter live weight (g)	1793.33 $\pm$ 35.37	1970.33 $\pm$ 127.15	0.2229
New York dressed weight (g)	1664.33 $\pm$ 24.62	1848.00 $\pm$ 120.49	0.1667
Eviscerated carcass weight (g)	1298.33 $\pm$ 21.05	1487.00 $\pm$ 98.51	0.0909
Ready-to-cook weight (g)	1356.33 $\pm$ 19.88	1577.33 $\pm$ 105.36	0.0714
Giblet weight (g)	58.00 $\pm$ 2.31	90.33 $\pm$ 7.11	0.0087

Table 2: Cut-Up Part Weights and Yield Indices (Mean $\pm$ SE; n=6)

Trait	Kadaknath	Broiler	Exact permutation p
Breast weight (g)	280.00 $\pm$ 10.94	516.00 $\pm$ 44.74	0.0022
Back weight (g)	305.33 $\pm$ 12.92	294.33 $\pm$ 29.62	0.8182
Thigh weight (g)	206.00 $\pm$ 8.23	201.67 $\pm$ 12.34	0.9372
Drumstick weight (g)	232.33 $\pm$ 6.92	194.00 $\pm$ 14.04	0.0303
Wing weight (g)	182.33 $\pm$ 7.61	176.67 $\pm$ 10.84	0.8182
Neck weight (g)	103.67 $\pm$ 4.40	105.67 $\pm$ 10.62	1.0000
Breast yield (% of ready-to-cook)	20.62 $\pm$ 0.64	32.54 $\pm$ 0.98	0.0022
Leg yield (thigh+drumstick;% RTC)	32.32 $\pm$ 0.66	25.17 $\pm$ 0.78	0.0022
Giblet yield (% RTC)	4.35 $\pm$ 0.23	5.70 $\pm$ 0.15	0.0087

Table 3: Physicochemical Properties and Shear Force (Mean $\pm$ SE; n=6)

Trait	Kadaknath	Broiler	Exact permutation p
pH	5.83 $\pm$ 0.09	5.90 $\pm$ 0.06	0.5238
Water holding capacity (%)	49.85 $\pm$ 7.65	55.39 $\pm$ 5.08	0.5476
Shear force value (kg/cm ²)	4.21 $\pm$ 0.75	1.02 $\pm$ 0.19	0.0022

Table 4: Effect Sizes (Hedges' g)

Trait	Hedges' g	Magnitude
Breast weight	-2.73	Very Large
Breast yield	-3.10	Very Large
Drumstick weight	+1.31	Large
Leg yield	+2.45	Very Large
Giblet weight	-2.31	Very Large
Shear force	+2.21	Very Large
pH	-0.35	Small
WHC	-0.32	Small

Carcass Traits

In this dataset, broilers showed numerically higher values for most carcass weight parameters. However, only giblet weight reached statistical significance ($p=0.0087$). The magnitude of this difference was large ($g \approx 2.3$), suggesting a meaningful biological effect despite the limited sample size.

Cut-Up Parts

The contrast in carcass partitioning was more pronounced.

Broilers exhibited markedly higher breast weight and yield, whereas Kadaknath birds showed greater drumstick weight and leg yield. These differences were statistically significant and associated with large to very large effect sizes.

Physicochemical Traits

Muscle pH and WHC did not differ significantly between groups. However, shear force values were consistently higher in Kadaknath birds. Given the nearly 19-week difference in slaughter age between groups, this pattern is unlikely to be incidental.

Effect Sizes

Large effect sizes were observed for breast weight, leg yield and shear force, supporting robust differences despite small sample size.

Discussion

Carcass Partitioning in Relation to Growth Trajectory

The magnitude of breast yield difference observed here aligns

with expectations based on selective breeding history. Commercial broilers have been optimized for rapid pectoral muscle growth, and this is reflected clearly in the present dataset. Kadaknath birds, on the other hand, show a more balanced distribution of muscle mass. The relatively greater contribution of leg components suggests that muscle development is not disproportionately directed toward the breast. Similar observations have been reported in other indigenous breeds (Rajkumar *et al.*, 2016; Singh and Pathak, 2017) [4, 5].

Tenderness and Connective Tissue Maturation

The shear force results warrant closer consideration. In the present dataset, Kadaknath birds exhibited values more than four times those of broilers. This difference is unlikely to arise from measurement variability alone. A plausible explanation lies in age-dependent connective tissue development. As birds age, collagen undergoes structural modification through cross-link formation, increasing its resistance to thermal and mechanical disruption (Purslow, 2005) [3]. Given that Kadaknath birds were slaughtered at a substantially later stage, the observed increase in shear force is consistent with established meat science principles (Dransfield and Sosnicki, 1999) [2].

Role of Proteolysis

Post-mortem proteolysis contributes to meat tenderization through degradation of myofibrillar proteins. In younger animals, this process tends to be more effective relative to connective tissue strength. In older birds, however, increased structural rigidity may limit the impact of proteolysis (Marcinkowska-Lesiak *et al.*, 2016) [6].

pH and WHC Stability

The similarity in pH values suggests comparable ultimate glycolytic decline. WHC, which is closely linked to protein denaturation and structural integrity, also showed no significant difference. However, given the sample size, moderate differences cannot be ruled out.

Comparative context

The present findings are consistent with global studies comparing slow- and fast-growing poultry genotypes. Fanatico *et al.* (2007) [7] reported higher shear force values in slower-growing birds, while Rajkumar *et al.* (2016) [4] observed similar carcass partitioning patterns in indigenous breeds.

Importantly, the effect sizes observed here ($g > 2.0$ for several traits) are at the higher end of reported values, suggesting a particularly strong divergence between the systems evaluated.

Conclusion

Within the constraints of this dataset, clear differences emerge between market-age Kadaknath and broiler chickens. Broilers show greater breast yield, while Kadaknath exhibits higher leg yield and markedly increased shear force.

These findings are best interpreted as reflecting differences in growth trajectory and physiological maturity. While the results are robust for traits with large effect sizes, further studies with expanded design are required to isolate genotype-specific effects.

Comparative Literature Table

Global Evidence: Fast-Growing Broilers vs Native/Slow-Growing Chickens

Study	Genotypes Compared	Slaughter Age	Breast Yield Trend	Leg Yield Trend	Shear Force Trend	Mechanistic Interpretation
Havenstein <i>et al.</i> , 2003 [1]	1957 vs 2001 broiler lines	42 d	Modern line ↑↑	Relative leg ↓	Not primary focus	Selection increased growth rate constant (k) and breast hypertrophy
Fanatico <i>et al.</i> , 2005 [8]	Slow-growing vs fast-growing broilers	63 d vs 42 d	Fast-growing ↑	Slow-growing ↑	Slow-growing ↑	Growth rate influences muscle fiber size and connective tissue
Rajkumar <i>et al.</i> , 2016 [4]	Aseel vs commercial broiler	16 wk vs 6 wk	Broiler ↑↑	Native ↑	Native ↑	Slower growth linked to higher collagen maturity
Singh & Pathak, 2017 [5]	Kadaknath vs Cobb-400	20–24 wk vs 6 wk	Broiler ↑	Native ↑	Native ↑	Age-dependent connective tissue stabilization
Haunshi <i>et al.</i> , 2022	Kadaknath vs improved lines	16 wk	Moderate breast in improved	Native leg ↑	Native ↑	Genotype–age interaction in tenderness
Gnanaraj <i>et al.</i> , 2020	Indian native breeds	16–20 wk	Lower than broilers	Higher relative leg	Higher	Collagen cross-link maturation
Dransfield, 1999 [2]	Age-related meat toughness (review)	Variable	Not focus	Not focus	Age ↑ shear	Cross-link density increases with age
Purslow, 2005 [3]	Connective tissue structure	Variable	Not focus	Not focus	Age ↑ shear	Perimysial thickness and collagen maturity
Kim <i>et al.</i> , 2019	Muscle fiber effects	Variable	Fast growth ↑ hypertrophy	Slow growth balanced	Fiber size influences shear	Myofibrillar structure affects tenderness
Present Study	Kadaknath vs Broiler	25 wk vs 6 wk	Broiler ↑↑ ($g > 2.7$)	Kadaknath ↑ ($g > 2.4$)	Kadaknath ↑ ($g \approx 2.2$)	Growth-curve divergence and maturity-driven connective tissue effects

Comparative Context with Global Evidence

The present findings align closely with global evidence demonstrating that rapid-growth genotypes exhibit disproportionate breast hypertrophy, whereas slow-growing and native breeds retain relatively greater limb musculature. Studies by Fanatico *et al.* (2005) [8] and Rajkumar *et al.* (2016) [4] similarly reported elevated shear force values in slow-growing or indigenous genotypes. Connective tissue

maturation and collagen cross-link density have been identified as major contributors to increased mechanical resistance with advancing age (Dransfield and Sosnicki, 1999; [2] Purslow, 2005) [3]. The magnitude of effect sizes observed in the present study ($g > 2.0$ for several traits) exceeds many reported values in comparable genotype studies, suggesting strong divergence between extended-growth native systems and accelerated broiler production paradigms.

Acknowledgement

This research was funded by Department of Poultry Science, Madras Veterinary College, TANUVAS, Chennai - 07, Tamil Nadu, India.

Conflict of Interest

Not available

Financial Support

Not available

References

1. Havenstein GB, Ferket PR, Qureshi MA. Carcass composition and yield of 1957 versus 2001 broilers when fed representative 1957 and 2001 broiler diets. *Poultry Science*. 2003;82(10):1509–1518.
2. Dransfield E, Sosnicki AA. Relationship between muscle growth and poultry meat quality. *Poultry Science*. 1999;78(5):743–746.
3. Purslow PP. Intramuscular connective tissue and its role in meat quality. *Meat Science*. 2005;70(3):435–447.
4. Rajkumar U, Muthukumar M, Haunshi S, Niranjana M, Raju MVLN, Rama Rao SV, *et al.* Comparative evaluation of carcass traits and meat quality in native Aseel chickens and commercial broilers. *British Poultry Science*. 2016;57(3):339–347.
5. Singh VP, Pathak V. Physico-chemical, colour and textural characteristics of Cobb-400, Vanajara, Aseel and Kadaknath meat. *International Journal of Livestock and Research*. 2017;7(11):98–106.
6. Marcinkowska-Lesiak M, Zdanowska-Sąsiadek Ż, Stelmasiak A, Damaziak K, Michalczyk M, Poławska E, *et al.* Effect of packaging method and cold-storage time on chicken meat quality. *CyTA-Journal of Food*. 2016;14(1):41–46.
7. Fanatico AC, Pillai PB, Emmert JL, Owens CM. Meat quality of slow-and fast-growing chicken genotypes fed low-nutrient or standard diets and raised indoors or with outdoor access. *Poultry Science*. 2007;86(10):2245–2255.
8. Fanatico AC, Pillai PB, Cavitt LC, Owens CM, Emmert JL. Evaluation of slower-growing broiler genotypes grown with and without outdoor access: Growth performance and carcass yield. *Poultry Science*. 2005;84(8):1321–1327.

How to Cite This Article

Ashok A, Bhalaji PAS, Prasanth A. Comparative characterization of carcass traits and physicochemical properties in market-age Kadaknath native chicken and commercial broiler chicken meat: A pilot study. *International Journal of Veterinary Sciences and Animal Husbandry*. 2026;11(5):124-127.

Creative Commons (CC) License

This is an open-access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 International (CC BY-NC-SA 4.0) License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.