# Effects of Strain, Sex and Age on Growth Performance of Malaysian Kampong Chickens

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## Abstract

The effect of strain (genotype), sex and age on growth performance was evaluated in kampong chickens reared in individual cages. One hundred and fifty day-old North strain chicks and the same number of South strain were utilized. Significant strain effects were observed, with the North strain being significantly superior to the South strain with respect to body weight gain (BWG) and feed intake while the difference in feed conversion ratio (FCR) between strains was significant only for the 14-wk rearing age. Sexual dimorphism was exhibited, with males consuming more feed, gaining more weight and recording lower FCR than females ($p<0.01$). Significant interaction effects of strain by sex were observed for BWG and feed intake over the rearing age of 10 wk but not over 14 wk, while no such interaction occurred for FCR over all rearing ages. With increases in rearing age from 10 to 14 wk, BWG, feed intake and FCR increased significantly while productivity index consistently declined.

**Key words:** kampong chickens, growth performance, rearing age, sex, strain

## Introduction

The original kampong chicken of Malaysia has made a lot of progress and improvement over the last 60 years. Originating as a cross between the Malay breed and the red jungle fowl (*Gallus gallus*), the first generation of kampong chickens were then indiscriminately mated to imported pure breeds from Europe and China to produce the second generation. These second generation birds were then bred with the commercial breeds of broilers and layers to give rise to the current third generation kampong chickens - the breeding processes were unplanned and random. Despite being no longer pure, the current resultant generation of kampong chickens still manages to retain much of the phenotypic characteristics of their ancestors. These 'original' birds can be found throughout the country. They are so heterogeneous that no single characteristic could describe the entire population. An attempt was made to categorize these birds and three common strains have been described (Engku Azahan (1994a).

The performance of the original kampong chickens in terms of growth and egg production was reportedly poor (Engku Azahan and Seet, 1981; Engku Azahan, 1983). Although these birds manage to find a niche among enthusiasts of kampong chicken meat, the market for kampong chickens is very small due to their relatively high market price which was a consequence of their long rearing period, slow growth and low feed conversion efficiency.

Since the last decade, many kampong chicken breeders have begun to venture into planned selection and breeding programs in the effort to produce kampong chickens with

improved growth performance. Today, a number of commercial kampong crossbreds are available to consumers and these crosses comprise over 95% of the total number of kampong chickens consumed by Malaysians. These birds are relatively fast growers when fed on commercial broiler feed and are usually marketed from the age of ten wk, in contrast to the original kampong chickens which are usually slaughtered at around the age of four mo. Due to the differing breeding objectives and approaches of the individual kampong chicken breeders, it is anticipated that variation in live performance of the various strains exists, as do variation due to sex as reported for various poultry such as the broiler (Engku Azahan *et al*., 2007), turkey (Engku Azahan, 1994b), pheasant (Engku Azahan *et al*., 1993) and ostrich (Noraziah and Engku Azahan, 1999). The present study was attempted to determine the variation in growth performance at rearing ages between 10 and 14 wk which are also the current market ages for these commercial kampong chickens in Malaysia.

## Materials and Methods

Three hundred day-old crossbred kampong chickens of two popular commercial strains were used in the study. One hundred and fifty birds were of the North strain while the remainder were of the South strain. The birds were brooded individually in wire-floor cages measuring 50.8 cm wide x 55.9 cm deep x 61.0 cm high. During the two-wk brooding period artificial heat was provided by electric bulbs. The birds were then grown till the age of 14 wk. Commercial feed was provided ad libitum while fresh drinking water was made available at all times. The birds were individually weighed at day-old and subsequently at ages of 10, 12 and 14 wk.

Feed intake per bird was measured over the rearing ages of 10, 12 and 14 wk. Mortality was recorded daily as and when it occurred. Body weight gain (BWG) and feed conversion ratio (FCR) over the three rearing ages were determined for each bird while productivity index for each strain over each of the rearing ages was calculated according to the formula:

Productivity index = livability (%) x live weight (kg) / age (day) / feed conversion ratio x 100.

Where amenable, data were analyzed statistically using Analysis of Variance (ANOVA) procedure of SAS (1991) to determine the existence of significant differences in performance parameters between strains, sexes, as well as rearing periods. The presence of interaction effects of strain by sex was also statistically determined.

## Results and Discussion

Over all the rearing ages studied, the North strain recorded higher ($p<0.01$) rates of BWG and feed intake than the South strain (Table 1). This emphasizes the role of genotype, besides environmental factors, in determining growth. Similar strain effects on growth were observed by Adedeji *et al*. (2006) in local chicken strains of Nigeria. Between the two strains studied, FCR was generally not significantly affected except over the 14-wk rearing period when the South strain was observed to be more efficient ($p<0.01$) than the North strain.

Table 1. Effects of strain on growth performance of kampong chickens

| Rearing age (wk) | Strain | Body weight gain (g) | Feed intake (g) | Feed conversion ratio |
|---|---|---|---|---|
| 10 | South | 1528 ± 15 | 3481 ± 39 | 2.29 ± 0.01 |
| | North | 1852 ± 14* | 4170 ± 36* | 2.27 ± 0.01ns |
| 12 | South | 1902 ± 18 | 4754 ± 50 | 2.52 ± 0.02 |
| | North | 2247 ± 17* | 5643 ± 46* | 2.54 ± 0.01ns |
| 14 | South | 6212 ± 62 | 6212 ± 62 | 2.80 ± 0.02 |
| | North | 7196 ± 57* | 7196 ± 57* | 2.89 ± 0.02* |

*Significant between strain ($p<0.01$) at each of the specified ages, for each parameter;
ns – not significant

The general lack of significant effects in FCR between strains, in particular over rearing ages of 10 and 12 wk, was similarly noted by Joya *et al*. (1979) and Sinha and Verma (1984) with different breeds of broiler chickens. Male birds were observed to be superior ($p<0.01$) to females in all growth parameters investigated over the three rearing ages studied (Table 2). Superiority for body weight ranged between 22.5% over the rearing age of 10 wk to 25.6% over 14 rearing wk while for FCR, superiority ranged between 10 and 12.2%. Male birds also consumed 14.4 to 15.6% more feed than females. Similar records of male superiority in body weight and FCR were made by Corzo *et al*. (2005) and Engku Azahan *et al*. (2007) with broilers. Adedeji *et al*. (2006) also observed improved growth in males over females for local Nigerian chickens.

The main reason for the absence of uniformity in body weight in straight-run flocks of broiler chickens is sexual dimorphism. Sexual dimorphism in poultry is present across genotype, as has been numerously reported (Tariq *et al*., 1992; Scheuermann *et al*., 2003; Corzo *et al*., 2005; Horsted *et al*., 2005). Although many factors have been forwarded as possible causes for sexual dimorphism (Purchas, 1991), works by Henry and Burke (1991) and Mitchell and Burke (1995) suggested that the main factor for body weight differences between sexes may be predetermined during embryonic development when the number of myofibrils is established.

Table 2. Effects of sex on growth performance of kampong chickens

| Rearing age (wk) | Sex | Body weight gain (g) | Feed intake (g) | Feed conversion ratio |
|---|---|---|---|---|
| 10 | Male | 1918 ± 24 | 4138 ± 52 | 2.16 ± 0.01 |
| | Female | 1477 ± 17* | 3544 ± 44* | 2.40 ± 0.02* |
| 12 | Male | 2376 ± 27 | 5656 ± 67 | 2.38 ± 0.01 |
| | Female | 1789 ± 19* | 4775 ± 56* | 2.67 ± 0.0* |
| 14 | Male | 2743 ± 27 | 7285 ± 80 | 2.66 ± 0.01 |
| | Female | 2031 ± 19* | 6156 ± 66* | 3.03 ± 0.02* |

*Significant between sex at each of the specified ages, for each growth parameter

Data analysed for the possible presence of interaction effects of sex by strain reemphasized the significant main effects of sex and strain on the live performance parameters in most instances (Table 3). It also revealed the presence of interactive effects of strain by sex for BWG and feed intake over the rearing age of 10 wk but not for 14 wk; the interaction effect over the rearing age of 12 wk was significant only for BWG. There were also no interaction effects of strain by sex for FCR over the three rearing ages.

The significant strain by sex interaction for BWG, particularly over rearing ages of 10 and 12 wk, indicates that the two strains used in this study have specific sexual dimorphism with regard to BWG. Strain response observed for growth performance was influenced, to some extent, by sex, but mostly at early rearing ages; the observed interaction over the rearing age of 10 wk was not repeated over 14 wk or even 12 wk for feed intake suggesting a difference in growth rate of these birds, particularly during the early days of life.

Table 3. Main and interaction effects of strain and sex on various growth parameters of kampong chickens reared over ages of 10, 12 and 14 wk

| Variables | Rearing age (wk) | Strain | Sex | Strain x Sex |
|---|---|---|---|---|
| Body weight gain (g) | 10 | *** | *** | *** |
| | 12 | *** | *** | ** |
| | 14 | *** | *** | ns |
| Feed intake (g) | 10 | *** | *** | * |
| | 12 | *** | *** | ns |
| | 14 | *** | *** | ns |
| Feed conversion ratio | 10 | ns | *** | ns |
| | 12 | ns | *** | ns |
| | 14 | *** | *** | ns |

Level of significance: * = p<0.05); ** = p<0.02); *** = p<0.01;
ns = not significant (p>0.05)

Body weight gain and feed intake increased (p<0.01) with the increase in rearing age (Tables 4, 5). Conversely, the efficiency in utilizing feed declined with increase in rearing age. This trend of changes in mean performance of the various growth parameters with increase in rearing age was further emphasized when analyses were carried out on pooled data for all birds (Table 6). Heavier birds could therefore be expected with extended market age though at the expense of reduced efficiency in the utilization of feed.

Mortalities recorded for the two strains are as indicated in Table 7. Mortality data were used for the calculation of the estimated productivity indices. Throughout the duration of the study deaths occurred in most of the weeks except in wk 11 and 12. Therefore, save for rearing ages of 10 and 12 wk, data recorded indicated that mortality rates increased with increasing age. Productivity indices determined for each strain as well as for the combined strain consistently indicated that productivity declined with increase in rearing age ( Table 7).

Table 4. Growth performance of two strains of kampong chickens over four rearing ages

| Rearing age (wk) | Strain | Body weight gain (g) | Feed intake (g) | Feed conversion ratio |
|---|---|---|---|---|
| 10 | South | 1516 ± 24[a] | 3467 ± 50[a] | 2.30 ± 0.02[a] |
| 12 | | 1885 ± 31[b] | 4731 ± 66[b] | 2.53 ± 0.02[b] |
| 14 | | 2219 ± 38[c] | 6181 ± 84[c] | 2.82 ± 0.03[c] |
| 10 | North | 1851 ± 23[a] | 4168 ± 40[a] | 2.27 ± 0.02[a] |
| 12 | | 2244 ± 30[b] | 5640 ± 55[b] | 2.54 ± 0.02[b] |
| 14 | | 2520 ± 35[c] | 7192 ± 68[c] | 2.89 ± 0.02[c] |

[abc]For each strain, means in the same column with different superscripts differ at p<0.01)

Table 5. Growth performance of male and female kampong chickens over four rearing ages

| Rearing age (wk) | Sex | Body weight gain (g) | Feed intake (g) | Feed conversion ratio |
|---|---|---|---|---|
| 10 | Male | 1919 ± 24[a] | 4140 ± 52[a] | 2.16 ± 0.01[a] |
| 12 | | 2377 ± 27[b] | 5658 ± 66[b] | 2.38 ± 0.01b |
| 14 | | 2745 ± 27[c] | 7290 ± 80[c] | 2.66 ± 0.01[c] |
| 10 | Female | 1487 ± 17[a] | 3565 ± 44[a] | 2.40 ± 0.02[a] |
| 12 | | 1798 ± 19[b] | 4807 ± 57[b] | 2.68 ± 0.02[b] |
| 14 | | 2040 ± 19[c] | 6194 ± 67[c] | 3.04 ± 0.02[c] |

[abc]For each sex, means in the same column with different superscripts differ at p<0.01)

Table 6. Growth performance of all kampong chickens over four rearing ages

| Rearing age (wk) | Body weight gain (g) | Feed intake (g) | Feed conversion ratio |
|---|---|---|---|
| 10 | 1695 ± 20[a] | 3843 ± 38[a] | 2.28 ± 0.01[a] |
| 12 | 2078 ± 24[b] | 5218 ± 51[b] | 2.53 ± 0.01[b] |
| 14 | 2380 ± 27[c] | 6723 ± 62[c] | 2.85 ± 0.02[c] |

[abc]Means in the same column with different superscripts differ at p<0.01)

Table 7. Effects of rearing age on growth and productivity parameters of kampong chickens

| Strain | Rearing age (wk) | Body weight gain (g) | Feed conversion ratio | Mortality (%)* | PI* |
|---|---|---|---|---|---|
| South | 10 | 1556 ± 24[a] | 2.30 ± 0.02[a] | 9.33 | 87.63 |
| | 12 | 1925 ± 31[b] | 2.53 ± 0.02[b] | 9.33 | 82.13 |
| | 14 | 2259 ± 38[c] | 2.82 ± 0.03[c] | 11.33 | 72.48 |
| North | 10 | 1891 ± 23[a] | 2.27 ± 0.02[a] | 2.00 | 116.62 |
| | 12 | 2285 ± 30[b] | 2.54 ± 0.02[b] | 2.00 | 104.95 |
| | 14 | 2561 ± 35[c] | 2.89 ± 0.02[c] | 2.67 | 88.01 |
| Combined Strain | 10 | 1736 ± 20[a] | 2.28 ± 0.01[a] | 5.67 | 102.60 |
| | 12 | 2118 ± 24[b] | 2.53 ± 0.01[b] | 5,67 | 94.01 |
| | 14 | 2421 ± 27[c] | 2.85 ± 0.02[c] | 7.00 | 80.61 |

[abc]Means in the same column by strain and combined strain with different superscripts differ at $p<0.01$)

*Not subjected to statistical analysis; PI = productivity index

## Conclusion

The importance of genetics in influencing growth response of the modern kampong chicken of Malaysia is suggested by the findings of this study. Commercial kampong chicken genotypes differed significantly in their growth performance. Similar to most other agriculturally-important animals, males are superior to females in terms of growth. The study also revealed that rearing kampong birds over younger ages is probably more economical than raising them till older ages as indicated by the decline in feed efficiency and productivity index with advancement in rearing age.

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