



RESEARCH ARTICLE

NON-GENETIC FACTORS AFFECTING GROWTH PERFORMANCE OF INDIGENOUS CHICKEN BREEDS IN NEPAL

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ABSTRACT

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There are three identified indigenous poultry breeds in Nepal; Sakini, Ghanti Khuile, Pwankh Ulte. They are reared for dual purpose i.e. meat & egg. To access various non-genetic factors affecting growth performance of indigenous chicken, different relevant research papers, review papers, annual progress reports, and statistical year book were reviewed & analyzed. Results revealed that local breeds are hardy & subject to be affected with environmental factors. They are reared on natural food than formulated feed which meant that they were hardy & rich in high quality protein. They had better weight as they found food continuously in free ranging system. It was found that chicken reared in cool climate had higher body weight than the ones grown in hot period due to less respiratory loss & low body maintenance required. Natural daylight supplemented light at night time was being deployed by farmers & had satisfactory performance. Due to well-developed thick feathers on their body, indigenous chicken were deployed for brooding than artificial methods. Body weight and feed intake was found higher when floor space of 0.279/m² per bird and flock size of 30 chickens were maintained. Despite any vaccinations, the indigenous breeds still had minimum disease incidence which may be linked to their better adaptability.

KEYWORDS

Indigenous, Chicken, Non-genetic, Hatchability.

1. INTRODUCTION

Livestock farming is one of the major agricultural sub-sector in Nepal. Livestock and its products like milk, meat, hide covers 32% of AGDP and 11.5% of total country GDP. The overall growth rate of livestock is about 5.3% (Bhatta et al., 2018). Chicken (*Gallus gallus domesticus*) is the 3rd most popular source of meat in Nepal. About 46% of the local indigenous poultry breeds are scattered mostly in rural areas and remaining 54% are reared by organize commercial poultry farm in urban and semi urban area (Bista et al., 2002). Growth rate of poultry was found to 17-18%. Poultry is reared in all three terrains of Nepal viz. Mountain (5.14%), Hill (50.25%) and Terai (44.61%) (Desha et al., 2016). The highest concentration of commercial poultry farming is found in Chitwan (46%) and backyard holding in Biratnagar (68.30%). About 90% of the household keeping poultry have local chicken in the scavengingsystem.

The population of poultry is 45171185 with healthy growth rate of 10.3% per annum. Chicken meat production 403616mt and egg production was increased from 560 to 691 million from 2003 to 2010/11 (Diba et al., 2015). Similarly poultry meat production has increased from 7-13%. The local/indigenous chicken breeds are hardy in nature and are suitable for scavenging and serve as dual purpose with high meat & egg quality. The three identified indigenous poultry breeds in Nepal are Sakini, Ghanti Khuile (Naked Neck), Pwankh Ulte (frizzled feather) and are huge reservoir of poultry genome. Ghanti Khuile and Pwankh Ulte breed's

population are at declining trend and are at risk (Livestock Farming, 2015).

Nepal imports about 985503 broiler and 107894-layer parents' stock in 2011/12 from India in cross-border district (Gerber et al., 2007). Nepal has no any history of export, but recently started to exporting broiler and egg to Bhutan and in negligible amount to India. Among indigenous breeds, Sakini is principal breed that covers more than 50% of total national poultry population (Gueye, 2002). In Nepal, indigenous chicken has almost equal shares compared to commercial breed and play significant roles in fulfilling protein requirements through egg and meat (Jha, 2019). However, poor productive performance in terms of growth, egg production and egg size of indigenous chicken are the main reason for shifting the commercial farmers toward other dual purpose trans-boundary and exotic breeds. The productive and reproductive performance of chicken are governed by two factors; genetics factors and non-genetic/environmental factors like feeding, health care, shed and ecological condition. Indigenous breeds are adaptable hardy environment and have tasty egg (Kamau, 2018). Thus, they have more survivability in the existing environment than exotic breeds. Not much research has been done to find out productive and reproductive performance of indigenous breeds in different location. Inefficient breeding plan & lack of conservation efforts have resulted in the decrease of animal genetic resource of the country (Kamau et al., 2019).

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2. MATERIAL AND METHODS

Different relevant research papers, review papers, annual progress reports, statistical year book, on headings like poultry status in Nepal, status of indigenous chicken of Nepal, non-genetic factors affecting productive, reproductive performance and survivability of indigenous chicken, rearing practice of indigenous chicken were searched (Mengesha, 2012). Relevant data so obtained were noted, compiled, evaluated, compared & presented in this review work.

3. RESULTS AND DISCUSSION

Indigenous breeds are hardy in nature and have tasty egg and meat than exotic breeds (Neupane et al., 2017). They perform better in low input and scavenging conditions and are reared for dual purpose egg and high quality meat. They are cheap source of protein and cash for poor people of rural areas. The frizzling and naked genes make them adaptable, act as sex markers and disease resistant factors. There are three identified indigenous breeds of chicken such as Sakini, Ghanti Khuile and Pwankh Ulte. They are huge reservoir of poultry genome. They are suitable for backyard rearing system. They are distributed across the various ecological zones i.e. from terai to mountains and are maintained in terms of static population from point of view of conservation (Neupane et al., 2014a). Their distribution is high in central development region 46% and in hilly region 50.25% with commercial type in Chitwan 46% and backyard type in Biratnagar 68.3%. Local chicken contributes 93946000 eggs and 2017 tones meat which is 16% of total egg and 13.5% of meat production in country (Neupane et al., 2014b).

The major indigenous chicken breeds of Nepal are:

3.1 Sakini

It is native breed of Nepal & covers about 50% of total national poultry population. They are well adapted from temperate high hills to tropical terai (Neupane et al., 2017; Neupane, 2017). They have good scavenging ability and can live without structural feeding. Hatchability of 60-80% varies with season i.e. hatchability is higher in sub-tropical than tropical areas. Higher temperatures result in lower hatchability and encourages chickens to leave the nest. Average egg production is around 70-80 per hen per year (Ochieng et al., 2012). Their body size is small and feathers color varies from black to red, spotted black and white, red and white, red and black. Adult weigh about 1.5 to 2 kg. They are reared mostly in-home backyard (Osti, 2020).

3.2 Ghantikhuile (Naked Neck)

It is hardy and dual purpose suitable for meat and egg and good for scavenging condition. They are distributed throughout the country (Osti et al., 2017). Their population are very low and need immediate conservation attention. They are typical bird with few feathers on neck and have different feathers colour; noted for the delicacy of its meat (Padhi, 2016; Paudel, 2017). Average egg production capacity is 60-80 per hen per year. Adult male weight 1.6 kg and female about 1.3 kg.

3.3 Pwankh Ulte (Dumse: Frizzled feathers)

They are also hardy in nature and reared for dual purpose for meat and egg and are suitable for scavenging condition (Petrus, 2011; Rama, 1994). They are Found in all ecological regions of Nepal. They are at risk and need immediate conservation attention. Adult male weight 1 kg and female about 0.97 kg. Although genetic play potential role in growth performance of chicken, non-genetic factors like feeding practice, housing, brooding, flock management, chick rearing, vaccination, etc also have great influence on growth and production performance of chicken (Reyes et al., 2018; Tiwari et al., 2017; Shah et al., 2019). The following non genetic factors have effect on growth performance of indigenous chicken breeds:

3.3.1 Feeding

Feeding is the most important input for poultry production and availability of low price & high-quality feed is critical for the expansion of the poultry industry (Sogunle et al., 2016). Major feed for indigenous

chicken is earthworm, insects, weeds, green leaves, kitchen waste and other plants material found in periphery of house. Most (72.10%) of the families feed rice polish, broken rice, wheat bran and kitchen waste twice in a day at Sylhet region of Bangladesh and 5.6% feed commercial feed mixing common salt and water with feed to feed their chicken (Sapkota et al., 2020; Sudaryati et al., 2016). Being in south asia, Nepalese farmers may also have similar feeding practice. Livestock in Nepal are feed deficit by over 3 million tonnes per annum. Fish bone and meat bone are used in intensive feeding. 117g / chicken + 42 g of forage / chicken + scavenging condition has higher body weight under deep liter system. Inclusions of lemon grass oil in feed improved weight gain with positive effect on feed to grain ratio and also reduce mortality and period of harvesting. Inclusion of *Moringa oleifera* leaves in diet cut of feed cost and reduced feed intake. A study reported that lack of protein, vitamin weakened the chicks and made them vulnerability to diseases and predators leads to mortality (Uddhav et al., 2016). Similarly, intake of forage may reduce feed consumption by 20%. 80% of farmers threw feed to their poultry for collective feeding. Hand mixed feeding gave better results than commercial and scavenging feedings.

3.3.2 Housing

Protective housing should be used in order to protect chicken from predators, theft, etc. but indigenous chicken are usually raised in free range system in Nepal in addition to deep liter & battery cage system. However, at the end of the day; the animals are brought back to walled houses for protection. A study reported use of bamboo to construct chicken housing in Nepal. It was found that 79% of rural families shared shelter with chicken and other animals like goat and cats. Chicken raised on free ranging had higher body weight than confinement & hardy too as they fed on natural materials found in surrounding. In deep litter system chicken were fed the recommended quantity of commercial feed two times a day with fresh and clean drinking water. 69% of farmers had constructed wooden cage for housing of their chicken at night while 31% households kept their chicken in Bamboo basket at night (Upadyay et al., 2017). A group researcher reported growth performance of mature village local chicken were 2.2 kg for male and 2 kg for female. Some researchers found that average body weight of local male and female chicken under scavenging system were 1.67 and 1.42 kg respectively. Feed intake was higher; with low mortality rate in deep litter where as more egg production and egg weight in battery cage system (Sharma, 2010). Supplements of feeds ingredients mostly depends upon the availability of waste grains, insects, grass weeds, etc around the area. Light and compact body weight of indigenous chicken helped them to escape from predators in free Range system easily (Sapkota et al., 2020).

3.3.3 Climate

Sakini performed better in inner terai while Naked Neck in hill. Body weight, hen egg production, feed intake egg weight is higher in wet season than dry. Al-Rawi and Abou – Ashour have reported that high body weight in cooler temperature were due to high feed consumption. Njoya and Picard observed that heat stress in hot dry season had a negative effect on the growth and feed intake of chicken.

3.3.4 Temperature

High ambient temperature had negative effect on the performance of the birds as they show decreased food consumption and growth. Temperature of about 15.6°C to 21.1°C is suitable for growing. Chicken are most comfortable, more productive and less stressed when ambient temperature is in the thermoneutral zone.

3.3.5 Light

Long dark period enhanced growth more than continuous illumination. By contrast when darkness was extended birds received no illumination at all and growth impaired. Morris, 1967 found that chicks reared under natural daylight supplemented by night time lightening had an increased early growth rate, maximum growth and maximum yield (Sapkota et al., 2017). A group researcher showed that intermittent light improved food efficiency, leg abnormalities and reduced mortality. About 16 hours light

per day is sufficient for better growth and development of chickens. Lower feed efficiency can be obtained with intermittent lightening in windowless house.

3.3.6 Watering

Farmer provided clean and safe water to their indigenous chicken by using pots made of plastic & metallics container. Those who didn't, relied on rain water puddles and dew. 72% chicken rearing families used to provide water twice a day in Sylhet region, Bangladesh. In, Nepal too, similar trend might be followed too (Islam et.al.). Farmers who reared chicken in free ranging mainly; didn't supply water for drinking but in commercial rearing they provided water twice to thrice in a day.

3.3.7 Brooding

Farmer used brooding hen to hatch their chicks rather than high tech hatcheries. They generally used 10 eggs per hen for hatching. Higher hatchability was found in Sakini than Naked Neck due to presence of immense feathers in Sakini and can take more egg and trap more heat; resulting higher hatchabilities. Hatchability rate and fertility rate was high in summer than spring. Kalita et.al., 2012 reported 6-10% of mortality rate in chicks of 0-5th week of age due to faulty brooding mainly. Hatchability is more in cool environment of hill than terai. Coal brooding was superior than electric and natural brooding.

3.3.8 Density and Flock size

Average number of chickens per household was 9.5 in Bangladesh (Islam et al., 2017). Where as in Kenya it was 5. In Nepal it is 5-7. Body weight gain feed intake and feed efficiency were the highest in density of 0.279/m² per bird and flock size of 30 chickens. Optimum stocking density and flocks' size for native chicken under intensive system management is 0.279 m² / chicken and 30 chickens (Ali et al., 2012).

3.3.9 Vaccination

Vaccination stimulates production of antibodies against a specific infective agent like virus, bacteria, parasites & fungal diseases. Most of the indigenous chicken rearing families didn't vaccinate. Lack of veterinary expertise in rural areas may be considered a major reason behind these. However, due to ample exercise, low density rearing & natural feeding habit, they are hardy & show resistance against a variety of common poultry diseases.

3.3.10 Biosecurity

Biosecurity prevents transmission of disease (Anne et al.). Yet, indigenous chicken being raised using local resources; biosecurity is not maintained in backyard chicken farming. Houses should be decontaminated by fumigation using chemicals like potassium permanganate and formalin to kill germ.

4. CONCLUSION

Sakini, Ghanti Khule & Pwank Ulte are the major indigenous breeds of Nepal & are well distributed in the hills & terai of Nepal. Sakini is the principal indigenous chicken breed among Ghantikhuile and Pwank Ulte. Indigenous chicken are reared for their high quality meat & egg. They serve as great source of income for rural farmers. In addition to genetic factors, various non-genetic factors have shown to have profound effect on growth performance of these breeds. In Nepal, these chicken breeds are grown in backyard conditions & they feed on natural resources like worms, weeds, insects & kitchen waste than formulated feeds. This results in formation of high-quality protein in the course of their growth & they have better taste than the ones grown with formulated feeds. Higher body weight is evident in free ranging system than any other type of system & hence; indigenous breeds have better weight compared to others. It was found that chicken reared in cool climate have higher body weight than the ones grown in hot period due to respiratory loss & loss via body maintenance prospects.

Temperature range of 15.6°C to 21.1°C was found ideal for them. Effect of

lighting on growth performance was not clear as different scientists had contradictory views. However, natural daylight supplemented by night time light, about 16 hours light per day was being deployed by farmers & had satisfactory performance. Being reared in free-range system; exogenous supply of water wasn't evident in indigenous chicken farming. Yet, water in food sources & other water found naturally might be sufficient for them. Due to well-developed thick feathers on their body, indigenous chicken was deployed for brooding than artificial means. Body weight and feed intake was found higher for floor space of 0.279/m² per bird and flock size of 30 chickens. Despite any vaccinations, the indigenous breeds still had minimum disease incidence; this may be linked to their better adaptability. But it is found that they are slow growers & thus, researches on enhancing its quick growth rate should be carried out.

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