PERFORMANCE EVALUATION OF QUAIL CLOSED-HOUSE SYSTEM IN INSTITUTE OF POULTRY TECHNOLOGY, MALAYSIA

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ABSTRACT. Quail closed-house system is a house that support quails' optimum requirements as far as temperature, relative humidity, ventilation and light are concerned. One of the four units of quail closed-house systems at the Institute of Poultry Technology, Malacca was used in this study. The objective of this project was to evaluate the performance of the quail closed-house system by comparing the condition of the house under current management condition and after the Standard Operating Procedure determined by DVS was adhered. The house performance was evaluated by observing its ability to achieve an optimum temperature range of 20°C to 27°C with a relative humidity between 60% to 80% as perfect surroundings for quails. At the end of the experiments, the results showed a decline in internal temperature at almost 3°C and increasing in a relative humidity of 10% after all the specifications and procedures were followed.

Keywords: closed-house system, quail, internal environmental condition

INTRODUCTION

Institute of Poultry Technology, Malacca is accommodates of four units of quail closed-house systems. The closed-house system named as House A which is being studied hold the adult quails with dimension of 45 meters length, 10.8 meters width and 3.7 meters height. The house is equipped with evaporative cooling pad and automatic drop curtain system along the house. The curtains must be ensured in a good condition as any hole and leaking can affect the house ventilation. It is also equipped with six units of exhaust fans located at the end of the house. Stale air is removed by the exhaust fans and fresh air brought in through intake openings. A good condition and operation of the exhaust fans and evaporative cooling pad can reduce the internal temperature and at the same time increase the relative humidity in accordance to the specifications (Berry and Huhnke, 2003). Proper ventilation in a poultry house is very crucial and must be maintained as it is essential to sustain life apart to remove excess heat, moisture, dust and odours from the building (The Poultry Site, 2012).

RE# MJVR -0030-2014

House A used in this study is an A-shaped closed-house without ceiling installation as shown in Figure 1. The roof is insulated with thermal reflective insulation in order to reduce heat inside the house especially during hot weather. However, complaints have been raised that the quail closed-house in Institute of Poultry Technology has recorded high temperature especially at the middle of the house. House A has already been installed with control panel that show the internal temperature of the house but the reading displayed was slightly higher than the specification due to the house operation did not adhere to the guidelines and standards determined by the DVS. Table 1 shows the allowable internal environmental condition as recommended to build a poultry closed-house system (Sulaiman *et al*., 2005). The current environmental condition affect the growth of quails as well as the efficiency of production cost and at the same time creates discomfort to the workers since the high temperature will affect the odor and air quality inside the house.

Table 1: Allowable Internal Environmental Condition of Closed-House System (Sulaiman *et al*., 2005)

Items	Reading
Temperature, T (°C)	20 – 27
Relative Humidity, RH (%)	60 – 80
Ammonia, NH_3 (ppm)	< 20
Hydrogen Sulfide, H_2S (ppm)	< 5
Carbon Dioxide, CO_2 (%)	< 0.3
Carbon Monoxide, CO (%)	0

The aim of this study was to evaluate the performance of the quail closed-house system by comparing the operation of House A under current management condition and after all specifications and Standard Operating Procedure (SOP) followed as determined by the Department of Veterinary Services.

MATERIALS AND METHODS

The performance of the quail closed-house system was evaluated by locating four units of data loggers near the evaporative cooling pad, at the front, middle and end of the quail's cage line as shown in Figure 2. The data loggers were placed at the same level of the quail's cage so that the temperature and relative humidity recorded exactly the same as those accepted by the quails. The internal temperature and relative humidity were recorded at two-hour interval using the data logger.

There were two conditions of experiments conducted named as (a) Experiment 1 and (b) Experiment 2. In Experiment 1, the data were recorded in the current management operation without operating the evaporative cooling pad and the exhaust fans were set in a manual mode in which only one or two fans were operated simultaneously. Experiment 2 was conducted in accordance to the specifications and procedures determined by DVS in which the evaporative cooling pad was operated properly while the exhaust fans were set in an automatic mode as mentioned by Sulaiman *et al*. (2005). In

Figure 1. Roof without ceiling

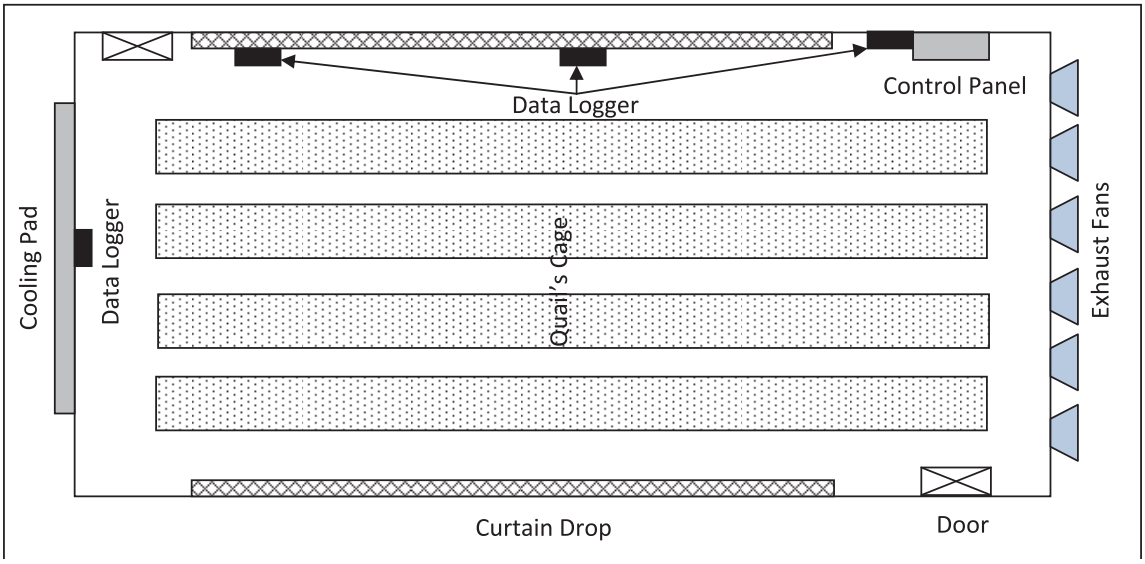

Figure 2: Location of HOBO data logger inside the house

Table 2. Gases reading of House A

Date	Recording Point	Gases Reading				Last Manure Collection
		Oxygen, 0_2 (%)	Ammonia NH_3, (ppm)		Hydrogen Sulfide, H_2S (ppm)	
			Reading 1	Reading 2		
5/3/2013	Front	20.9	0	0	0	4/3/2013
	Middle	20.9	0	0	0	
	End	20.9	0	0.1	0	
6/3/2013	Front	20.9	0	0	0	
	Middle	20.9	0	0	0	
	End	20.9	0	0	0	
7/3/2013	Front	20.9	0	0	0	
	Middle	20.9	0	0	0	
	End	20.9	0.1	0.1	0	
12/3/2013	Front	20.9	0	0.1	0	11/3/2013
	Middle	20.9	0	0.1	0	
	End	20.9	0	0.1	0	
13/3/2013	Front	20.9	0	0.6	0	
	Middle	20.9	0.1	1.1	0	
	End	20.9	1.1	1.4	0	
14/3/2013	Front	20.9	0	0.7	0	
	Middle	20.9	0	1.1	0	
	End	20.9	1.0	1.4	0	

both experiments, the data were recorded within 14 days.

The results obtained were compared to identify and determine the differences of the internal environmental condition of House A before and after all procedures were followed. In addition, three types of gases namely oxygen, ammonia and hydrogen sulfide were analysed to monitor the air composition inside the house.

RESULTS AND DISCUSSION

Gases Reading

The gases reading of oxygen, ammonia and hydrogen sulfide of House A are as presented in Table 2. The readings were taken at three different points during Experiment 1 was conducted. The amount of ammonia and hydrogen sulfide were recorded between 0-1 ppm and 0 ppm respectively. The results showed that all

three gases did not exceed the acceptable limit as recommended to operate a closed-house system as shown in Table 1. Hence, no further study was carried out for Experiment 2 in terms of gases reading as the changes are not significant. The amount of ammonia should be controlled to ensure the air quality of the house since high concentrations of ammonia can reduce weight gains and increase susceptibility to disease like irritate to mucous membranes of the respiratory tract and the conjunctivae and corneas of the eyes (World Poultry, 2010). Meanwhile, the oxygen level should be monitored since it is crucial to sustain life and carries out the harmful gases and undesirable odors caused by respiration and waste decomposition (The Poultry Site, 2012).

Temperature and Relative Humidity

In this study, four units of data loggers were installed near the evaporative cooling pad, at the front, middle and end of the quail's cage line respectively. Figure 3, Figure 4, Figure 5 and Figure 6 show the temperature and relative humidity recorded at four different points for both experiments; before and after Standard Operating Procedure was adhered (Sulaiman *et al.*, 2005). All data were recorded at two-hour intervals.

Based on the results obtained, the internal temperature was slightly dropped after Experiment 2 was conducted. The temperature dropped at almost 3°C while a relative humidity increased about 10% after all procedures were followed.

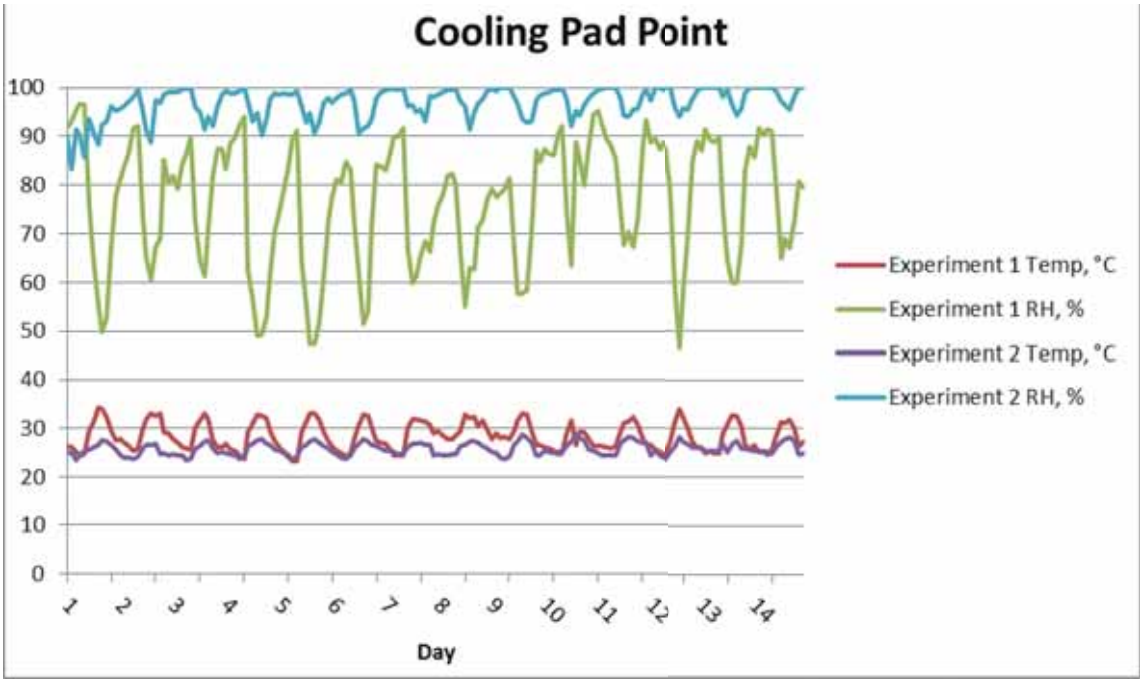

Figure 3: Relative humidity near the cooling pad shows rapid increasing of relative humidity during Experiment 2 compared to Experiment 1. While Temperature has dropped below 30°C in Experiment 2.

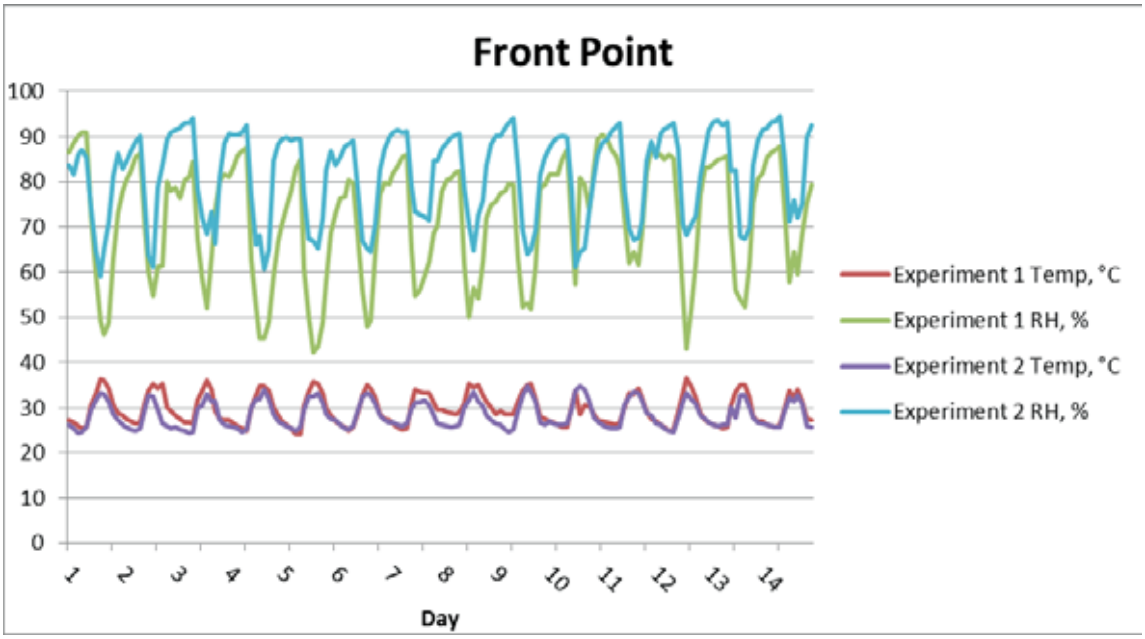

Figure 4: Temperature at the front point shows slightly dropped and the relative humidity was increased.

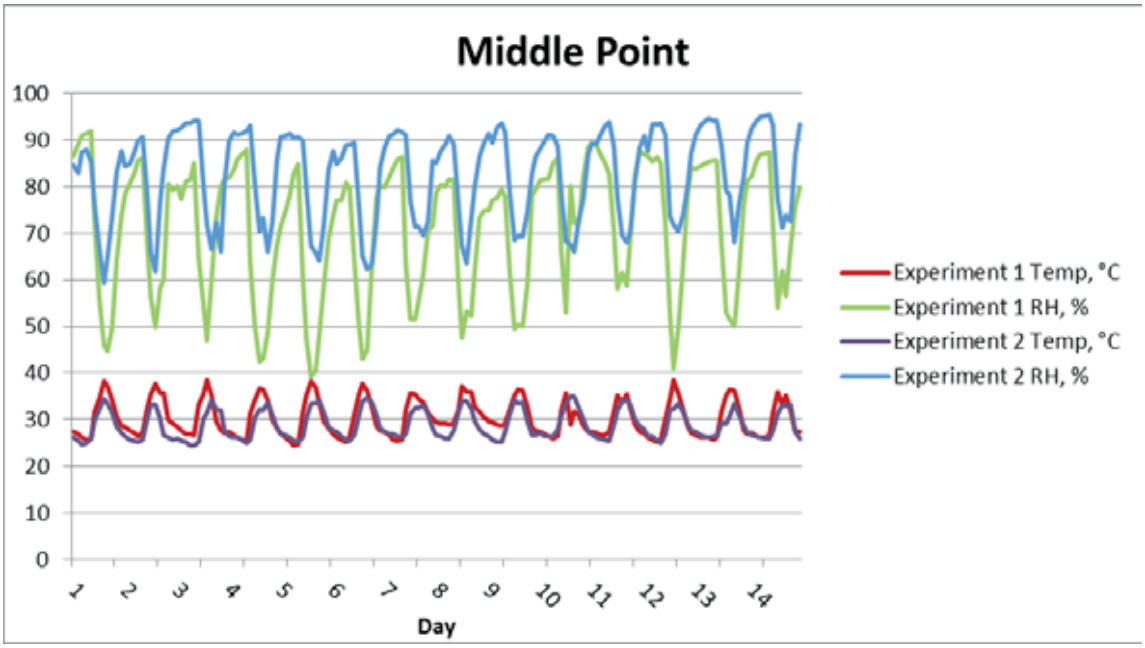

Figure 5: Temperature at the middle point shows slightly decreased but the relative humidity was significantly increased and more constant through out the time frame.

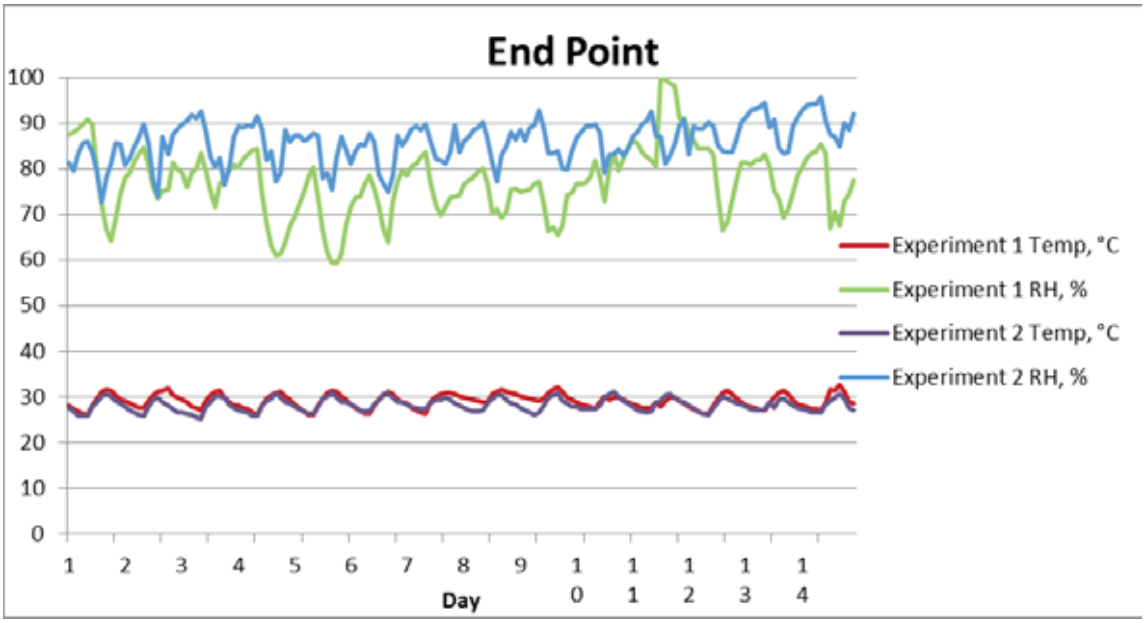

Figure 6: Temperature at the end point shows very little differences between Experiment 1 and 2, but the relative humidity has increased.

The automatic operation of evaporative cooling pad and exhaust fans affect the environmental condition inside the house. However, the temperature recorded for both experiments were between 28°C and 38°C and it exceeded the temperature range of 20°C and 27°C as recommended by DVS to operate a closed-house system. Meanwhile, the relative humidity recorded a satisfactory rate in a range of 70% and 80% for both experiments.

CONCLUSION

The closed-house system has a lot of advantages such as it can control the house ventilation, reduce internal temperature and give more comfortable to the birds as weak ventilation system can lead to poor air quality and, resulting in birds' health and performance issues. A proper environment must be maintained to increase quail's performance. Even though the closed-house performance was increased after the Standard Operating Procedures followed, it is not achieve a satisfactory level. Therefore, the quail closed-house system in Institute of Poultry Technology, Malacca needs more improvements in terms of building structure since no significant differences of the temperature and relative humidity were shown after the study was completed.

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