



Journal of Experimental Biology and Agricultural Sciences

<http://www.jebas.org>

ISSN No. 2320 – 8694

IMPACT OF MORTALITY AND LIVE BODY WEIGHT PERFORMANCE IN BROILER CHICKEN ON THE INCOME GENERATION BY SMALL FARMERS IN RURAL ASSAM (INDIA)

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Received – *** **, 2019; Revision – *** **, 2019; Accepted – *** **, 2019

Available Online – December **, 2019

DOI: [http://dx.doi.org/10.18006/2019.7\(6\).***.***](http://dx.doi.org/10.18006/2019.7(6).***.***)

KEYWORDS

Mortality

Live weight

Broiler Chicken

Assam

ABSTRACT

The aim of this study was to investigate the disease problem, mortality pattern and live weight performance of broiler chicken flocks raised in the rural farms of Assam and compare the results of current study with the corresponding data obtained from an instructional farm. On the basis of obtained results level of income generation by farmers from the sale proceeds was also determined in this study. The rural farms witnessed higher (17.21%) mortality than that of instructional farm (2.16%). Average live weight performance of birds at a market age of 49 days was 2.34 kg/bird in the rural farms against an average record of 2.79 kg/bird in the instructional farm. Post-mortem examination of dead birds showed that the farms were affected with coccidiosis (44.44%), colibacillosis (22.22%) hydro-pericardium syndrome (15.55%), gout (13.33%), brooder pneumonia (8.88%) and enteritis (6.67%) of which enteric infections were found to be the major cause of death. Experimental subclinical coccidiosis resulted an average 451.67g less weight gain compared to healthy controls and this also paralleled to the lower performance observed in the rural farms. The farmers were found to incur 15.38% and 13.65% losses of sale proceeds obtained in instructional farm due to higher mortality and lesser weight gain respectively with a total 29.03% income loss. The findings of the study warrant technical support to untrained farmers in the neglected areas of litter management, health care and disease prevention for a better prospect towards improving the farmers' income.

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Peer review under responsibility of Journal of Experimental Biology and Agricultural Sciences.

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1 Introduction

Broiler chicken farming is a popular commercial enterprise among small and marginal farmers of developing countries including India (Shreya & Murthy, 2017). It is a short-term business, which can be done in several batches within a year with less capital investment and high economic return in a span of 6-7 weeks per batch. Farmers with awareness on the benefit of this venture towards employment generation for both male and females and regular flow of income are easily attracted to adopt broiler farming on a commercial basis (Adetola & Simeon, 2013). Technical efficiency and adoption of newer strategies are recognized to be important components for obtaining best possible weight in broilers at market age and maximize the profit margin (Samarakoon & Samarsinghe, 2012).

Although nutrition plays an important role in attainment of 2.5 kg standard live weight per broiler at 42 days of age (Cresswell, 2005), one may fail to achieve the target due to diseases which affect the birds' performance. Diseases are frequently observed in birds raised on deep litter (Riddel & Kong, 1992). Faecal contamination of litter is a key factor for occurrence of several infectious and non-infectious diseases capable of causing ill health of birds in clinical and subclinical forms (Adamu, 2015). Apart from viral diseases, coccidiosis, necrotic enteritis, colibacillosis and salmonellosis are considered to be the common infectious enteric diseases of birds responsible for decreased feed intake, nutrient absorption, increased feed conversion ratio, reduced body weight gain, high morbidity and mortality thus leading to a huge economic loss (Dahiya et al., 2006; Shirzad et al., 2011; Abera et al., 2017). Higher medication cost to fight diseases, development of drug resistance, drug residue and public health risk of consumption of contaminated broiler meat are some other aspects which adversely impact upon improperly managed farms (Muhammad et al., 2010; Timbermont et al., 2011).

Broiler farming in Assam and other North-East Indian states has gained momentum in the past decade due to its high potentiality on income generation. As a result, the unemployed youths have been taking up broiler farming on commercial basis. Unlike other parts of India, this region however experiences heavy rainfall, recurrent waves of flood during monsoon, moderate temperature and a very high humidity throughout the year. All these climatic factors are conducive for proliferation and longevity of disease agents in endemic areas. Prevalence of various infectious disease agents in broiler chicken has been worked out in this region (Buragohain & Kalita, 2010; Borah et al., 2017; Kalita et al., 2018). However there is paucity of information on the growth performance, mortality pattern and income generation by rural farmers adopting broiler farming as a commercial enterprise for livelihood. The present study was undertaken to evaluate the performance of the broiler farms adopted by small and marginal

farmers in Assam on the basis of bird mortality and income generation.

2 Materials & Methods

The field investigation was conducted during June'2015-May'2016 at 74 broiler chicken farms in undivided Kamrup, Morigaon, Darrang and Jorhat districts of Assam which is situated in northeast region of India. Single visit was made to the farms for collection of data through discussion with farmers, access to farm records wherever available, personal observation on farm management, necropsy of dead birds and laboratory investigation. The farm data included the broiler breeds, flock, size, vaccination, medication, nutrition, litter management, bird mortality and live body weight performance at 7 weeks market age. General information on farmers' personal data such as educational status, training and experience of broiler framing were also obtained during discussion. Deep litter quality and hygiene status in the farms were noted through personal observation. A total of 190 birds found dead in the farms on different visiting days were necropsied in the farm premises and causes of death were ascertained on the basis of gross pathological findings observed at necropsy. Data on bird mortality, live body weight (bwt) attainment at 7 weeks market age and sale proceeds at a farm gate price of Rs. 75.00/kg live bwt of broilers maintained with all technical efficiency in the Instructional Poultry Farm of the Lakhimpur College of Veterinary Science, North Lakhimpur (Assam) were obtained to compare with the respective field data analyzed in the form of average and percentage calculation. A preliminary experiment was conducted with Institutional Animal Ethics Committee approval to assess the influence of an enteric disease due to coccidia on the bwt performance of broilers. For this, 6 broiler chicks at 2 weeks of age were infected each by oral inoculation of 5×10^4 laboratory sporulated oocyst of coccidia belonging to *Eimeria acervulina*, *E. tenella* and *E. maxima* species. Equal number of birds was kept as uninfected control. All birds of both the groups were maintained in separate wire netted cages with non-medicated feed and water supplied *ad libitum*. Birds were observed for faecal positivity to oocysts of coccidia, clinical signs and mortality during the experiment. Birds were weighted individually before initiation of the experiment and at weekly interval for 5 weeks thereafter. Body weight performance in the experimental group was compared with that of healthy control. Financial gain/loss in rural farms on the basis of sale proceeds and mortality loss was calculated in comparison with respective data generated from the instructional farm.

3 Results & Discussion

Most of the farmers involved in broiler chicken farming in the present survey areas were non-matriculate (83.33%) while only 16.66% were having educational qualifications as matriculate and

above. None of the farmers had acquired any training on poultry farming but the day-to-day problems were solved through consultancy services. The present findings are in agreement with Satapathy et al. (2017) who reported lot of farmers in India were small scale uneducated and untrained. Similar data were also projected from a neighboring country, Bangladesh where more than 70% farmers had secondary level of education and majority had no training on broiler farming (Islam et al., 2014). Training, education, farming experience and extension contact were recognized to be the significant factors affecting the profitability of small scale broiler farmers (Kawsar et al., 2013; Satapathy et al., 2017).

Broilers were raised on deep litter placed mostly over Kutcha floor (97.91%) while only 2.08% farmers used pucca floor. In current study, deep litter used by 6.25% farmers were fresh for each broiler batch while 93.75% farms used the same litter for raising multiple (2-4) broiler batches. Deep litter is recognized to be the important source of infection to the broilers which are easily infected with pathogens from poorly managed litters (Yegani & Korver, 2008; Abera et al., 2017) through faecal-oral route.

Farm history on disease occurrence in order of farmers' perception level included chronic respiratory disease (CRD-97.92%), infectious bursal disease (IBD-79.17%), hydro-pericardium syndrome (72.92%), colibacillosis (58.33%), gout (31.25%) and coccidiosis (27.08%) as the diseases affecting their farms (Table-1). Post-mortem examination of 190 dead birds however revealed coccidiosis to be the commonest disease diagnosed in 44.44% of

the farms followed by colibacillosis (22.22%), hydro-pericardium syndrome (15.55%) and gout (13.33%). According to the body system involved, gastro-intestinal system was found mostly affected with infectious organisms. Similar examination of dead birds at the instructional farm recorded occurrence of only colibacillosis and respiratory tract infection. Earlier, Borah et al. (2017) also recorded certain microbial diseases in broiler chickens of Assam. Kalita et al. (2018) reported coccidiosis in clinical and subclinical forms to be the most common and this was found to be in conformity with the present finding. Occurrence of coccidiosis at a rate much higher than the farmers' perception level indicated lack of awareness and poor management procedures practised by untrained farmers in this region where environmental conditions of high rainfall, high humidity and moderate temperature are influencing propagation of coccidia and other pathogenic microbes in the deep litter. This agreed to the disease induced high mortality in birds observed as observed by Buragohain & Kalita (2010) and Yegani & Korver (2008).

Looking into the data on bird mortality and live bwt attained in birds at 7 weeks rearing period, the rural farmers witnessed 1.5%-41.6% (Average 17.21%) mortality and 1.90-2.87 kg (Av. 2.34 kg) live bwt attained in surviving birds in the rural farms (Table 2). In contrast, there was only 2.03-2.30% (Av. 2.16%) bird mortality and 2.62-2.97 kg (Av. 2.79 kg) live bwt recorded in birds at the instructional farm. Higher mortality and lesser bwt attainment in birds also reflected poor management problems in the rural farms (Zahir-ud-Din et al., 2005; Bera et al., 2010). Profit and loss accounts prepared on the basis of average loss due to mortality and

Table 1 Disease problems in broiler chicken farms of rural Assam

Disease	No. of farm positivity (%) as per	
	Farm History (N=48)	Post mortem examination (N=45)
Coccidiosis	13 (27.08%)	20 (44.44%)
Infectious bursal disease (IBD)	38 (79.17%)	-
Chronic Respiratory Disease (CRD)	47 (97.92%)	-
Hydropericardium Syndrome	35 (72.92%)	7 (15.55%)
Heat Stress	5 (10.42%)	-
Gangrenous dermatitis	3 (6.25%)	-
Gout	15 (31.25%)	6 (13.33%)
Colibacillosis	28 (58.33%)	10 (22.22%)
Enteritis	3 (6.25%)	3 (6.67%)
Magotted wound	1 (2.08%)	-
Brooder Pneumonia	3(6.25%)	4 (8.88%)

Table 2 Comparison of averages in mortality rate, live weight attainment at 7 weeks & income level per flock of 100 birds in rural farms & instructional farms

Parameters	Rural farms	Instructional farm
Average mortality (%)	17.21 (1.50 - 41.60)	2.16 (2.03 - 2.30)
Average live weight (kg)	2.34 (1.90 - 2.87)	2.79 (2.62 - 2.97)
Sales Proceeds (INR)*	14,529.64	20,473.02
Total loss in INR (%)	-5943.38(29.03)	-
Loss in INR due to mortality (%)	-3149.22 (15.38)	-
Loss in INR due to live weight performance (%)	-2794.16(13.65)	-

*Calculated on the basis of Rs.75/kg live body weight of birds as Farm Gate price.

Table 3 Statement of average financial loss due to bird mortality and reduced live body weight in rural broiler chicken farms (N = 26) compared to instructional farm

Proportion of loss incurred	Number of rural farms (%) affected due to		Total number of farms (%)
	Mortality	Reduced live weight	
No loss	1 (3.85)	1 (3.85)	Nil
Loss	25 (96.15)	25 (96.15)	26 (100.00)
– <10%	10 (40.00)	9 (36.00)	1 (3.85)
– 10-20%	6 (24.00)	10 (40.00)	8 (30.77)
– 20-30%	8 (32.00)	6 (24.00)	5 (19.23)
– 30-40%	0 (0.00)	0 (0.00)	6 (23.07)
– 40-50%	1 (4.00)	0 (0.00)	3 (11.53)
– 50-60%	0 (0.00)	0 (0.00)	3 (11.53)

live bird sale proceeds it was found that the rural farms incurred loss on an average 29.03% of the sale proceeds obtained in the instructional farm. The loss incurred by the rural farms included 15.38% due to mortality and 13.65% due to reduction in live bwt of birds sold. The farms had to lose on average Rs. 209.25/bird due to mortality and Rs. 33.75/bird for reduction of 450g live bwt/bird. Performance of only one rural farm (3.85%) was almost identical to the instructional farm while the remaining 96.85% farms were found to have incurred 10-60% of total (29.03%) losses when compared with the sale proceeds of the instructional farm (Table 3). Highest loss due to mortality and reduced live weight reached upto 50% and 30% of the respective losses incurred by the farms. Profit and loss in the rural farms of the present study was calculated on the basis of bwt performance and mortality witnessed by comparing with those of the instructional farm since, these two are considered to be the important economic traits that determine the net profit or loss in broiler industry (Zahir-ud-Din et al., 2005; Bera et al., 2010). The farmers expect to earn good revenue fetched from bird sale on live bwt basis when mortality rates are negligible (Afzal & Khan, 2017).

Birds experimentally infected with coccidia parasites attained 1170.0 g (\pm 58.31) mean bwt compared to 1621.67 g (\pm 26.54) bwt observed in the healthy group (Table 4). Thus coccidia infection caused an average 451.67 g less bwt production per bird and it amounted to 27.83% sale proceeds loss when compared with the performance of healthy control birds of the experiment. Experimental finding might be parallel to the field situation where the birds also weighed 450 g/bird on average less than that of instructional farm. This confirms that the economic losses caused by coccidia affecting the gastro-intestinal tract of the birds are enormous (Kumar et al., 2015). Coccidiosis not only affects the birds but also predisposes them to suffer from bacterial infections of the gut to produce a total loss in the broiler industry (Dahiya et al., 2006). Any abnormality in the gastro-intestinal tract can disturb the digestion of food nutrients with resultant increase in the feed conversion ratio, which is another determinant factor of profitability (Bandara & Dassanayake, 2006; Kawsar et al., 2013) in farms. Moreover high cost of feeds and chicks also affect the cost of production especially in the small scale farming as compared to medium and large scale farming (Mohsin et al.,

Table 4 Average body weight performance in birds with experimental coccidiosis

Week of Infection	Average weight (g) in healthy birds (N=6)	Average weight (g) in infected birds (N=6)
Initial (Pre-infection)	146.67 ± 2.47	148.0 ± 1.22
1 st week (Post infection)	343.33 ± 4.77	232.0 ± 8.46
2 nd week	615.0 ± 9.92	390.80 ± 14.22
3 rd week	964.17 ± 21.92	717.0 ± 49.03
4 th week	1203.33 ± 36.09	895.0 ± 39.94
5 th week	1621.67 ± 26.54	1170.0 ± 5 8.31

N.B.- Average 451.67 g less body weight gain in birds experimentally infected with coccidia and incurring 27.83% INR loss compared to healthy birds; Average 450 g less body weight gain in birds of rural farms as compared to the instructional farm.

2008). The present finding on reduced live bwt performance in birds with coccidiosis agreed to Bera et al. (2010) claiming a minimum of 0.1 kg weight loss due to subclinical forms of coccidiosis. Since profit making is the ultimate goal of any commercial activity, the rural farmers are seemed to have enough scope to increase the profitability by availing effective training on broiler farming through regular flock health monitoring (Keirs et al., 1991) and adoption of better management procedures for mortality reduction as envisaged by previous workers (Singh et al., 2010; Samarakoon & Samarsinghe, 2012).

Conclusion

Data generated through the present field investigation provided a useful insight into economic performance of rural small-scale farmers engaged in commercial broiler farming in Assam. Higher mortality and lesser body weight at market age recorded in broiler chickens reflected lack of training and practical experience of farmers on proper management procedures. Enteric infections remained as the major challenge to the broiler farming with deep litter system where farmers need to take effective steps to maintain the intestinal health of birds through litter management and adoption of better hygiene and sanitation procedures.

Acknowledgement

The authors are thankful to the Dean, College of Veterinary Science, Guwahati and the Associate Dean, Lakhimpur College of Veterinary Science, North Lakhimpur for the facilities provided to conduct this field investigation.

Conflict of Interest

The authors declare that they have no conflict of interest.

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