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Growth Performance, Survivability, and Egg Production Characteristics of Five Korean Native Chicken Parent-Stock Lines

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ABSTRACT This study evaluated growth performance, survival rate, and productive traits among five Korean native chicken (KNC) strains denoted as YC, YD, CF, CK, and RC from hatch to 52 weeks of age. A total of 850 birds (600 hens and 250 roosters) were allocated in a completely randomized design. Body weight was recorded biweekly until week 16 and at four week intervals thereafter for hens and roosters. Survival rates were monitored throughout, and hen-day egg production (HDEP) was assessed from 16 to 52 weeks of age. Strain-dependent differences in body weight were observed for both hens and roosters at all ages ($P<0.05$). RC hens consistently exhibited superior growth, reaching a final weight of 2198.17 g at week 52. In contrast, CF hens showed the lowest body weights (2,006.73 g). Rooster growth followed similar patterns, with RC attaining the highest final weight (2,719.58 g at week 28), while CK remained significantly lighter (2,363.75 g, $P = 0.004$). Survival rates also differed among strains. By week 48, CK hens exhibited the lowest survival (70%), whereas YC maintained higher survivability (80%). CF rooster maintaining 100% survival up to 12 weeks, while YD recorded the lowest (78% at week 8). Egg production peaked between weeks 24 and 28 (79−89%). Significant differences re-emerged during the late laying phase (weeks 40−52; $P<0.05$), with YC hens demonstrating superior performance, sustaining 83% at week 52. Overall, RC demonstrated superior growth, YC excelled in late-phase egg production, and CF maintained high rooster survival.

(Key words: growth performance, hen-day egg production, korean native chicken, strain differences, survival rate)

INTRODUCTION

Globally, the poultry sector is one of the fastest-growing areas of agriculture, contributing substantially to food security by supplying affordable, high-quality animal protein while generating significant economic value (Gilyazova et al., 2025; Kim, 2025). Within this sector, chickens are particularly important due to their short generation interval, high reproductive efficiency, and strong responsiveness to genetic improvement compared with other livestock species (Cho et al., 2021). In addition to commercial broiler and layer lines, increasing attention has been directed toward indigenous poultry genetic resources, particularly Korean native chickens (KNC), which form an important component of the national poultry industry and exhibit distinct production and stress response characteristics among breeds (Cho et al., 2020). However, many native chicken breeds in Korea have become endangered or extinct owing to their relatively poor commercial performance compared with imported commercial breeds, limiting their production to small-scale farms (Jeon et al., 2010). To preserve these valuable genetic resources, the National Institute of Animal Science has developed restored KNC lines with favorable nutritional characteristics.

Korean native chickens are a valuable genetic resource characterized by considerable diversity, strong adaptability to local and harsh rearing environments, and distinctive meat and egg quality attributes (Kim et al., 2019; Haque et al., 2024). Notably, KNCs exhibit distinct genetic and phenotypic differences that influence growth performance, survivability, and egg production, underscoring the importance of genetic diversity analysis and systematic evaluation of productive traits for effective breeding and conservation strategies (Kim, 2021). Moreover, KNCs contribute to the diversification of poultry genetic resources (Jin et al., 2017), with breed diversity enhancing adaptability to environmental change, increasing disease resistance, and expanding the economic utility of

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chicken production systems (FAO, 2015; Choi et al., 2018). Consumer demand for traditional and locally produced poultry products has increased in recent years, further elevating interest in native chicken production (Choe et al., 2010; Kim et al., 2019). Korean native chickens (KNC) have gained increasing consumer attention due to their distinctive flavor and meat texture, which are generally preferred over commercial broilers; providing breed-specific information further enhances consumer evaluation and purchase behavior (Jayasena et al., 2013; Jin et al., 2017; Lee et al., 2017; Park et al., 2022). At the same time, the conservation and sustainable utilization of indigenous breeds have become increasingly important to safeguard genetic diversity and enhance long-term resilience of the poultry sector (Macharia et al., 2022).

Despite their recognized value, many KNC strains remain underutilized in commercial production systems. This is largely attributable to substantial variation in productive performance among strains, particularly in growth rate, survivability, and reproductive traits, as well as sensitivity to management and sex-related feeding strategies (Ogola et al., 2021; Yu et al., 2021a; Afrin et al., 2024). Unlike commercial broiler and layer lines that have undergone intensive selection for uniformity and efficiency, KNC populations retain broader genetic variability derived from diverse genetic backgrounds (Cho et al., 2021; Afrin et al., 2024). Consequently, systematic evaluation of key productive traits is essential to support informed breeding decisions, genetic improvement programs, and effective conservation strategies for KNCs (Kim et al., 2019; Afrin et al., 2024).

Among the traits used to assess poultry productivity and economic efficiency, body weight development, survival rate, and egg production are particularly important (Lukanov et al., 2023). Body weight and survivability reflect growth potential, robustness, and adaptability in both hens and roosters, especially under long-term rearing conditions (Elson, 2015), and are critical determinants of breeding suitability. Egg production traits, such as hen-day egg production, directly influence reproductive efficiency and profitability in laying systems (Lukanov et al., 2023). However, previous studies have often examined these traits in isolation or over limited rearing periods, and comprehensive comparisons among multiple KNC strains reared under uniform management conditions remain scarce (Afrin et al., 2024; Haque et al., 2024).

Therefore, the objective of the present study was to evaluate and compare body weight development and survival rate in both hens and roosters, as well as hen-day egg production in laying hens, among five Korean native chicken strains from hatch to 52 weeks of age under standardized management conditions. It was hypothesized that substantial strain-specific variation in productive traits would be observed. In addition, birds were raised to sexual maturity for mating and subsequent production of crossbred progeny. The findings of this study provide foundational information to support breeding strategies, crossbreeding programs, conservation efforts, and the efficient utilization of Korean native chicken genetic resources.

MATERIALS AND METHODS

The experiment was conducted at the Poultry Research Unit of the Cheongyang Research Station, Chungnam National University. Experimental procedures were approved and conducted as per the guidelines of the Animal Ethics Committee of Chungnam National University (Protocol Number: 202407A-CNU-126).

1. Experimental Birds and Design

A total of 850 Korean native chickens (KNC), comprising 600 hens and 250 roosters, were used in this study. Five Korean native chicken strains (YC, YD, CF, CK, and RC) were evaluated using a completely randomized experimental design with five treatments corresponding to each strain. Roosters were allocated to 10 cages, with two replicates per treatment and 25 birds per replicate (total of 250 roosters). Hens were housed in 50 cages, with ten replicates per treatment and 12 birds per replicate (total of 600 hens). All birds were individually identified using wing tags to facilitate longitudinal data collection.

2. Housing and Environmental Conditions

Birds were maintained under standardized environmental and nutritional conditions to minimize non-genetic sources of variation. Ambient temperature was controlled at 20−22℃ throughout the experimental period, and ventilation was uniformly regulated to ensure consistent air quality. During the rearing phase, birds were housed in battery cages (76 ×

61 × 46 cm^3) until 16 weeks of age, after which they were transferred to layer-type battery cages (60 × 25 × 45 cm^3) and maintained until 52 weeks.

3. Experimental Diet and Lighting Program

Experimental diets were formulated to meet the nutrient requirements of Korean native chickens during the growing phase (0−16 weeks). Birds were fed age-specific corn-soybean meal-based diets divided into starter (0−5 weeks), grower (6−10 weeks), and finisher (11−16 weeks) phases (Seo et al., 2023), with continuous lighting (24 h light) provided throughout this period. The diets were adjusted to provide progressively increasing metabolizable energy and decreasing crude protein levels according to growth stage, and feed was offered ad libitum to allow unrestricted expression of growth potential. From 16 weeks of age, all hens were switched to a commercially available layer diet formulated for Korean native chickens and maintained on this diet until 52 weeks of age (Kim et al., 2021). During the laying period, feed allowance was restricted according to age and target body weight guidelines, whereas water was provided *ad-libitum* throughout the experimental period. Lighting was adjusted to a controlled photoperiod of 16 h light and 8 h dark beginning at 18 weeks to sustain egg production. The ingredient and nutrient composition of the experimental diets used during the growing phase is presented in Table 1.

Table 1. Ingredient and nutrient composition of the experimental diets (% as-fed basis) during the growing phase

Ingredients	Week 0−5	Week 6−10	Week 11−16
Corn	60.40	65.30	70.40
Soybean meal	32.50	26.90	21.10
Wheat bran	1.00	1.50	2.00
Corn gluten meal	1.00	1.50	2.00
Soybean oil	1.50	1.50	1.50
Di-calcium phosphate	1.50	1.30	1.10
Limestone	1.10	1.05	1.00
Salt	0.25	0.25	0.25
L-Lysine	0.05	0.05	0.05
DL-Methionine	0.20	0.15	0.10
Vitamin-mineral premix[1]	0.50	0.50	0.50
Calculated chemical composition			
ME	3,059	3,123	3,187
CP	20.30	18.60	16.70

[1] Vitamin and mineral mixture provided the following nutrients per kg of diet: vitamin A, 24,000 IU; vitamin D3, 6,000 IU; vitamin E, 30 IU; vitamin K, 4 mg; thiamin, 4 mg; riboflavin, 12 mg; pyridoxine, 4 mg; folacin, 2 mg; biotin, 0.03 mg; vitamin B8 0.06 mg; niacin, 90 mg; pantothenic acid, 30 mg; Fe, 80 mg (as $FeSO_4 \cdot H_2O$); Zn, 80 mg (as $ZnSO_4 \cdot H_2O$); Mn, 80 mg (as $MnSO_4 \cdot H_2O$); Co, 0.5 mg (as $CoSO_4 \cdot H_2O$); Cu, 10 mg (as $CuSO_4 \cdot H_2O$); Se, 0.2 mg (as Na_2SeO_3); I, 0.9 mg [as $Ca(IO_3) \cdot 2H_2O$].

4. Body Weight Measurement

Body weight was used as an indicator of growth performance and was measured separately for hens and roosters throughout the experimental period. For hens, individual body weight was recorded at hatch and subsequently at bi-weekly intervals from 2 to 16 weeks of age, followed by measurements at four-week intervals from 20 to 52 weeks of age. For roosters, body weight was recorded at hatch and subsequently at four-week intervals from 4 to 28 weeks of age. All measurements were obtained using a calibrated digital scale and are expressed in grams.

5. Survival Rate Measurement

Survival rate was recorded separately for hens and roosters throughout the experimental period. The initial number of birds in each Korean native chicken group (YC, YD, CF, CK, and RC) was recorded at the beginning of the experiment. Mortality was monitored daily, and the number of live birds was recorded at regular intervals. For hens, survival data were collected from hatch up to 48 weeks of age at predetermined time points (weeks 2, 4, 6, 8, 10, 12, 14, 16, 20, 24, 28, 32, 36, 40, 44, and 48). For roosters, survival was recorded from hatch to 12 weeks of age, with counts taken at weeks 4, 8, and 12. All survival data were expressed as percentages for each group and age period.

Survival rate (%) was calculated using the method described by (Olutunmogun et al., 2016).

6. Productive Performance

Hen-day egg production was recorded weekly from 16 to

52 weeks of age. Eggs were collected daily, and production was expressed as the percentage of eggs produced per day relative to the total number of hens present on that day. Hen-day egg production (%) was calculated using the following formula (Oketch et al., 2025).

7. Statistical Analysis

Data were analyzed using SPSS statistical software (Version 26.0; IBM Corp., Armonk, NY, USA). Survival rates were calculated using Microsoft Excel. The effects of strain were evaluated by one-way analysis of variance (ANOVA). When significant differences were detected, mean comparisons were performed using Tukey's multiple range test. Results are presented as means±standard error of the mean (SEM). Statistical significance was set at $P<0.05$, with highly significant differences considered at $P<0.001$.

RESULTS AND DISCUSSION

1. Hen and Rooster Body Weight

Significant strain-dependent differences in body weight were observed in both hens and roosters throughout the experimental period ($P<0.01$ or $P<0.001$; Tables 2 and 3), indicating marked genetic variation in growth potential among the five native chicken strains. In hens, initial body weight at hatch differed modestly among strains, with YC showing the highest weight (33.91 g) and CK the lowest (31.01 g). From 2 weeks of age onward, growth trajectories diverged

Table 2. Changes in body weight (g) of hens from hatch to 52 weeks of age among five Korean native chicken strains

Items	Strain[1]					SEM[2]	*P*-value
	CF	CK	RC	YC	YD		
Initial	31.44^{ab}	31.01^{a}	32.53^{b}	33.91^{c}	31.38^{a}	0.122	<0.001
Week 2	131.18^{a}	126.90^{a}	140.92^{b}	137.64^{b}	127.94^{a}	0.646	<0.001
Week 4	298.52^{ab}	289.53^{a}	341.72^{c}	320.49^{b}	307.19^{bc}	1.629	<0.001
Week 6	534.42^{ab}	519.60^{a}	615.97^{b}	576.52^{ab}	603.56^{b}	9.306	<0.01
Week 8	770.08^{a}	758.67^{a}	886.45^{c}	836.43^{b}	809.77^{b}	3.563	<0.001
Week 10	1,003.90^{a}	996.40^{a}	1,189.79^{c}	1,105.64^{b}	1,085.16^{b}	4.740	<0.001
Week 12	1,168.96^{a}	1,136.12^{a}	1,387.20^{c}	1,281.54^{b}	1,240.09^{b}	6.677	<0.001
Week 14	1,329.41^{a}	1,301.07^{a}	1,623.13d	1,479.96^{c}	1,412.06^{b}	6.995	<0.001
Week 16	1,527.53^{a}	1,508.55^{a}	1,842.52^{c}	1,689.86^{b}	1,660.76^{b}	7.476	<0.001
Week 20	1,729.02^{a}	1,734.51^{a}	2,055.30^{c}	1,874.33^{b}	1,838.06^{b}	6.836	<0.001
Week 24	1,736.94^{a}	1,748.44^{a}	2,069.01^{c}	1,876.77^{b}	1,857.34^{b}	11.643	<0.001
Week 28	1,822.62^{a}	1,815.37^{a}	2,106.14^{c}	1,978.79^{bc}	1,932.70^{ab}	14.894	<0.001
Week 32	1,908.04^{a}	1,942.48^{a}	2,199.79^{c}	2,052.17^{b}	2,049.6^{b}	16.358	<0.001
Week 36	2,004.71^{a}	2,028.42^{a}	2,167.42^{c}	2,130.62^{bc}	2,104.72^{ab}	18.245	<0.001
Week 40	1,999.49^{a}	2,036.53^{ab}	2,169.59^{c}	2,134.88^{bc}	2,108.93^{b}	19.715	<0.001
Week 44	2,005.49^{a}	2,042.64^{ab}	2,176.09^{c}	2,141.28^{bc}	2,115.25^{b}	20.735	<0.001
Week 48	2,006.65^{a}	2,044.68^{ab}	2,180.38^{c}	2,144.49^{bc}	2,118.85^{b}	22.026	<0.001
Week 52	2,006.73^{a}	2,052.38^{b}	2,198.17^{c}	2,148.78^{bc}	2,133.68^{bc}	21.368	<0.001

$^{a-c}$ Values in a row with different superscripts differ significantly ($P<0.05$).
[1] CF, CK, RC, YC, and YD refer to five korean native chicken strains used in this study.
[2] Pooled standard error of mean.

Table 3. Changes in body weight of roosters from hatch to 28 weeks of age among five Korean native chicken strains

Items	Strain[1]					SEM[2]	*P*-value
	CF	CK	RC	YC	YD		
Initial	33[ab]	31.71[a]	32.58[b]	33.92[c]	32.56[a]	0.164	<0.01
Week 4	338.64[a]	331.46[a]	393.94[b]	360.62[b]	330.83[a]	2.589	<0.001
Week 8	870.85[a]	874.03[a]	952.96[b]	935.31[b]	860.26[a]	6.530	<0.001
Week 12	1416.31[a]	1398.67[a]	1591.19[b]	1578.96[b]	1584.78[b]	9.249	<0.001
Week 16	1930.83[a]	1910.42[a]	2234.79[b]	2263.96[b]	2246.08[b]	12.974	<0.001
Week 20	2330.62[a]	2316.04[a]	2644.79[b]	2487.67[ab]	2531.25[b]	18.719	<0.001
Week 24	2387.08[ab]	2334.38[a]	2726.04[c]	2542.08[bc]	2528.75[ab]	21.042	<0.001
Week 28	2436.25[a]	2363.75[a]	2719.58[b]	2601.25[ab]	2620.20[ab]	64.636	0.004

[a–c] Values in a row with different superscripts differ significantly ($P<0.05$).
[1] CF, CK, RC, YC, and YD refer to five korean native chicken strains used in this study.
[2] Pooled standard error of mean.

substantially. RC birds of both sexes consistently exhibited superior growth from early rearing through maturity, reaching the highest final weights at 52 weeks in hens (2,198 g) and 28 weeks in roosters (2,719 g). In contrast, CF and CK remained significantly lighter across all ages, while YC and YD showed intermediate growth performance. These results align with previous reports identifying RC and RC-derived strains as superior in growth rate and final body weight among KNC populations (Wickramasuriya et al., 2015; Song et al., 2023). In contrast, the persistently lower body weights of CF and CK highlight the need for targeted genetic improvement. YC and YD displayed intermediate growth performance, suggesting moderate potential that may be optimized depending on production goals.

Table 4. Survival rate (%) of hens from hatch to 48 weeks of age in five Korean native chicken strains

Items	Strain[1]				
	YC	YD	CF	CK	RC
Week 2	99.00	98	100	99	98
Week 4	99.00	98	100	97	98
Week 6	99.00	97	100	97	98
Week 8	98.00	97	99	96	97
Week 10	98.00	95	99	95	97
Week 12	97.00	94	99	95	97
Week 14	96.00	90	91	79	94
Week 16	96.00	90	85	79	94
Week 20	96.00	90	85	79	91
Week 24	96.00	90	79	77	91
Week 28	80.00	81	78	70	80
Week 32	80.00	79	77	70	79
Week 36	80.00	79	77	70	79
Week 40	80.00	81	79	80	82
Week 44	80.00	81	79	80	82
Week 48	80.00	79	77	70	79

[1] CF, CK, RC, YC, and YD refer to five korean native chicken strains used in this study.

2. Hen and Rooster Survival Rate

Survival rates differed among strains and sexes, further reflecting strain-specific resilience (Tables 4 and 5). Hen survival remained high during the early rearing phase (0−6 weeks), with CF maintaining 100% survival and other strains exceeding 97%. Thereafter, survival declined progressively,

Table 5. Rooster survival rates across 0−12 weeks of age

Items	Strain[1]				
	YC	YD	CF	CK	RC
Week 4	98.00	96%	100%	98%	100%
Week 8	90.00	78%	100%	92%	88%
Week 12	90.00	78%	100%	92%	88%

[1] CF, CK, RC, YC, and YD refer to five korean native chicken strains used in this study.

Table 6. Hen-day egg production (%) of five Korean native chicken strains from 16 to 52 weeks of age

Items	Strain[1]					SEM[2]	*P*-value
	CF	CK	RC	YC	YD		
Week 16	9.00	11.00	13.00	13.00	10.00	0.163	0.184
Week 20	59.00^{ab}	68.00^{b}	54.00^{a}	51.00^{a}	54.00^{a}	0.632	0.041
Week 24	84.00	88.00	80.00	80.00	83.00	0.167	0.093
Week 28	84.00	84.00	79.00	86.00	89.00	0.476	0.228
Week 32	67.00	64.00	66.00	68.00	60.00	0.319	0.176
Week 36	73.00	71.00	67.00	77.00	69.00	0.231	0.067
Week 40	71.00^{ab}	61.00^{a}	70.00^{ab}	78.00^{b}	65.00^{a}	0.423	0.032
Week 44	64.00^{a}	69.00^{ab}	72.00^{b}	84.00^{c}	65.00^{a}	0.513	0.009
Week 48	64.00^{a}	69.00^{ab}	72.00^{ab}	80.00^{b}	65.00^{a}	0.324	0.014
Week 52	62.00^{a}	65.00^{a}	70.00^{ab}	83.00^{b}	64.00^{a}	0.529	0.006

$^{a-c}$ Values in a row with different superscripts differ significantly (P<0.05).
[1] CF, CK, RC, YC, and YD refer to five korean native chicken strains used in this study.
[2] Pooled standard error of mean.

particularly in CK hens exhibiting the lowest survivability from week 16 onward, and declined to 70% by week 28. In contrast, YC, RC, and YD hens consistently maintained higher survival rates throughout laying, remaining relatively stable from weeks 32 to 48. Rooster survival followed a similar pattern during early rearing. All strains exhibited high survival up to week 4 (96–100%); however, strain-related differences became evident by week 8. Roosters belonging to CF maintained 100% survival through week 12, whereas YD roosters showed the greatest decline, reaching 78%. No additional mortality occurred between weeks 8 and 12. Overall, RC and YC birds exhibited superior survivability, while CK consistently showed the poorest survival, particularly among hens. These findings corroborate earlier studies reporting strain-specific differences in livability among KNCs (Seo et al., 2023) and suggest that survival may be influenced by both genetic robustness and sex-linked vulnerability. The lower survival observed in YD roosters relative to hens warrants further investigation into sex-specific physiological or behavioral factors.

3. Hen-Day Egg Production

Hen-day egg production exhibited clear strain-specific patterns across the laying cycle (Table 6). At the onset of lay (week 16), HDEP was uniformly low across strains (9.0–13.0%; P>0.05). By week 20, significant differences emerged (P = 0.041), with CK hens showing the highest early production (68.0%), followed by CF (59.0%), whereas YC and RC lagged. Egg production increased markedly in all strains between weeks 24 and 28, corresponding to peak lay, with HDEP ranging from 79.0% to 89.0%. During this period, YD achieved the highest peak production (89.0% at week 28). From weeks 24 to 36, no significant strain differences were detected, indicating comparable peak laying capacity. In contrast, distinct differences re-emerged during the mid- to late-laying phase. YC hens sustained superior laying persistence during the late phase (weeks 40–52), maintaining 83% production at week 52, whereas CF and YD showed reduced persistence. CK hens achieved high early HDEP despite poorer growth and survivability. These results highlight a trade-off between early growth, early egg production, and laying persistence. This pattern aligns with previous reports indicating that faster-growing or heavier strains may exhibit reduced or less persistent egg production (Wickramasuriya et al., 2015).

CONCLUSION

The integrated evaluation of growth, survivability, and egg production underscores the complementary strengths of slow-growing Korean native chicken strains. RC exhibits clear advantages in growth and survival, making it well-suited for meat-oriented breeding programs. YC demonstrates superior laying persistence and is therefore a strong candidate for egg production systems. CK, despite limitations in growth and survivability, shows potential for early egg production. These findings emphasize that breeding strategies for Korean native chickens should be trait-specific and multi-dimensional to optimize productivity, sustainability, and genetic conservation. Furthermore, the strain-specific insights generated in this study provide practical guidance for developing targeted selective breeding and crossbreeding strategies that balance growth and reproductive traits, while also informing conservation-oriented policies aimed at preserving genetic diversity and supporting the sustainable utilization of Korean native chicken genetic resources.

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