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Evaluate growth performance, age at sexual maturity and egg weight of Bhutanese indigenous chickens under deep litter management

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ABSTRACT: Four strains of Bhutanese indigenous chickens were included to evaluate the performance under deep litter system. A total of 91 hens were assessed for weight gain per week, age at sexual maturity and egg weight at sexual maturity. Frizzle gained significant body weight than other strains. Onset sexual maturity was observed early in Yuebjha Narp (145.931.13± d) followed by frizzle (147.633.43± d). The longest day to reach sexual maturity was naked neck hen, but the egg (36.571.13± gm) was the biggest. Present findings on performance profile can assist to initiate programme for breed improvement and development for future generation.
Keywords: breeding; indigenous chickens; growth performance; sexual maturity

Introduction

In Bhutan, indigenous chickens are important source of cheap animal protein for poor family and serve as an alternate source of income. The money generated enables farmers to attend social gatherings. Moreover, indigenous birds are adapted to stressful environmental conditions such as poor feed and housing conditions. All mentioned qualities contribute to sustainable poultry production in rural area (Sonaiya and Sawan, 2004). On the other hand, hen lays about 60 eggs per year and takes about two to three years to reach market weight. The low production might be the cause in rapid declining of indigenous birds in the country. In 2005, indigenous birds consisted of 219,186 and decreased to 143,073 in 2013 (Livestock Statistics, 2013).

Ten different indigenous chickens are recorded in Bhutan based on plumage colour and pattern, but four strains may be considered as important chicken genetic resources. Seim (Red Jungle fowl type) and Yuebjha Narp (black feathered) are found throughout while naked neck and frizzle are popularly reared in southern part of the country. Yuebjha Narp are believed to have medicinal values. Naked neck is generally found in warmer parts of the country as they are heat tolerant. Frizzle is specifically reared by some castes in southern Bhutan. There is relatively less information available on production performance of Bhutanese indigenous chickens. Therefore, this study aims to evaluate growth performance of indigenous chicken under deep litter system to establish baseline information to be used in any future poultry development of breeding strategies and plans in Bhutan.

Materials and methods

Study area

The experiment was conducted at the College of Natural Resources, Lobesa located at an altitude about 1,440 meters above sea level. The study area falls under dry subtropical with an average temperature of 17°C.

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Population and sample size

The indigenous eggs (1-7 day old) were collected from Ozorong (Trashigang), Khengkar (Mongar), Dagapela (Daga) and Semjong (Tsirang). During incubation period, eggs were candled to remove the infertile and damaged eggs. A female chicks consisting of Seim (n = 36), Yuebjha Narp (n = 15), naked neck (n = 15) and frizzle (n = 15) were reared separately.

Management

Brooder heat source was installed and tested a day before the arrival of chicks to maintain a temperature of 28°C. A data logger was used to ensure the constant temperature. Day old chicks were leg banded. Electric bulbs were installed to meet 16 hours of light in a day. Birds were vaccinated against Marek disease, Infectious Brusal disease and Newcastle disease. About 3 cm clean shavings were used as litter materials to cover the floor. Turning of litter were done twice a week.

Commercial feed were provided based on age of the birds (Sonaiya and Swan, 2004): starter (0 to 8 week old), grower (8 to 17 week old) and layer feed (above 17 week old). Feeding was done three times per day during the chick first week and then twice at 6:30 hrs and 16:00 hrs. Clean and fresh water was provided throughout the experiment.

Data collection

Body weight gain (gm) was measured by electronic weighing balance. Onset of sex maturity was determined by palpating the cloaca and if an index finger (2.5 cm) fits between the pelvic bones, the hens were considered sexually matured (Wright et al., 2012).

Statistical analysis

Data was entered into Microsoft Excel. Analysis of Variance was used to compare body weight gain and egg weight among four populations by SPSS version 16. Bonferroni method was used to test the level of significance at $P<0.05$.

Results and Discussion

Growth rate and age at sexual maturity

Weight of naked neck day old chicks were slightly heavier than the rest population but, significant difference was not observed among the populations at $P>0.05$ (**Table 1**). Bhutanese day old chicks weighed heavier than native chickens of Ethiopia (Halima et al., 2007) and Bangladesh (Faruque et al., 2010). Moreover, Bhutanese naked neck day-old weight was higher than naked neck of Bangladesh reared under intensive system (Faruque et al., 2010).

Live body weight of the young frizzle chicks was more than Seim, naked neck and Yuebjha Narp. Furthermore, the frizzle birds had faster growth rates (**Figure 1**) and a significant live body weight was recorded at 16 weeks (**Table 1**). Na gene has favourable influence on growth performance under high temperature (Fathi et al., 2013), but in our study, slow growth rate was observed in naked neck population than its counterparts which could be attributed to cold temperature. In cold environment, the body dissipate heat from the bare skin of neck region in naked neck birds, consequently feed conversion ratio and the growth rates were affected. Onset sexual maturity in naked neck hen was comparatively longer than the other strains at $P>0.05$ (**Table 1**). Sexual maturity of the hen may also be associated with live body weight. Bhutanese indigenous hens reached sexual maturity slightly quicker than the Ethiopian (Halima et al., 2007) but slower than Bangladeshis (Faruque et al., 2010) chicken.

There was either decrease in average body

weight or slow growth rates in 19th week, particularly the frizzle (**Figure 1**). The 19–22 weeks coincided with the cold winter months and the hens start to lay her first egg in this period. In addition, frizzle exhibit broodiness (20–21 weeks).

Egg weight at sex maturity

The average egg weight at maturity was the heaviest and lightest in naked neck (36.571.13±g) and frizzle (31.931.05±g), respectively. However, the genotype did not have significant effect on egg weight at P >0.05 (**Table 1**). The larger egg size in naked neck is expected because Na gene has positive effect on egg weight in hot as well as in ambient temperature (Fathi et al., 2013).

Conclusion

In conclusion, frizzle was superior in terms of growth performance and sexual maturity. There is a scope to explore the full potential of Bhutanese indigenous chickens through good husbandry however, there is a need to analyse production performance against the inputs provided under improved management practices.

Table 1 Comparison of economic important traits among indigenous hens under deep litter system

Age (week)	Indigenous chicken population			
	Yuebjha Narp	Naked neck	Seim	Frizzle
BW0 (gm)	31.81±1.02^{a}	33.54±0.75^{a}	30.57±0.84 ^{a}	31.370.93±^{a}
BW8 (gm)	562.20±24.14^{a}	562.93±15.63^{a}	592.03±12.17^{a}	632.0021.6±^{a}
BW16 (gm)	1235.33±47.69^{a}	1235.33±51.41^{a}	1280.67±27.19^{a}	1575.3367.80±^{b}
BW21 (gm)	1510.27±61.72^{a}	1448.33±59.36^{a}	1570.31±32.92^{a}	1650.00103.59±^{a}
BW22 (gm)	1550.33±62.90^{a}	1508.00±69.17^{a}	1664.17±32.44^{a}	1695.00102.35±^{a}
BW23 (gm)	1543.33±71.81^{a}	1580.67±71.36^{a}	1709.44±32.78^{a}	1734.00103.61±^{a}
BW24 (gm)	1542.00±70.01^{a}	1614.67±61.84^{ab}	1756.00±35.55^{b}	1734.00103.61±^{ab}
Age at sexual maturity (d)	145.931.13±^{a}	164.504.35±^{b}	152.432.55±^{a}	147.633.43±^{a}
Egg weight at maturity (gm)	33.411.41±^{a}	36.571.13±^{a}	32.730.89±^{a}	31.931.05±^{a}

^{a,b} within the rows with different superscripts are significantly different at P<0.05.
BW0, day old chick body weight; BW8, 8 week old body weight; BW16, 16 week old body weight; BW21, 21week old body weight; BW22, 22 week old body weight; BW23, 23 week old body weight; BW24, 24 week old body weight.

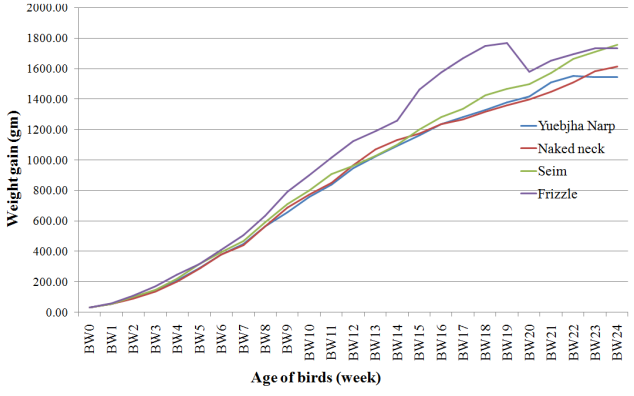

Figure 1 Weight gain (gm) in different populations

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