

SHORT NOTE

Pig Productivity Threatened by Higher Air Temperature and Relative Humidity in Pig Populated Regions of Assam

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Abstract Pigs rearing under low input system in the Lakhimpur and Dhemaji districts of Assam, India might not only undergo nutritional stress but may also be affected by the environmental variables. As pigs lack a well-developed cutaneous thermoregulatory mechanism, it makes them more uncomfortable with the changing environment. Therefore, in the present study, an analysis was done on the possible impact of temperature and relative humidity on the productive and reproductive performances of the pigs reared in the area of study.

Keywords Air temperature, Relative humidity, Pig.

Introduction

Assam possesses the highest population of swine in India yet the demand for pork is still increasing in Assam and other North Eastern (NE) region. The piggery can be one of the ways for the upliftment of poverty. The livelihood of many people in the rural

and tribal areas of NE region comes from piggery. Kumaresan et al. (2009) reported that the small landholder and landless farmer can rear pigs based on kitchen waste and locally available plants. Similarly, Moanaro et al. (2011) opined that pig rearing is profitable due to the low input production system. The feed conversion efficiency i.e., attain more weight per kg of feed consumed by the pig is better than other livestock species. Therefore, piggery can be the higher potential for economic gain. It is a prolific animal. Sows produce 6–12 piglets in each farrowing, the sexual maturity is early, bred 8–9 months of age and can farrow twice in a year. They have shorter generation interval, attainment of market weight (60–90 kg) is early within 7–10 months. The enhancement of pig production system can play a significant role for income generation in rural / tribal people in North Eastern region of India. In spite of significant role in the piggery, the climate change can hinder and or threat to its growth resulted from negative impact on economic upliftment of tribal people. In higher ambient temperature homoeothermic dissipate heat from the respiratory system, sweating, conduction, convection to maintain the body temperature. It has been reported by Renaudeau et al. (2012) reported that pigs can dissipate only 50% through the respiratory system. Pigs have the lesser density of sweat glands (30 / cm²) than cattle and sheep which possess 800 to 2000/cm² and 250 cm², respectively as reported by Amakiri and Mordil (1975). Pigs cannot lose heat by sweating. It is believed that the sweat glands present in the skin might not be stimulated by heat stress, also called non-functional sweat gland (Ingram 1967).

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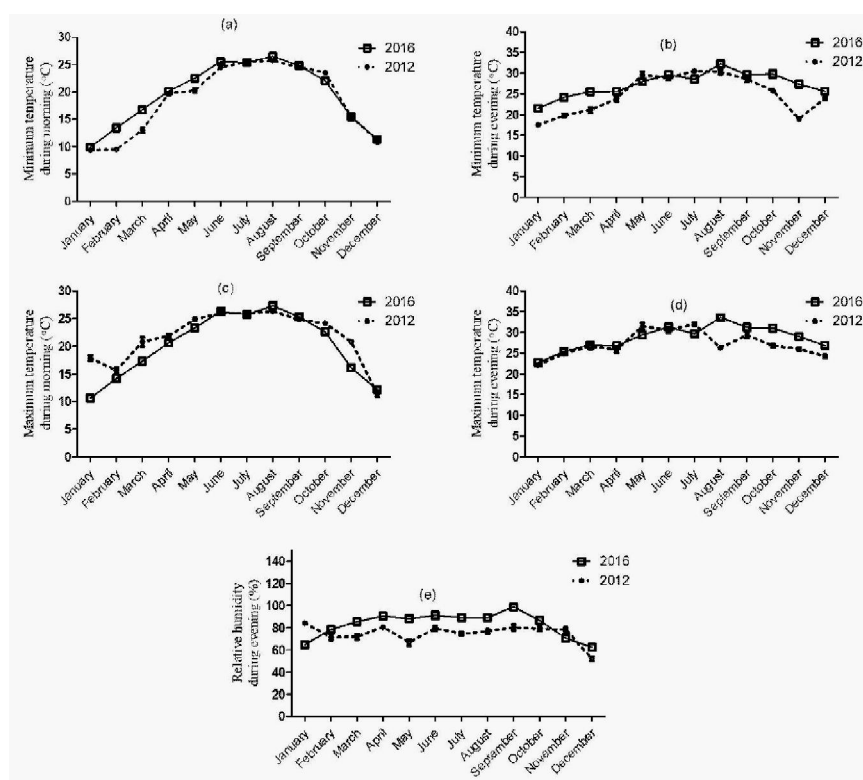


Fig. 1. Variation of Ambient Temperature and Relative Humidity (VATRHR) during 2012 and 2016. Minimum temperature during the morning (a), and evening (b), maximum temperature during the morning (c), and the evening (d) and relative humidity during the evening (e).

Therefore, the growth performances of the pig are severely affected by hot environment, the finisher pigs are more susceptible to heat stress than younger pigs (Collin et al. 2001). The present study was carried out to study the variation of temperature and humidity in big populated areas of Assam for last five years. Reproductive parameters of pigs viz. age at puberty and litter size was also recorded based on the survey from piggy farmers.

(The article arose based on the pilot survey conducted under the DBT, Government of India funded project entitled 'Enhancing pig productivity by optimizing biomolecular expression through nutritional intervention in the existing system of pig farming').

Materials and Methods

The environmental variables viz. minimum and maximum temperature during morning and evening and

relative humidity were collected from Regional Agricultural Research Stations (RARS) at North Lakhimpur, Assam, India. The temperature humidity index (THI) was calculated from the formula given by NRC (1971).

$$THI_{80} = (1.8 \times T_{max} \text{ } ^\circ\text{C} + 32) - (0.55 - 0.0055 \times RH_{min}\%) \times (1.8 \times T_{max} \text{ } ^\circ\text{C} - 26)$$

The statistical analysis was analyzed by Prism 5 software. The minimum and maximum temperature during morning and evening between 2012 and 2016 were carried out using student t test. The comparison of relative humidity between 2012 and 2016 was also carried out by student t test. The graphs were plotted by Prism 5 software.

Results and Discussion

The minimum temperature during morning (Fig. 1a)

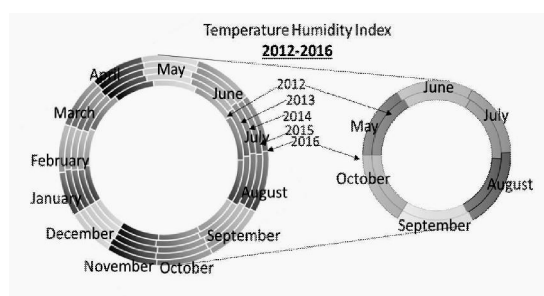


Fig. 2. Temperature Humidity Index (THI) from 2012 to 2016. Comparison of THI of 2012 and 2016.

and evening (Fig. 1b) revealed an increased by 1 to 2°C in 2016 from 2012. Similarly, the maximum temperature during the evening was increased by 0.5 to 1.5°C in 2016 from 2012 during July, August, October, November and December (Fig. 1d). However, the maximum temperature during morning did not overshoot from 2012 (Fig. 1c). The relative humidity was also higher in most of the months in 2016 than 2012 (Fig. 1e). Analysis of environmental variables is shown that the temperature humidity index (THI) increased during May, June, July, August, September and October in 2016 from 2012 (Fig. 2). The variation of THI from 2012 to 2016 presented month wise in the Table 1. The age at puberty in gilts were longer (12–18 months) than the average normal age at puberty and the litter size at weaning was decreased ($p < 0.05$) than the litter size at birth (Data recorded based on the survey from few farmers at Lakhimpur).

Swine production is an integral part and a source of income for many tribal people in NE region. People rear indigenous or crossbred pigs with minimum input i.e., locally available staff like kitchen waste, plants and managed by family labor (Patr et al. 2014). The majority of pork production comes from these groups of people. It has been reported by Nath et al. (2013) that the market weight of crossbred pigs is better than indigenous breeds. Therefore, people prefer the rearing of crossbred pigs for profitable or income generation. The present scenario may severely impact the growth of these pigs due to increasing in ambient temperature. The present study observed the increase in minimum temperature during morning and evening by 1 to 2°C in 2016 as compared to 2012. The higher ambient temperature can significantly affect the

Table 1. Variation of Temperature Humidity Index (THI) from 2012 to 2016 (month wise).

Month	THI 2012	THI 2013	THI 2014	THI 2015	THI 2016
Jan	67.06	60.29	61.73	63.10	61.27
Feb	66.52	65.24	63.66	63.10	66.40
Mar	72.02	68.87	68.05	69.79	70.75
Apr	73.02	71.51	72.13	72.45	73.79
May	77.71	75.91	76.15	77.85	78.06
Jun	79.83	81.90	81.90	79.48	82.45
Jul	80.36	82.43	83.60	82.58	80.50
Aug	76.60	82.50	81.91	81.47	85.13
Sep	77.97	80.66	81.91	81.57	82.70
Oct	75.56	74.53	76.90	77.14	78.70
Nov	71.06	66.57	69.64	69.21	70.31
Dec	62.49	62.39	64.16	62.40	65.21

growth performances of pigs as they possess very limited functional sweat gland (Curtis 1983). Subcutaneous circulation is very important for dissipating heat from internal body to environment. The higher amount of fat deposition in the subcutaneous considerably hindered the heat dissipation mechanism. Therefore, the heat dissipation mechanism in the superficial layer or in the skin is not suitable for pig due to high fat content (Mount 1979). The THI was recorded 80 or more than 80 during the summer season in the month of June, July, August and September in 2016 which were more than 2012 in the same months. This might be alarming for pig production system that may be hindered or decreased in coming future. THI is considered as the indicator of heat stress on livestock. Mild, medium and severe stress was classified on the basis of THI range, i.e. 72–80 (mild), 80–90 (medium), and 90–98 (severe). Livestock species are comfortable at THI values between 65 and 72 (Upadhyay et al. 2007).

The pig production system is facing many challenges for its sustenance growth. The environmental problems further impact the pig production system (Renaudeau et al. 2012). The present survey reported delayed the age at puberty and litter size at weaning in pigs from last few years. The survey may indicate the possibility of poor reproductive performances in sow under increasing temperature. Chakraborty (2016) reported the higher concentration of antioxidant enzyme (superoxide dismutase) in blood plasma of pig during summer than winter which indicates the oxida-

tive stress. When the production of reactive oxygen species is increased from physiological level, it altered the biochemical profile in the body (Bernabucchi et al. 2002). The serum thyroid hormone (T_4) was found to decrease significantly during summer as compared to winter (Chakraborty 2016). The variation of thyroid hormones between seasons declares a condition of their comfortability and un-comfortability. The suitable environment of an animal can evaluate based on their performances. When the THI exceeds from 72 or 78, the productive and reproductive performances can be affected (Upadhyay et al. 2007). The data of the present study assumed a threat on the pig production system in near future in pig populated areas of Assam and other North Eastern states. Therefore, a holistic approach seemed to be very essential for sustainable piggery and livelihood generation for the rural people.

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