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Effect of accommodation on the physiological behaviour of pigs

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Abstract
Total of 12 upgraded female (Hampshire x Tenyivo) in the genetic ratio of 75:25 at the age of 42 days were reared in two different accommodation. A set of six pigs at 42 days of age each were reared under group accommodations (Group 1, T_1) and six pigs accommodated individually (Group 2, T2), under standard management conditions for 28 fortnights. The average value of rectal temperature (˚C) in T1 and T2 groups was 38.74 and 38.85, the pulse rate (beats per min) in T1 and T2 groups was 76.02 and 79.98 and respiration rate (movements per min) in T_1 and T_2 groups was 33.43 and 34.15. The values of all physiological behaviours did not differ irrespective of accommodation. However, the value of temperature was significantly (p<0.05) higher in T1 as compared to T_2 at 7th, 12th and 28th fortnights. From the results, it can be concluded that different types of accommodation in the crosses of Hampshire x Tenyivo with the ratio of 75:25 does not affect differently physiologically.

Keywords: Group accommodation, individual accommodation, physiological parameters, rectal temperature, pulse rate, respiration rate, crossbreed pigs

Introduction
Pigs were first domesticated around 9000 years ago (Larson and Fuller, 2014) [1]. In recent years, the concept of welfare farming has been increasingly valued by the industry and the health of pigs which has received increasing attention (Jizhu *et al*., 2016) [2]. Several factors have been examined, including group size, space requirements, feeding options, and the economic differences between different housing types of systems (Schau *et al*. 2013) [3]. Pig accommodation had been designed to protect pigs and give them the most ideal environment for growth and production (Dominguez, 2020) [4]. Animal behaviour expressed individually or collectively has an obvious and composite functioning. Learning and knowing the animal behaviour enables farmers and experts to develop better production system to provide comfort to livestock and efficiently utilizes the domesticated animals to serve men (Bhat *et al.*, 2010) [5]. Several studies have evidently provided the advantages and disadvantages for group accommodation and individual accommodation system in pigs. In individual housing, the animals demand separate supervision and intensive care. It enables the animal to feed at its own space and it further allows the ration to be regulated according to the animal need. The major throwback of this system is that it has an adverse influence on attainment of puberty as well as libido. On the contrary group housing confinement enhances attainment of puberty and libido (Ramesh *et al.* 2015) [6]. Group housing is believed to reduce stress, increase social interaction and promote the general wellbeing of the animals. Environments also have effect on physiology (Pearce and Paterson, 1993) [7] for example body temperature information is very helpful for the diagnosis and treatment of animal diseases (Lu *et al*., 2015) [8], and change in sow body temperature can judge the condition for the estrus of sows (Xudong *et al*., 2013) [9].

To ensure the high welfare of animals, it is important to understand their biological, physiological, and behavioral needs. Pigs are highly intelligent and social animals, the social status of which is determined by their age, body weight, and physical strength (Ludwiczak *et al*., (2021) [10]. Pereira *et al*. (2019) [11] states that to provide the best animal welfare, measureable indicators of stress, such as heart rate and respiratory rate, body temperature or behavioural indicators should be recorded in animal trails. The study of behavioural pattern is important in swine production because every individual at different ages behave differently due to the effects and interaction of stimuli which may be genetical or non-genetical variations and which finally affects the performance traits of animal (Saxena and Saxena 2003) [12].

Environmental enrichments clearly improve the welfare of pigs by allowing them to express natural, species-specific behaviors. Enrichments on pigs depend on many factors, including the type of enrichment, its adequate quantity, location, maintenance, and safety (Ludwiczak *et al*. 2021) [10]. Morally acceptable housing systems are expected to assure adequate harmony between the genetic predisposition of farm animals and their overall environment (Magesh *et al*. 2019) [13]. Keeping the above facts in view, the present research work entitled "Effect of accommodation on the physiological behaviour of pigs" was postulated to see the effects of accommodation the physiological behaviour of crossbreed pig in Nagaland.

Materials and Method

The present study of which a total of 12 upgraded female (Hampshire x Tenyivo) in the genetic ratio of 75:25 at the age of 42 days were selected from the pig farm of Livestock Production and Management Department, Nagaland university, SASRD, Medziphema Campus, Nagaland. The farm location is at 93.20˚ E to 95.15˚ E longitudes and latitudes between 25.60 20˚ N to 27.40˚ N at an elevation of 310 meter above sea level. For this experiment the 12 pigs were divided into two groups of 6 pigs each, the first one was group housing system, where all the pigs were accommodated in a single sty and for second one that was individual housing system, all the 6 pigs were accommodated individually in six separate sties. The housing for both the treatments was concrete floors and the side walls of the sties were made of concrete material as well. The roof was made of CGI sheet of nine feet in height. All the pigs of both the treatment were fed conventional standard feeding system prescribed by ICAR (2013) [13]. The concentrate feed was manually formulated in 100 kg quantity at a time. Clean drinking water was provided ad-libitum. The pigs were vaccinated against Swine classical fever. De-worming was done right after the weaning to all the twelve pigs and also when the pig was six months old.

Physiological behaviour in terms of body temperature, pulse rate and respiration were recorded at fortnightly intervals till 28th fortnights by following standard procedure. Body temperature, pulse rate and respiration rate was collected every fortnight in total of 28th fortnights. The observation was taken was in the morning to avoid environmental stress. Respiration rate was observed first followed by body temperature and pulse rate for both the treatments. The data so recorded were subjected to statistical analysis by using SPSS (version 16.0). The overall level of statistical significance was defined as $p<0.05$.

Result and Discussion

Body Temperature

From the perusal of data (Table 1), the mean value of body temperature (BT) of the pigs was 37.90˚C and 38.78˚C at first fortnight in T1 and T2, group respectively. With advancement of age the corresponding value of body temperature at 28th fortnight was 39.57 °C and 37.33 °C. From the statistical analysis it was observed that the body temperature at 7th, 12th and 28th fortnight differed significantly and it was significantly higher in T1 group as compared to T2 group. The mean value for remaining fortnight did not differ significantly. The results of the present study were well corroborated with the observations of Anton (2005) [16] and Walling *et al*. (2021) [17], who had also observed the body temperature in same trend, having same genetic characteristics of pigs at different age group.

Pulse Rate

From the perusal of date (Table 1), the mean value of pulse rate (PR) of the pigs was 66.00 and 76.61 beats per minute at first fortnight in T1 and T2 groups respectively. With advancement of age, the corresponding values of pulse rate at 28th fortnight were 77.50 and 83.83 beats per minute. From the statistical analysis it was observed that the pulse rate did not differ significantly. The mean value of pulse rate during all the fortnights did not differ significantly between T1 and T2 groups. The results of the present study were well corroborated with the observation of Walling *et al*. (2021) [17], who had also observed the pulse rate in same trend, having same genetic characteristics of pigs at different age group. The findings of the pulse rate were also in the normal range as suggested by Detweiler *et al*. (2004) [18]. With the observation of Jackson and Cockford (2007) [19] they reported that the pulse rate may vary depending on the age of the pig.

Respiration Rate

From the perusal of data (Table 1), it was observed that the mean value of respiration rate (RR) of the pigs was 38.67 and 35.50 movements per minute at first fortnight in T1 and T2 group, respectively. With advancement of age, the corresponding value of respiration rate at 28th fortnight was 27.33 and 28.33 movements per minute. From the statistical analysis, it was observed that the respiration rate did not differ significantly. The result of the present study was well corroborated with the observation of Detweiler *et al*. (2004) [18], who had also observed that the respiration rate of the pig during resting ranged between 32-58 beats per minute. The value of the present study also lie in this range. It was also in agreement with the observation of Walling *et al*. (2021) [17], who had observed the respiration rate in same trend, having same genetic characteristics of pigs at different age group. Actually, the respiration rate had been observed to be an indicator of stress when compared to body temperature and hence this parameter might be more valid in assessing the environmental stress on animals (Mukherjee and Banejee, 1980) [20] and Brown-Brandl *et al*. (2001) [21].

Table 1: Influence of accommodation on body temperature, pulse rate and respiration rate

	BODY TEMPERATURE (BT) ˚C			PULSE RATE PR) BEATS/MIN			RESPIRATION RATE (RT) MOV/MIN		
FORTNIGHT	TREATMENT		REMARK	TREATMENT		REMARK	TREATMENT		REMARK
	T1	T2	S/NS	T1	T2	S/NS	T1	T2	S/NS
1	37.90	38.78	NS	66.00	74.67	NS	38.67	35.50	NS
2	38.52	38.37	NS	74.83	80.00	NS	34.67	39.00	NS
3	39.07	39.20	NS	87.83	82.17	NS	31.33	41.33	NS
4	38.82	38.83	NS	79.33	82.17	NS	36.00	36.50	NS
5	39.43	39.27	NS	71.83	72.83	NS	35.67	31.67	NS
6	39.40	39.28	NS	84.83	80.00	NS	34.83	35.67	NS
7	39.85^{a}	39.00^{b}	S*	63.50	62.67	NS	33.00	38.67	NS
8	38.68	38.48	NS	76.67	74.33	NS	35.17	36.67	NS
9	39.77	39.65	NS	84.83	85.33	NS	28.50	27.50	NS
10	39.53	39.42	NS	70.50	71.50	NS	28.17	28.17	NS
11	37.92	39.23	NS	90.00	76.17	NS	30.67	29.33	NS
12	39.52^{a}	38.67^{b}	S*	66.67	69.83	NS	32.50	31.17	NS
13	38.70	38.52	NS	76.00	77.83	NS	32.67	31.17	NS
14	39.02	38.72	NS	74.83	75.33	NS	45.33	46.67	NS
15	37.95	39.10	NS	78.83	81.83	NS	35.50	37.17	NS
16	36.00	41.67	NS	87.17	86.83	NS	36.33	37.17	NS
17	39.20	39.27	NS	81.33	77.50	NS	35.67	36.17	NS
18	38.52	38.63	NS	68.17	72.67	NS	36.00	35.00	NS
19	38.58	38.60	NS	71.33	69.50	NS	38.67	37.17	NS
20	38.18	38.17	NS	69.67	84.00	NS	38.83	39.50	NS
21	38.58	38.40	NS	71.50	71.50	NS	37.83	39.50	NS
22	37.90	38.48	NS	68.17	73.50	NS	30.67	34.67	NS
23	38.40	38.48	NS	81.17	80.67	NS	29.33	31.50	NS
24	39.77	39.65	NS	83.50	88.17	NS	27.83	27.83	NS
25	38.38	38.17	NS	75.67	78.50	NS	27.17	27.17	NS
26	38.53	38.72	NS	73.67	76.67	NS	27.83	28.83	NS
27	38.93	37.83	NS	73.33	65.50	NS	30.00	27.17	NS
28	39.57^{a}	37.33^{b}	S*	77.50	83.83	NS	27.33	28.33	NS
MEAN	38.74 ± 0.15	38.85 ± 0.14	NS	76.02 ± 1.32	76.98 ± 1.41	NS	33.43 ± 0.89	34.15 ± 0.79	NS

a, b means bearing different superscripts in a row differ significantly (p<0.05)

Conclusions

The study was carried out to assess the effect of accommodation on physiological behaviour of pigs. For this study 12 upgraded tenyivo pigs were divided into two groups, where T1 was for group housing and T2 for individual housing. All the animals were reared under similar feeding regime and standard housing system. The average body temperatures were 38.74 °C and 38.85 °C for T1 and T2 respectively. The average pulse rates were 76.02 and 76.98 beats per minute for T1 and T2 respectively and lastly the average respiration rates were 33.43 and 34.15 movements per minute for T1 and T2 respectively. There were no significant difference in body temperature, pulse rate and respiration rate. From the results it maybe be concluded that different types of accommodation does not affect any distinction physiologically.

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