A Study on Heat Stress occurrence and management of Layer Chicken in Hathazari Upazilla, Bangladesh

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Abbreviation	Elaboration
%	Percentage
Freq	Frequency
e.g.,	Example
etc	Et cetera
et. al	And his Associate
UVH	Upazila Veterinary Hospital
CVASU	Chattogram Veterinary and Animal Science University

Abstract

The study presents the occurrence of heat stress in layer chicken and managemental measures for its prevention in different unions of Hathazari Upazilla under Chattogram district. 32 broiler farms in different unions were selected for the study. Simple Random sampling technique was followed for selection the layer farms. The average flock size found 800 in the study area. The estimated frequency of heat stress is 24.37% and the average mortality due to it is 2.6%. Heat stress issue is alarming threat for layer chicken industry. The farm owner adopted some measures but still they felt discouraged to rear layer due to such frequent occurrence and drastic change in the layer production in summer seasons. If the problems can be removed, proper guideline for prevention of heat stress in layer is provided, applying modernized managerial strategies can lessen the adverse effects of heat on egg production and its quality and people would be more encouraged to establish layer farms on a large scale in all seasons. The current baseline inspection provides an accurate picture of the state of inadequate heat stress management practices in the layer chicken farms in Hathazari Upazila. The findings of this report will play an important role in designing and creating a proper strategy for mitigating heat stress in layer chicken farms in Bangladesh.

Keywords: Heat Stress, Layer, Production, Management.

Chapter 1

Introduction

Layer chickens are reared for the purpose of commercial egg production in Bangladesh. The production of layers can be hampered by lack of proper management, environmental stress, and various types of systemic and infectious diseases. Heat stress is the occurrence of an uncomfortable condition if poultry is outside their thermoneutral zone and struggles to regulate their body temperature. (Pastor, 2021). Poultry is very prone to heat stress as they have poor thermoregulation mechanisms. Therefore, when the environmental temperature rises to 100°F, the layer chickens' core internal temperatures will rise to unfavorable temperatures if proper measures are not taken. Thus, temperature and humidity of the environment are playing the most important role in occurring heat stress. (Sherwood, 2018). In order to overcome this condition, it is necessary to monitor both environmental temperature and humidity in the housing of poultry.

The optimum temperature zone which is necessary to provide the best possible comfort to layer chickens is between 60 to 75°F (Noll, 2022). During the summer season, usually, the temperature rises upto 85°F. Layer chickens try to cope with this extreme temperature by consuming less feed which subsequently reduces the production performance. Farmers will bear direct costs of climate change characterized by reduction in poultry yields and indirect costs of adaptation *(Patra, 2021)*. This implies heat stress is contributing to low production while simultaneously increasing production costs (Rath et al., 2022). Though the importance of animal responses to environmental challenges applies to all species, however, poultry seems to be particularly sensitive to temperature-associated environmental challenges, especially heat stress. It is revealed that modern poultry genotypes are prone to produce more body heat, as their metabolic activity is greater in comparison with other genotypes (Deeb et al., 2002). Understanding and controlling environmental conditions is crucial to yielding successful poultry production and their welfare. Otherwise, it will lead to a reduction in layer chicken enterprises profitability and is a threat to the survival of the sector.

In dry-hot condition, early heat conditioning is used to induce heat resistance and adaptation of poultry breeds in middle east countries. (Saeed et al., 2019). Intermittent feeding such as feeding during the early hours of day to reduce the metabolic heat output is practiced in Egypt. (Farghly et al., 2018). Exhaust fans is also used to remove hot air from the poultry

housing in USA and other American countries. (Bell & Weaver, 2002). Bangladesh is categorized as one of the most helpless countries for global temperature rise due to its distinctive geographical location. (Huq and Ayers, 2008). A paper reviewed the relationship between temperature rise and poultry health in Bangladesh and the possibility for increased effect for the poultry sector and identified absence of methodical research worldwide and lack of data in Bangladesh in this regard. However, during hot weather birds are supplied plenty of watering and roof shade in rural area but these are not sufficient. (Milind, 2021)

Viewpoint data from layer chicken farms is very important as previous studies mostly were done focusing in occurrence and effects of heat stress in broiler chicken production. It could give a fresh perspective to develop practice-oriented heat stress management strategies. Most of the developing countries like Bangladesh have very limited data related to heat stress occurrence status in layer chicken farms. On this backdrop, the present study was undertaken to evaluate the heat stress occurrence scenario and its management in the poultry farms of Hathazari Upazila, Chattogram, Bangladesh.

Objectives:

1. To assess the heat stress management practices of layer chicken farms in the study region.

2. To know the constraints in overcoming the frequent occurrence of heat stress in layers.

Chapter 2

Methods and Materials

2.1 Study area and period:

The study was conducted in Hathazari Upazilla of Chattogram District. The study period was from 17th february, 2022 to 28th april, 2022. Hathazari is under the Chattogram division. It is situated at 22.5083°N 91.8083°E. It comprises 52,594 households and a total land area of 251.28 square kilometers. Hathazari Upazila is comprised with 15 union parishad and further they are divided into 59 villages and 48 mouzas. The main river is Halda. It is surrounded by Pachlaish and Chandgaon Thana on the south, Fatikchhari Upazila on the north, Sitakunda Upazila on the west, Raozan Upazila on the east. Hathazari has a total population of 431,748 which includes 215,201 Males and 226,547 Females. Around 60% residents are somehow connected to agriculture, either directly or indirectly. According to information of Upazila Livestock Office and Veterinary Hospital, Hathazari, a total of 186 poultry farms (31 Layer farms, 105 Broiler farms, 5 Duck farms, 1 breeder farm, 32 Sonali bird farms, 12 Pigeon farms poultry farm) situated in this area. This study was conducted during the summer season when the range of the environmental temperature was 30.2°C (86.4°F) to 21.5°C (70.8°F). The average humidity of Hathazari Upazilla within the study period was 70%. The data was collected over a total of 48 working days when the working period was 9 am to 5 pm in the Veterinary Hospital.

Figure 1: Map of Hathazari (Study area)

2.2 Selection of participants:

The participants in the studies were local layer farmers of Hathazari upazilla who have minimum 300 layers. Participants were divided into three groups based on the number of birds in their farm. Farmers having <500, 501-1000 and >1000 layer birds are categorized as small, medium and large-scale farmers, respectively. Participants were selected randomly who came to the Upazila Livestock Office and Veterinary Hospital for the treatment of their animals.

2.3 Questionnaire design and data collection:

Total 32 farmers participated in this study. The data was collected on their own farms. To obtain the data for this study, a standardized questionnaire was used. Data was obtained through interviews conducted in-person on their own farm using the questionnaire. In the first section of the questionnaire, demographic and socioeconomic information was gathered, in the second section, there were 13 questions about their housing system, ventilation type, roof and floor system; in the third section, there were 5 questions about the observed clinical signs due to heat stress; and in the fourth section, there were 9 questions about practice done in such case scenarios and about their constraints. The questionnaire was designed with similar goals as this study after researching several related studies conducted in other countries. A professional supervisor and livestock extension officer (LEO) from Upazilla Veterinary Hospital (UVH), Hathazari Upazilla, reviewed this questionnaire. While some farmers completed the survey on their own, the surveyor made every question easy to understand by translating it into each farmer's native tongue. However, for the remaining farmers, the surveyor obtained the information through interviews by physically visiting and seeing the farm. People who took the survey did so voluntarily and had the option to opt out at any moment.

2.4 Data Analysis:

The collected data were sorted and imported into Microsoft Excel (Microsoft 365 Apps for Enterprise) mainly to demonstrate the results per the objective of the study.

Chapter 3

Results

3.1 Demographic parameters of farm owners

Table 1 shows the demographic characteristics of farm owners in the study area. The majority (87.50%) of the farmers were male. About 50% of farmers completed the secondary standard, 25% primary level, and 12.5% completed graduation. Farming is the main occupation for most (84.38%) farmers. A large percentage (78.13%) of the farmers belong to the middle-income group.

Table 1: Socio-demographic status of farm owners:

Farm owner demography	**Category**	**Frequency (n)**	**Percentage(%)**
Farm ownership	Female	4	12.50
	Male	28	87.50
	Illiterate	0	-
Owners educational level	Primary	9	28.13
	Secondary	17	53.13
	Graduate	6	18.75
Main occupation	Farming	27	84.38
	Business	5	15.63
	low income (10000-30000)	7	21.88
Economic status	Middle income (30000-50000)	25	78.13
	High income(>50000)	0	-

Farm Characteristics

Of 32 study farms, 14 were rented, while 18 were owned by the farmer (Table 2). The majority (56.25%) of farms were medium-scale, followed by large-scale (43.75%).

Table 2: Characteristics of Farms:

Characteristics	Category	Frequency (n)	Percentage(%)
Sources of premises	Owned	18	56.25
	Rented	14	43.75
Farm capacity (number)	Small-scale(<500)	0	-
	Medium-scale(501-1000)	18	56.25
	Large-scale(>1000)	14	43.75

3.2 Ventilation Facility in the layer house

Table 3 shows that 18.75% of farmers used tunnel ventilation, 75% used mechanical ventilation, and the remaining farmers (6.25%) used natural ventilation systems.

Table 3: Ventilation facility of layer farms:

Ventilation Type	Frequency (n)	Percentage %
Natural	6	18.75
Mechanical	23	71.875
Tunnel	3	9.375

3.3 Flooring and Roof System

The flooring and roof systems of the study farms are summarized in Table 4.Around 68.75% of farms were littered, 18.75% were wire mesh, 12.5% were combination littered, and no floor system was found slatted. The majority (93.75%) of farms had shed-type roofs, and 6.25% were multistoried, but no gable-type roof was found.

Table 4: Flooring and Roof System of layer farms:

Parameters	Categories	Frequency (n)	Percentage %
Floor-type	Littered	21	65.625
	Wire Mesh	3	9.375
	Slatted	0	0
	Combination littered	8	25
Roof type	Shed type	30	93.75
	Multi-storied	2	6.25

3.4 Observed Clinical Signs in Heat Stress:

Among the 32 farms, 25.06% are affected with heat stress where 69.28% showed labored breathing, 62.82% layer chicken showed panting, 44.14% showed lifting wings away from body as clinical signs.

Table 5: Observed Clinical Signs in Heat Stress:

	Frequency (n)	Percentage
Heat stress affected	**6240**	25.06
Laboured breathing	**5850**	69.28
Panting	**5500**	62.82
Wing lifting away	**5129**	44.14

3.5 Management practices when heat stress signs appear:

It was found that among the farms, when clinical signs of heat stress appear, 9.375% farmers use vitamin C and electrolyte. 81.75% farmers use them as prevention before occurrence of clinical signs and 9.375% use aspirin for therapeutic purpose.

Table 6: Management practices when heat stress signs appear

Management	Frequency (n)	Percentage%
Use Of Vitamin C, Electrolyte only after Clinical Sign	3	9.375
Use Of Vitamin C, Electrolyte for Prevention	26	81.25
Use of other drugs (Aspirin)	3	9.375

3.6 Mortality rate in studied poultry farms:

Among the studied farms, 43.75% has mortality rate <1%, 40.63% farms have mortality rate of 1.01-4% and 15.63% farms have mortality rate below 4%.

Table 7: Mortality rate in studied layer farms

Mortality rate (%)	Frequency (n)	Percentage (%)
<1	14	43.75
1.01-4	13	40.63
>4	5	15.63

3.7 Constraints of management of heat stress:

The constraint of management of heat stress is presented in Figure 1, among the factors; financial problem is largely responsible which 37.50% is. Inadequate ventilation and poor knowledge about preventing heat stress is also responsible for 21.88%. Poor education is 9.38% and inappropriate housing system is responsible for 9.38%.

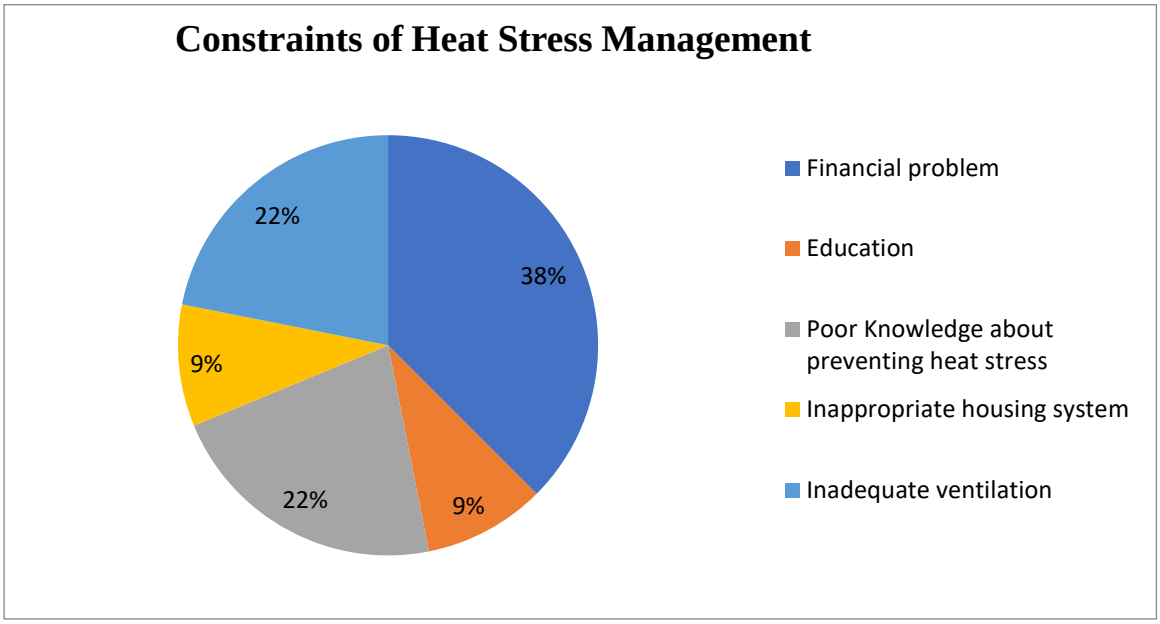

Figure 2: Constraints of management of heat stress

Chapter 4

Discussion

The indoor air temperature rises as a result of both the high external temperature and the heat released by the activities inside the poultry house. (Oloyo and Ojerinde, 2018). At Hathazari Upazila, those layer farms that relied on only natural ventilation faced high occurrence of heat stress. So in order to boost air flow and encourage the dissipation of body heat from the layers, circulating fans need to be spaced and positioned typically placed 25 to 30 feet apart in curtain layer houses. (Anderson, 2004)

Although solar heat through roof is a major issue in occurrence of heat stress, (Pawar et al., 2016) but well established roofing was not present in the farms of study area to mitigate the problem. Insulating poultry houses' roofs and ceilings is always effective to reduce heat stress during warm weather by lowering the roof temperature by 5°C with reflecting insulation, rigid board insulation, spray polyurethane insulation, and reflective roof paints that significantly can reduce heat gain through roof surfaces. (Chaurasia et al., 2022)

Majority farms floor was littered in the study area. Compared to layers raised on wood shavings, those raised on plastic flooring are better as use of perforated plastic flooring under heat stress can enhance chickens hygiene and air quality (lower CO_2 and NH_3 concentrations). (Almeida et al., 2018)

A large number of farmers use electrolyte and vitamin supplement before the appearance of heat stress signs during hot humid weather as a measure of prevention. Vitamin and electrolyte supplement can aid layers with heat stress by increasing body weight, boosting energy levels, and other positive effects. (Abidin & Khatoon, 2013)

A significant finding in the study area for heat stress management was found that, a large number of farmers used aspirin drug for mitigating heat stress. A study showed that in diet of layers affected with heat stress, aspirin supplementation 500 mg/kg can make enhanced performance and their welfare. (Rokade et al., 2016)

There was a substantial inverse relationship between farmer perceptions of the necessity of artificial ventilation and shed compliance. This indicates that farmers' perceptions of the necessity of ventilation were poor. The lack of knowledge of the prevention of heat stress

which is better than management after occurrence of clinical signs is also apparent in the study area.

In this study, a few factors, mainly farmers ignorance, lack of training, lack of knowledge about clinical signs of heat stress, and financial problems are pointed out to be the significant constraints of management of heat stress in layers.

Conclusion

From the above discussion it can be concluded that the occurrence of heat stress in layer chicken in Hathazari Upazila under Chattogram district is very frequent and causes significant impact on the production. The measures of management to control the occurrence are not sufficient. There occurs poor condition on manage-mental practices of controlling heat stress in Hathazari Upazilla. There are many reasons for failure to heat stress management in the study area including lack of training, financial problem, and ignorance. In conclusion, this survey will give an overall scenario of farmers' perception heat stress management practices for layers in the study area. This information will further help to identifies area needed to be improved in terms of managerial practices of layers heat stress.

Limitation

There were several limitations at the time of preparing this report. Particularly, the duration of the study was very narrow. There was not enough opportunity to work with farms that are located outside a particular area. For this reason, neither the results of this report are relevant to the whole country, nor is it possible to present a realistic representation of the whole Bangladesh in this report.

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