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Characterization of growth traits in indigenous and Punjab broiler-2 chicken of Karnataka

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Abstract

The present study was carried out to characterize growth traits in Indigenous and Punjab Broiler 2 (PB2) birds. The Indigenous and synthetic colored broiler dam line PB2 chicken groups, each consisting of two hundred birds, reared and maintained under standard management procedures at AICRP on Poultry Meat, Veterinary College, Bengaluru formed the experimental birds of this study and these birds were subjected for recording growth traits. The mean body weight (BW, g) in Indigenous chicken at zero day, 2nd week, 4th week, 6th week, 8th week, 10th week, and 12th week was 29.77±0.21, 75.93±0.86, 162.20±2.49, 303.00±4.67, 461.51±7.69, 659.10±9.99 and 823.38±12.87, respectively. Likewise, in PB2 birds, the mean BW at zero day, 2nd week, 4th week and 6th week was 46.07±0.29, 243.35±12.58, 660.06±7.33 and 1182.60±14.88. The mean average daily gain (ADG, g) determined at 1st fortnight, 2nd fortnight, 3rd fortnight, 4th fortnight, 5th fortnight, 6th fortnight and for the entire period of study in Indigenous birds was 3.08±0.06, 5.75±0.13, 9.39±0.18, 10.57±0.28, 13.17±0.39, 10.95±0.59, and 8.82±0.14, respectively. Similarly, in PB2 birds the ADG determined at 1st fortnight, 2nd fortnight, 3rd fortnight and for the entire period of study was 13.15±0.84, 414.62±13.68, 519.99±11.68 and 25.26±0.33. The BWs and ADGs in PB2 birds were higher than that of Indigenous birds. The variabilities in the growth traits of Indigenous and PB2 chicken of present investigation may be utilized for proper selection and improvement of birds in these economic traits.

Keywords: chicken, indigenous, PB2, growth, characterization

Introduction

The poultry sector in India stands high with 851.81 million birds (Anon., 2019) [1] to meet the demands of ever growing human population for nutritional security through egg and meat production. Total egg production is steadily increasing over the years and it was 103.32 billion which ensured the annual per-capita availability of 79 eggs (BAHS, 2019) [2]. To this total egg production, the contribution of commercial poultry is 82.18 per cent with production of 84.90 billion eggs from 299.10 million layers and that of backyard poultry is 17.81 per cent with the production of 18.40 billion eggs from 142.47 million birds (BAHS, 2019) [2]. Similarly, meat production from poultry is 4.06 million tonnes which is about 50.06 per cent of country's total meat production (8.11 million tonnes). This evinces the poor productivity of Indigenous birds. Hence, there exists a scope for improvement of these chicken by recording and characterizing the economic traits.

Interestingly, these Indigenous chickens have contributed enormously in availability of poultry produces particularly in rural and tribal areas of the country due to their adaptability to different agro-climatic conditions (Khan, 2008) [13]. For the poor farmers with minimal or no land holdings, major issues are subsidiary income, nutritional security through supplementation in the form of valuable animal protein and women empowerment (Shukla *et al.*, 2011) [16]. These Indigenous birds in backyard poultry farming are capable of contributing profoundly to alleviate malnutrition, poverty and unemployment. Hence, backyard poultry has the most potential to be a good source of subsidiary income for landless poor farmers. Egg and meat produced from these backyard poultry are always appreciated for their taste and texture, in both rural and organized markets. This is evident in the 50 to 100 per cent higher price for unit weight of Indigenous/ desi birds than that of commercially produced birds (Conroy *et al.*, 2005) [6].

In spite of these advantages and potentialities in backyard poultry production of Indigenous and non-descript chicken, major limiting factors are low egg production and slower growth rates. This may be due to the lack of proper breeding plans for improving Indigenous birds for

better and efficient production, and are limited to certain pockets only. Also, there exist a diversity among Indigenous chicken with respect to body weight, plumage pigmentation, plumage distribution, comb type, shank and skin color, which increases the adaptability of these breeds to varied climatic conditions of our country. Hence, the demand of farmers for improved varieties of Indigenous birds with multi-colored plumage, brown eggs for better acceptability, ability to grow fast and produce fairly good number of eggs, ability to evade predators, better disease resistance and ability thrive well in free range conditions with scavenging habits, which are suitable to family production system is increasing. Therefore, the Indigenous chicken are yet to be fully explored for better growth and carcass traits. Also, there is a need to characterize Indigenous chickens as they are gold mines of major genes for improvement of high yielding germplasm with tropical adaptability and disease resistance. Considering these aspects, the present study was carried out with the objective of characterizing growth traits in Indigenous and Punjab Broiler 2 (PB2) chicken in Karnataka.

Materials and Methods

The Indigenous and synthetic colored broiler dam line Punjab Broiler 2 (PB2) chicken groups, each consisting of two hundred birds, reared and maintained under standard management procedures at All India Coordinated Research Project (AICRP) on Poultry Meat, Veterinary College, Bengaluru formed the experimental birds of this study and these birds were subjected for recording growth traits at different time intervals.

Body weight (BW, g) was recorded at 0 day, 2nd week, 4th week, 6th week, 8th week, 10th week and 12th week of age in Indigenous birds; and at 0 day, 2nd week, 4th week and 6th week of age in PB2 birds. BWs at 8th, 10th and 12th week were not measured in PB2 birds as these birds were sacrificed at the age of 6th week. From these BWs, average daily gain (ADG) was determined in both Indigenous and PB2 birds. Descriptive statistical analysis of data on growth traits in Indigenous and PB2 birds was carried out in SPSS.16 software.

Results and Discussion

Body weight (BW, g) in indigenous birds

Body weight profile of Indigenous chicken at different age groups is presented in Table 1. The average BW of day old chicks recorded in the present study in Indigenous birds was 29.77±0.21. Similarly, Deepak (1995) [7] in Native fowl of Mizoram, Thakur *et al.* (2006) [19] in Kadaknath, Kalitha *et al.* (2009) [12] in Indigenous chicken of Assam, Haunshi *et al.* (2011) [11] in Kadaknath, and Thakur and Parmar (2011) [18] in Kadaknath chicken breeds have recorded the BW of 28.3±0.5, 28±0.17, 25.36±0.20, 28.55±0.12 and 27.4, respectively in day old chicks. Likewise, Gopinath (2013) [9] has recorded an average BW of 26.40±0.29, 25.13±0.24 and 25.73±0.20, respectively, in day old chicks of Chamarajanagar, Mysore and Mandya districts with an overall mean BW of 25.75±0.24 for Mysore division. Also, Rajakumar (2013) [14] has recorded an average BW of 30.29±0.27, 27.63±0.22 and 25.43±0.22, respectively, in day old chicks of Bangalore Rural, Chikkaballapur, Ramanagara districts with an overall average BW of 27.70±0.15 for Bangalore division. Similarly, Sudhir (2021) [17] has reported an average BW of 27.04±0.25, 27.47±0.21 and 27.37±0.30 in Indigenous chicken of Bidar, Gulbarga and Koppala districts, respectively; and

Veerannagowda (2020) [20] has reported an average BW of 27.18±0.16 in Indigenous chicken of Belgaum division. Average BW reported by the above researchers is lower than that recorded in the present study in day old chicks of Indigenous birds. Interestingly, average BW of 32±0.20, 37±0.30 and 35±0.10 was recorded respectively in the Brown, Black and White varieties of Nicobari day old chicks (Chatterjee and Yadav, 2008) [4]. Also, mean BW of 33.19±0.20 was recorded in day old chicks of Aseel bird (Haunshi *et al.*, 2011) [11]. The values reported by these two studies are higher than that obtained in the present study.

The average BW at 2nd week of age in Indigenous chicken in the present investigation was 75.93±0.86. This value is comparable with that of 72.88±0.99 reported in Aseel birds (Haunshi *et al.*, 2011) [11]. Interestingly, Gopinath (2013) [9] has recorded an average BW of 59.54±0.85, 55.52±0.65 and 59.97±0.66, respectively, in two week old Indigenous chicken of Chamarajanagar, Mysore and Mandya districts with an overall mean BW of 58.34±0.72 for Mysore division. Similarly, Rajakumar (2013) [14] has recorded an average BW of 70.50±0.81, 68.15±0.88 and 61.35±0.57, respectively, in two weeks old Indigenous chicken of Bangalore Rural, Chikkaballapur and Ramanagara districts with an overall average BW of 66.49±0.46 for Bangalore division. Also, mean BW of 54±0.62 in Kadaknath (Thakur *et al.*, 2006) [19], 51.80±0.48 in Kadaknath (Chatterjee *et al.*, 2007) [3], 60.57±0.48 in Kadaknath (Haunshi *et al.*, 2011) [11] and 65.10±1.04 in Aseel (Chatterjee *et al.*, 2007) [3] birds was reported in two weeks old Indigenous chicken. Similarly, Sudhir (2021) [17] has reported average BW of 62.71±0.98, 63.27±1.01 and 65.63±0.63 in Indigenous chicken of Bidar, Gulbarga and Koppala districts, respectively and Veerannagowda (2020) [20] has reported average BW of 62.67±0.33 in Indigenous chicken of Belgaum division. These values of average BW reported by the above researchers are lower than that recorded in the present study in two weeks old Indigenous chicken.

At 4th week of age, the average BW of 162.20±2.49 was recorded in Indigenous chicken of this study. This value is comparable with that of 168.96±4.11, 150.62±2.44 and 154±2.39 reported respectively in four weeks old Indigenous chicken of Bangalore Rural district (Rajakumar, 2013) [14], Kadaknath (Haunshi *et al.*, 2011) [11] and Aseel (Chatterjee *et al.*, 2007) [3] birds. Also, the average BW of 130.26±2.25, 128.80±2.57 and 143.97±3.03 were reported respectively in four weeks old Indigenous chicken of Chamarajanagar, Mysore and Mandya districts with a mean BW of 134.34±2.61 for Mysore division (Gopinath, 2013) [9]. Similarly, the average BW of 139.25±2.98 and 127.14±1.89 were reported in four weeks old Indigenous chicken of Chikkaballapur and Ramanagara districts with a mean BW of 144.49±1.87 for Bangalore division (Rajakumar, 2013) [14]. Likewise, the mean BW of 122.2±2.10, 74.38±2.32, 112±1.43, 125±2.27 and 114.62±1.40 was reported respectively in four weeks old native fowl of Mizoram (Deepak, 1995) [7], Nicobari fowl (Chatterjee *et al.*, 2002) [5], Kadaknath (Thakur *et al.*, 2006) [19], Kadaknath (Chatterjee *et al.*, 2007) [3] and Kadaknath (Haunshi *et al.*, 2011) [11]. Similarly, Sudhir (2021) [17] has reported an average BW of 129.86±2.17, 125.70±2.28 and 139.07±2.66 in Indigenous chicken of Bidar, Gulbarga and Koppala districts, respectively; and Veerannagowda (2020) [20] has reported average BW of 145.54±1.45 in Indigenous chicken of Belgaum division.

The average BW of Indigenous birds at 6th week of age recorded in the present investigation was 303.00±4.67. Similarly, Gopinath (2013)^[9] has recorded an average BW of 293.38±6.62, 269.77±4.53 and 259.55±5.81, respectively, in six weeks old Indigenous chicken of Mandya, Chamarajanagar and Mysore with a mean of 274.23±5.65 for Mysore division. Also, the average BW recorded in six weeks old Indigenous chicken of Bangalore Rural, Chikkaballapur and Ramanagara districts was 358.38±8.42, 305.45±6.28 and 244.04±3.72, respectively, with an overall average BW of 300.27±3.97 for Bangalore division (Rajakumar, 2013)^[14]. Likewise, the mean BW at six weeks old was 116.70±3.64 in Nicobari fowl (Chatterjee *et al.*, 2002)^[5], 168±1.81 in Kadaknath (Thakur *et al.*, 2006)^[19], 192.79±2.05 in Kadaknath and 267.19±3.93 in Aseel (Haunshi *et al.*, 2011)^[11]. Similarly, Sudhir (2021)^[17] has reported an average BW of 234.54±3.89, 221.47±4.00 and 248.69±4.84 in Indigenous chicken of Bidar, Gulbarga and Koppala districts, respectively; and Veerannagowda (2020)^[20] has reported average BW of 322.52 ±2.15 in Indigenous chicken of Belgaum division.

At 8th week of age, the average BW reported in Indigenous chicken of present investigation was 461.51±7.69. Likewise, Rajakumar (2013)^[14] has recorded the average BW of 585.36±13.34, 537.97±10.79 and 369.05±5.69, respectively, in eight week old Indigenous chicken of Bangalore Rural, Chikkaballapur and Ramanagara districts with a mean of 492.99±6.79 for Bangalore division. Also, Gopinath (2013)^[9] has recorded the average BW of 459.72±7.56, 453.25±9.35 and 387.93±7.70, respectively, in eight week old Indigenous chicken of Chamarajanagar, Mandya and Mysore districts with an average of 433.63±8.20 in Mysore division. Similarly, the average BW at eight weeks old was 232.6±5.9 in Native fowl of Mizoram (Deepak, 1995)^[7], 222.30±12.60 in Nicobari fowl (Chatterjee *et al.*, 2002)^[5], 239±3.07 in Kadaknath (Thakur *et al.*, 2006)^[19], 275±9.15 in Kadaknath (Chatterjee *et al.*, 2007)^[3], 393±8.52 in Aseel (Chatterjee *et al.*, 2007)^[3] and 356.30±2.16 in native chicken of North-Eastern states of India (Doley *et al.*, 2009)^[8]. Similarly, Sudhir (2021)^[17] has reported an average BW of 326.37±5.37, 311.47±5.66, 394.66±6.66 and 339.37±3.66 in Indigenous chicken of Bidar, Gulbarga, Koppala and Gulbarga division, respectively; and Veerannagowda (2020)^[20] has reported an average BW of 491.20 ±3.38 in Indigenous chicken of Belgaum division.

The average BW at 10th week of age in Indigenous chicken reported in the present study was 659.10±9.99. The values of the same trait in Nicobari fowl and Miri type of chicken was 341.90±16.70 (Chatterjee *et al.*, 2002)^[5] and 353.29±11.91 (Haunshi *et al.*, 2009)^[10], respectively.

At 12th weeks of age, the average BW recorded in the Indigenous chicken of present investigation was 823.38±12.87. Similarly, Gopinath (2013)^[9] has recorded an average BW of 697.64±10.94, 635.39±12.86 and 679.58±13.99, respectively, in twelve weeks old Indigenous chicken of Chamarajanagar, Mysore and Mandya districts with a mean value of 670.87±12.59 in Mysore division. Also, the average BW recorded in twelve weeks old Indigenous chicken of Bangalore Rural, Chikkaballapur and Ramanagara districts was 843.51±17.74, 791.56±17.45 and 618.54±10.12, respectively, with a mean of 745.96±9.50 for Bangalore division (Rajakumar, 2013)^[14]. Likewise, the average BW at twelve weeks of age was 796±13.12 in Aseel chicken (Chatterjee *et al.*, 2007)^[3], 446±10.10 in Native fowl of

Mizoram (Deepak, 1995)^[7], 396.8±18.60 in Nicobari fowl (Chatterjee *et al.*, 2002)^[5], 411±3.30 in Kadaknath (Thakur *et al.*, 2006)^[19], 583±18.18 in Kadaknath (Chatterjee *et al.*, 2007)^[3] and 566.12±7.88 in native chicken of North-Eastern state of India (Doley *et al.*, 2009)^[8]. Similarly, Sudhir (2021)^[17] has reported an average BW of 768.07±12.30, 679.54±13.81, 720.04±15.77 and 723.97±8.12 in Indigenous chicken of Bidar, Gulbarga, Koppala and Gulbarga division, respectively; and Veerannagowda (2020)^[20] has reported an average BW of 769.95 ±8.08 in Indigenous chicken of Belgaum division.

These varied BWs reported by various researchers in comparison to that reported in the present study may be attributed to the existence of differences in the genetic makeup of studied birds, varied environmental/ geographical conditions and managerial practices.

Body weight (BW, g) in Punjab broiler-1 chicken

BW profile of PB2 colored chicken at different weeks of age is presented in Table 1. The average BW recorded in PB2 birds at zero day, 2nd week, 4th week and 6th week of age was 46.07±0.29, 243.35±12.58, 660.06±7.34 and 1182.60±14.88, respectively. Similarly, Rajakumar (2011)^[14] has recorded the BW at zero day, 2nd week, 4th week and 6th week of age in crosses of Punjab Broiler-2 (PB-2) chicken with colored broiler chicken strains such as Necked Neck (NN), Dwarf (D) and Punjab Broiler (PB-1). The average BW at day old Necked Neck x PB-2 (NB₂), Dwarf x PB-2 (DB₂), PB-1 x PB-2 (B₁B₂), PB-2 x Necked Neck (B₂N), PB-2 x Dwarf (B₂D), PB-2 x PB-1 (B₂B₁) and PB-2 x PB-2 (B₂B₂) crosses was 45.21±0.37, 44.11±0.46, 42.25±0.31, 43.09±0.30, 39.11±0.25, 36.89±0.27 and 42.41±0.31, respectively. Likewise, the average BW in NB₂, DB₂, B₁B₂, B₂N, B₂D, B₂B₁ and B₂B₂ crosses at 2nd week of age was 176.68±3.56, 217.69±0.05, 209.84±2.90, 212.22±2.68, 194.29±2.54, 200.82±2.82 and 205.09±3.39, respectively (Rajakumar *et al.*, 2011)^[15]. At 4th week of age, the average BW recorded in NB₂, DB₂, B₁B₂, B₂N, B₂D, B₂B₁ and B₂B₂ crosses was 476.10±11.71, 566.87±15.04, 563.90±9.03, 594.03±7.98, 562.79±7.81, 528.71±7.33 and 549.29±10.24, respectively (Rajakumar *et al.*, 2011)^[15]. Similarly, the average BW recorded respectively in NB₂, DB₂, B₁B₂, B₂N, B₂D, B₂B₁ and B₂B₂ crosses at 6th week of age was 1018.34±19.47, 1168.66±31.98, 1267.65±15.58, 1326.52±14.07, 1153.06±16.14, 1139.98±16.29 and 1185.06±16.54 (Rajakumar *et al.*, 2011)^[15].

These varied BW reported by other researchers in comparison to that reported in the present study might be attributed to probable existence of differences in the genetic makeup of birds studied, diverse environmental and geographical conditions, and managerial practices.

Average daily gain (ADG, g)

The average daily gain (ADG) determined at 1st, 2nd, 3rd, 4th, 5th, 6th fortnights, and for the entire period of study in Indigenous birds was 3.08±0.06, 5.75±0.13, 9.39±0.18, 10.57±0.28, 13.17±0.39, 10.95±0.59, and 8.82±0.14, respectively. Similarly, Chatterjee *et al.* (2002)^[5] have reported the ADG of 1.74±0.00, 2.38±0.08, 2.77±0.12, 2.14±0.14, 3.79±0.23 and 1.78±0.34 in Nicobari fowl at 1st, 2nd, 3rd, 4th, 5th and 6th fortnights, respectively, under backyard system and the respective values in intensive system were 1.90±0.16, 1.95±0.16, 3.29±0.26, 4.67±0.33, 4.61±0.52 and 8.65±0.98. The higher values of ADG recorded in the present study in Indigenous birds than Nicobari fowls are ascribed to

breed differences, geographical differences and management of birds under different rearing systems. The ADG in PB2 birds determined respectively at 1st, 2nd, 3rd fortnights, and for the entire period of study was 13.15±0.84, 414.62±13.68,

519.99±11.68 and 25.26±0.33. These values could not be compared due to the paucity of research reports in PB2 and other colored birds.

Table 1: Least square means with standard error for various growth traits (weights in grams) in Indigenous and PB2 colored broiler chickens

| Traits (g) | Indigenous (200) | PB2 (200) | Overall (400) |
|---------------------------------|------------------|---------------|---------------|
| BW @ 0 day | 29.77±0.21 | 46.07±0.29 | 37.92±0.45 |
| BW @ 2 nd Week | 75.93±0.86 | 243.35±12.58 | 159.64±7.56 |
| BW @ 4 th Week | 162.20±2.49 | 660.06±7.34 | 411.13±13.05 |
| BW @ 6 th Week | 303.00±4.67 | 1182.60±14.88 | 742.79±23.35 |
| BW @ 8 th Week | 461.51±7.69 | - | - |
| BW @ 10 th Week | 659.10±9.99 | - | - |
| BW @ 12 th Week | 823.38±12.87 | - | - |
| ADG @ 1 st fortnight | 3.08±0.06 | 13.15±0.84 | 8.12±0.49 |
| ADG @ 2 nd fortnight | 5.75±0.13 | 414.62±13.68 | 210.18±12.31 |
| ADG @ 3 rd fortnight | 9.39±0.18 | 519.99±11.68 | 264.69±14.05 |
| ADG @ 4 th fortnight | 10.57±0.28 | - | - |
| ADG @ 5 th fortnight | 13.17±0.39 | - | - |
| ADG @ 6 th fortnight | 10.95±0.59 | - | - |
| ADG | 8.82±0.14 | 25.26±0.33 | - |

Values in parenthesis are number of observations in each group

Conclusions

Growth traits were characterized in both Indigenous and PB2 chickens. The PB2 birds had higher values for all the studied growth traits than Indigenous birds. The genetic variabilities in the growth traits of Indigenous and PB2 chicken of present investigation may be utilized for proper selection and improvement in these economic traits. However, these results need to be authenticated in larger population to confirmation with regard to growth traits.

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