MICRO - CLIMATIC VARIABLES AND THE PERFORMANCE OF LARGE WHITE YORKSHIRE SOWS IN DIFFERENT FARROWING HOUSING SYSTEMS

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ABSTRACT

The study was conducted to analyse the micro-climatic variables and the performance of Large White Yorkshire sows in three different farrowing housing systems, viz., conventional farrowing house with guard rail and one-third slatted floor (T1), farrowing house with guard rail and floor level ventilation (T2) and farrowing house with farrowing crates (T3) to find out the suitable one for tropical climates like Kerala. There were significant variations ($P<0.05$) in microclimatic variables of farrowing houses among treatments. The mean forenoon rectal temperature (°C) was significantly ($P<0.01$) less in T3 (38.39) compared to T1 (38.53) and T2 (38.64), whereas sows in T3 (39.69) had significantly ($P<0.01$) higher afternoon rectal temperature than T1 (39.12) and T2 (39.12). There were significant ($P<0.01$) variations in respiratory rate among treatments, sows in T3 had higher respiratory rate than T2 followed by T1. The average daily feed intake of T1, T2 and T3 were 5.42, 5.55 and 5.68 kg, respectively without any significant difference among them. Body weight loss during lactation was measured as 18.30, 17.80 and 23.32 kg in T1, T2 and T3, respectively, which was significantly ($P<0.05$) higher in T3 compared to other two treatments. The results of present study reveals that the significantly ($P<0.05$) higher house temperature, rectal temperature and respiratory rate in the farrowing house with farrowing crates lead to expression of negative behaviour of overlying, biting, injuring, killing the piglets and hostile to attendant which will lead to higher piglet mortality compared to other two houses namely conventional farrowing house with guard rail and one-third slatted floor and farrowing house with guard rail and floor level ventilation. So the latter two farrowing housing systems are more suitable for tropical conditions like Kerala.

Key words: Temperature, relative humidity, preweaning mortality, crushing

INTRODUCTION

Pig farming can be adopted as a livelihood activity by many small and marginal farmers as well as by educated entrepreneurs. Being more acceptable to rural people, pigs will contribute substantially to the rural wellbeing and self-sufficiency due to the profitable returns to the small and marginal farmers.

The profit from swine husbandry is mainly dependant on the pre-weaning mortality, of which the crushing of piglets by dam is the major contributing factor (Damm *et al*., 2005; Rangstrup-Christensen *et al*., 2018). When the ambient temperature is below the critical temperature of new born piglets, they try to survive through physiological or behavioral adaptation methods like shivering, huddling or stay near to the dam to keep warm (Mainau *et al*., 2015). Elevated ambient temperature keeps piglets away from dam, leading to reduction in suckling time thereby creating weak and undernourished piglets. Improvements in swine production can be made by adopting appropriate housing management to reduce the mortality of young piglets.

Thus, it is imperative to have optimum atmospheric conditions inside the farrowing houses to manage the behaviour and comfort of sows and piglets, so that the piglet mortality is minimised without affecting the wellbeing of the sow (Baxter *et al*., 2011). For the last many years, even though many researches were being carried out in this direction, the best system which is suitable for the tropical climate like that of Kerala is not identified so far. Hence the present study was conducted to find out the effect of different types of farrowing houses on the performance of sows and the environmental condition available inside the sheds during periparturient period.

MATERIALS AND METHODS

The study was conducted in Centre for Pig Production and Research, Mannuthy under Kerala Veterinary and Animal Sciences University. Average annual rainfall reported in the region is 3042.8 mm and the mean monthly maximum temperature ranges from 28.6 ^{0}C in July to 35.7 ^{0}C in March, whereas monthly minimum temperature varies between 21.8 ^{0}C in July to 24.5 ^{0}C in April/May. Average maximum monthly humidity ranges between 77 per cent (February) and 95 per cent (July/ August). Mean monthly minimum humidity varied from 37 per cent in March and 84 per cent in July (Nameer *et al*., 2000). The area is at an elevation of 22.5 m above sea level and has tropical climate (Ningaraju and Joseph, 2014).

Thirty Large White Yorkshire sows in last quarter of pregnancy were selected and 10 animals were housed in each of the three housing systems viz. conventional farrowing house with guard rail and one-third slatted floor (T_1), farrowing house with guard rail with floor level ventilation (T_2) and farrowing house with farrowing crates (T_3), as given in figure 1. These animals were maintained in these housing systems from last quarter of pregnancy until weaning of piglets (45 days after farrowing). The sows were fed with standard concentrate ration (18% CP) twice a day and managed as per standard farm protocols.

Microclimatic variables inside the farrowing houses such as maximum and

minimum temperatures and relative humidity during morning and evening time were recorded. Various physiological parameters of the sows viz., rectal temperature, respiration rate during morning and evening, daily feed intake, body weights before and after the treatment period were observed. The maternal behaviour of all the sows were studied in first three days after farrowing based on score sheet as described by Mathew (1997).

The data collected on various parameters were statistically analysed by Completely Randomized Design (CRD) as per Snedecor and Cochran (1994) and the maternal behavioural pattern were statistically analysed by Kruskal-Wallis test and the means of different experimental groups were also tested by using Duncan's Multiple Range Test (DMRT). The whole data were analysed using computerized software program SPSS Version 20.0.

Fig. 1. Various farrowing house modifications experimented. A - Conventional farrowing house with guard rail and one-third slatted floor (T1); B - Farrowing house with guard rail and floor level ventilation (T2); C - Farrowing house with farrowing crates (T3)

RESULTS AND DISCUSSION

The daily microclimatic variables such as maximum and minimum temperatures (^{0}F) and relative humidity (%) were recorded from each farrowing housing systems at morning (7.30 am) and afternoon (2.00 pm) are represented in Table 1. The mean daily maximum temperature varied between 80.96^{0}F and 93.91^{0}F and the minimum temperature varied between 74.53^{0}F and 77.39^{0}F thoughout the day. The relative humidity (%) varied between 55.02 and 84.49 throughout the day. There were no significant differences in maximum temperature among all treatments at morning. All other microclimatic variables significantly ($P<0.05$) differed from each group, especially relative humidity was highly significant ($P<0.01$) among all three groups at afternoon. The trend of higher temperature in T3 may be due to confinement and minimum floor space allotment. Similar observations were previously reported by Ramesh (1998) and Anton (2005).

Table 1. Microclimatic variables of different farrowing housing systems

Particulars	Treatment		
	T1	T2	T3
Maximum temperature °F (AM)	81.25 ± 0.26^{ns}	80.96 ± 0.26^{ns}	81.66 ± 0.28^{ns}
Minimum temperature °F (AM)	$75.93^{a}\pm0.32$*	$75.89^{a}\pm0.30$*	$74.53^{b}\pm0.30$*
Maximum temperature °F (PM)	$91.04^{c}\pm0.29$*	$92.02^{b}\pm0.32$*	$93.91^{a}\pm0.32$*
Minimum temperature °F (PM)	$76.97^{a}\pm0.33$*	$77.39^{a}\pm0.33$*	$75.87^{b}\pm0.34$*
Relative humidity (%) (AM)	$83.97^{a}\pm0.45$*	$84.49^{a}\pm0.39$*	$80.10^{b}\pm0.44$*
Relative humidity (%) (PM)	$56.18^{ab}\pm0.53$**	$56.69^{a}\pm0.45$**	$55.02^{b}\pm0.46$**

* Values bearing different superscripts in the same row differed significantly at 0.05 level
** Values bearing different superscripts in the same row differed significantly at 0.01 level

The mean rectal temperature (^{0}C) and the respiratory rate (breaths per minute) at forenoon and afternoon in all groups are furnished in Table 2. The mean rectal temperature varied between 38.39^{0}C to 39.69^{0}C throughout the day and it significantly differed (P<0.01) among treatments. The mean respiratory rate varied between 26.0 to 36.0 throughout the day and it was significantly (P<0.01) different among treatments. Both afternoon rectal temperature and respiratory rate were significantly (P<0.01) higher in T3 group compared to T2 and T1. This might be due to elevated room temperature recorded in this house. These results are in agreement with findings of Brown-Brandl *et al.* (2001) and Huynh *et al.* (2005). The respiratory rate and rectal temperature rates were numerically higher in the afternoon in all the groups which supports the opinion of Anton (2005) and Murugan (2007).

Table 2. Mean rectal temperature (^{o}C) of sows in different treatments

Particulars	Treatment		
	T1	T2	T3
Rectal temperature (FN)	$38.53^{a} \pm 0.01$	$38.64^{a} \pm 0.04$	$38.39^{b} \pm 0.03$
Rectal temperature (AN)	$39.12^{b} \pm 0.02$	$39.12^{b} \pm 0.03$	$39.69^{a} \pm 0.02$
Respiratory rate (FN)	$26.0^{b} \pm 0.35$	$26.0^{b} \pm 0.30$	$27.5^{a} \pm 0.12$
Respiratory rate (AN)	$32.5^{c} \pm 0.23$	$33.5^{b} \pm 0.24$	$36.0^{a} \pm 0.21$

Values bearing different superscripts in the same row differed significantly (P<0.01)

The average daily feed intake on fresh weight basis in different treatments were 5.42, 5.55 and 5.68 kg, respectively in T1, T2 and T3 (Table 3) and there were no significant differences among the treatments.

Mean body weight loss of sows from beginning to end of the experiment in all treatment groups are presented in Table 3. It was revealed that sows under T3 group had significantly ($P < 0.05$) more lactational weight loss than the other groups.

The maternal behaviour score card of sows under different housing systems was analyzed by Kruskal-Wallis test and presented in Table 4. There were no recognisable difference among all treatment groups except the negative behaviour of overlying, biting, injuring, killing the piglets and hostile to attendant which was higher in T3 group as compared to other two groups. in T3 group as compared to other two groups.

SUMMARY

The results of present study reveals that the significantly ($P<0.05$) higher house temperature, rectal temperature and respiratory rate in the farrowing house with farrowing crates lead to expression of negative behaviour of overlying, biting, injuring, killing the piglets and hostile to attendant which will lead to higher piglet mortality compared to other two houses namely conventional farrowing house with guard rail and one-third slatted floor. So the latter two farrowing housing systems are more suitable for tropical conditions like Kerala.

Table 3. Mean daily feed intake and body weight loss of sows during lactation in different treatments, kg

Parameter	Treatment		
	T1	T2	T3
Mean daily feed intake	5.42 ± 0.05^{ns}	5.55 ± 0.09^{ns}	5.68 ± 0.08^{ns}
Body weight loss	$18.30^{b} \pm 0.36$	$17.80^{b} \pm 0.29$	$23.32^{a} \pm .042$

Values bearing different superscripts in the same row differed significantly ($P<0.05$)

Table 4. Score card of behavioural pattern of sows in different treatments

Particulars	Treatment		
	T1	T2	T3
Good, temperament, docile and confidence on attendant	0	0	0
Teats and udder engorged with milk	7	4	5
Early completion of parturition (3hr or less)	10	10	10
Early expulsion of placenta (2 1/2 hrs or less)	10	10	10
Alertness towards safety of piglets	10	10	9
Fondling piglets before and after suckling	0	2	2
An interval of 90 minutes or less between suckling during first 14 days	3	1	2
Steady, progressive and uniform gain in weight of piglets	4	1	3
NEGATIVE			
Overlying, biting, injuring, killing the piglets and hostile to attendant	-	-	-4
Placentophagy	-	-	-
TOTAL SCORE	45	38	37

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