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ENVIRONMENTAL ENRICHMENT TO ABATE LEVERING AGGRESSIVE BEHAVIOUR IN PIGLETS

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ABSTRACT

The effect of environmental enrichment on levering aggressive behaviour of the weaned piglets was assessed in piglets. Forty-eight Large White Yorkshire (LWY) weaned piglets of either sex was selected and are grouped in to eight with 6 animals each. The treatments are, piglets weaned at 35 days on concrete floor of 9 sq.m (1mx1.5m) (T1-control), piglets weaned at 45 days on concrete floor of 9 sq.m (1mx1.5m) (T2-control), Piglets weaned at 35 days on concrete floor of 6 sq.m (1mx1m) (T3), Piglets weaned at 45 days on concrete floor of 6 sq.m (1mx1m) (T4), Enrichment of piglets weaned at 35 days with paddy straw for 2.5 cm on concrete floor (T5), Enrichment of piglets weaned at 45 days with paddy straw for 2.5 cm on concrete floor (T6), Enrichment of piglets weaned at 35 days with free balls on concrete floor (T7) and Enrichment of piglets weaned at 45 days with free balls on concrete floor (T8). In piglets weaned at 35 days, the duration of levering behaviour was longest in T_3 (175.67 ±3.25 s) and lowest in T_5 (48.33 ±3.13 s), followed by T_7 (61.83 ±3.83 s) in day one. However, T_5 and T_7 showed significantly lower duration compared to T_1 and T_3 ($P<0.01$). In piglets weaned at 45 days significant difference existed in the duration and frequency of levering behaviour throughout 14 days. However, T_6 and T_8 showed significantly lower duration compared to T_2 and T_4 ($P<0.05$). Enriching barren pens with straw and balls had minimized the aggressive encounters between pigs while increasing duration of exploration on substrates.

Keywords: Piglets-aggressive behaviour-levering duration and frequency-balls-paddy straw

INTRODUCTION

The pig population in India has reached 9.06 million accounting for 1.69%

of India's total livestock population, according to the country's 20th livestock census. Pigs generate 0.414 million tons of meat, accounting for 4.82 percent of total national meat production (DAHD, 2021). Besides being highly prolific in nature, pigs are endowed with a variety of intrinsic benefits, such as increased growth rate in a short period of time, improved feed conversion efficiency, low cost of production etc. Mixing unfamiliar post weaning pigs in a desolate environment are prone to develop behavioural problems. Aggression is at its peak for the first 1-2 hours after grouping which then gradually declines over the next 24-48 hours (Nowicki *et al*., 2007). A lack of appropriate enrichment sources might result in a wide range of agonistic behaviour. Materials such as straw, paper, compost, hay, etc boost overall activity, minimise stereotypes and improve social interactions in pigs (Fabrega *et al*., 2019). Provision of straw as bedding material minimises agonistic and displacement behaviour thereby promoting the welfare of pigs. Hence environmental enrichment was studied to abate aggressive levering behaviour in piglets.

MATERIALS AND METHODS

The study was carried out at the piggery farm, Livestock Farm Complex, College of Veterinary and Animal Sciences, Pookode, Wayanad, Kerala. Forty-eight Large White Yorkshire (LWY) weaned piglets grouped in to eight (n=6) of either sex was selected. The piglets were weaned at the age of 35 and 45 days, respectively. The feed for the study group animals was provided following ICAR (2013) nutrient recommendations. Other management practices prevailing in the farm were followed similarly throughout the experimental period. Treatments were applied over a period of fourteen days and throughout this period the behaviour of piglets in the resident pen was observed on a daily basis. The treatments are, piglets weaned at 35 days on concrete floor of 9 sq.m (1mx1.5m) (T1-control), piglets weaned at 45 days on concrete floor of 9 sq.m (1mx1.5m) (T2-control), Piglets weaned at 35 days on concrete floor of 6 sq.m (1mx1m) (T3), Piglets weaned at 45 days on concrete floor of 6 sq.m (1mx1m) (T4), Enrichment of piglets weaned at 35 days with paddy straw for 2.5 cm on concrete floor (T5), Enrichment of piglets weaned at 45 days with paddy straw for 2.5 cm on concrete floor (T6), Enrichment of piglets weaned at 35 days with free balls on concrete floor (T7) and enrichment of piglets weaned at 45 days with free balls on concrete floor (T8). The levering aggressive behaviour of the weaned piglets was assessed. In levering behaviour, piglets put its snout under the body of another piglet from behind or from the side and lift the

other pig up into the air. The behavioural ethogram defined by Jensen (1980) and Morrison *et al.* (2003) was followed.

RESULTS AND DISCUSSION

EFFECT OF ENVIRONMENTAL ENRICHMENT ON THE DURATION OF LEVERING AGGRESSIVE BEHAVIOUR OF PIGLETS

Levering aggressive behaviour of piglets weaned at 35 days

The effect of environmental enrichment on the duration of levering behaviour of piglets weaned at 35 days is presented in table 1. Results revealed that, there existed a significant difference in the duration of levering behaviour of LWY piglets weaned at 35 days old in various treatment groups except on the 8th day. On the first day of the experiment, comparison between different groups revealed that the duration of levering behaviour was longest in T_3 (175.67 ± 3.25 s) and lowest in T_5 (48.33 ± 3.13 s), followed by T_7(61.83 ± 3.83 s) Similar trend was followed on the subsequent days. However, T_5 and T_7 showed significantly lower duration compared to T_1 and T_3 ($P<0.01$). The aggressive behaviour levering in piglets was investigated using behaviour ethogram in this study. Similar behavioural ethogram was described by Jensen (1980) and Morrison *et al.* (2003) who classified

Table 1: Effect of enrichment facilities on duration of levering behaviour in piglets weaned at 35days (s/h/day)

Day	Piglets weaned at 35 days				(P- value)
	T_1	T_3	T_5	T_7	
1	123.50±3.71^{b}	175.67 ±3.25^{a}	48.33 ±3.13^{c}	61.83 ±3.83^{bc}	0.002**
2	123.33±3.44^{b}	175.33 ±3.07^{a}	47.67 ±2.96^{c}	60.67 ±3.03^{bc}	0.001**
3	60.35±3.68^{b}	98.33 ±2.19^{a}	12.67 ±3.34^{c}	25.33 ±3.34^{bc}	0.001**
4	24.52±3.11^{b}	37.39 ±3.42^{a}	4.67 ±2.25^{c}	10.88 ±3.50^{bc}	0.016*
5	24.44±2.17^{b}	37.37 ±2.48^{a}	4.64 ±2.15^{c}	10.86 ±2.86^{bc}	0.008**
6	24.41 ±2.13^{b}	37.36 ±2.91^{a}	4.64 ±2.33^{c}	10.77 ±2.42^{bc}	0.021*
7	24.38±2.21^{b}	37.35 ±2.89^{a}	4.61 ±2.14^{c}	10.65 ±2.32^{bc}	0.025*
8	24.35 ±3.82	37.36 ±3.13	4.58 ±2.23	10.67 ±3.06	0.089^{ns}
9	24.32 ±3.39	37.33 ±3.10^{a}	0 ±0^{c}	3.73.±3.32^{bc}	0.11*
10	11.58±3.15^{b}	18.39 ±3.81^{a}	0 ±0^{c}	3.69 ±1.14^{bc}	0.023*
11	11.58±3.16^{b}	18.38 ±3.26^{a}	0 ±0^{c}	3.68 ±1.10^{bc}	0.018*
12	11.56±3.13^{b}	18.37 ±3.15^{a}	0 ±0^{c}	3.67 ±1.04^{bc}	0.006**
13	11.55±3.06^{b}	18.35 ±3.57^{a}	0 ±0^{c}	3.67 ±2.32^{bc}	0.011*
14	11.51±3.13^{b}	18.32 ±3.16^{a}	0 ±0^{c}	3.65 ±1.17^{bc}	0.013*

** Significant at 0.01 level; * Significant at 0.05 level; ns non- significant

Means having different letter as superscript differ significantly within a row

levering as one of the aggressive behaviour in the case of pigs.

In case of 35 days old weaned piglets, it was found that the aggressive behaviour lasted longer for the first two days of the trial, but it steadily diminished from the third day onwards. Oczak *et al*. (2014) carried out study to detect aggressive behaviour in pig automatically using a multilayer feed forward neural network and an activity index. Based on the intensity of damage observed on the animal, the aggressive interaction was classified under median aggression including levering behaviour. The findings of Van De Weerd *et al*. (2003) are in accordance to the present study who suggested that provision of various pen enrichment amenities like straw, plastic balls, toys, metal chain, tyre, and so on proved beneficial in reducing the duration of aggressive behaviour of weaned piglets as compared to those reared in barren housing under intensive system of rearing.

The duration of levering behaviour was longer during the first two days of the experiment. It decreased gradually from the third day onwards until it was seen to be totally absent in T5 on 9th day. This is due to the fact that straw as enrichment minimized the aggressive encounters between pigs while increasing duration of exploration on substrates. This is in agreement with Van De Weerd *et al*. (2009) who reported that piglets housed in pens enriched with straw bedding spent less time in aggressive behaviour than those housed in the barren control pens ($P<0.01$) as piglets were seen spending about 25 percent of the active time interacting with the straw. Rius *et al.* (2019) concluded that straw provision as bedding material reduced aggressive behaviours significantly ($P<0.01$) and improved welfare in pigs. Morgan *et al*. (1998) differed in opinion who found that compared to barren housed pigs, a straw-based treatment had a higher rate of aggressiveness ($P<0.05$).

Levering aggressive behaviour of piglets weaned at 45 days

The effect of environmental enrichment on the duration of levering behavior of piglets weaned at 45 days old is presented in table 2. In the case of the piglets weaned at 45 days old there was a significant difference in the duration of levering behaviour of the piglets among different treatment groups throughout the entire period of 14 days.

Pairwise comparison revealed that duration of levering behaviour was longest in T_4 (194.33± 3.35 s) and least in T_6 (54.33 ± 3.23 s) on day one ofthe study period. A similar pattern was observed until the end of the trial. Compared to animals that did

not receive environmental enrichment, it was found that using a ball as an enriching object and washing it daily resulted in an improvement in animal well-being by reducing agonistic behaviour and improving play behaviour of piglets (Beattie *et al*., 2000). The findings of Doking *et al.* (2008) showed no significant effect of balls on the total duration of aggressive behaviour of Large White x Landrace piglets (P>0.05) implying that the pigs spent the same amount of time inactive regardless of the object present, which differed from the present findings. Treatment groups T_6 and T_8 showed significantly lower duration compared to T_2 and T_4 (P<0.01).

During the first two days of the trial, the duration of levering behaviour was longer, but it rapidly decreased from the third day onwards. This is in agreement with the results of Nowicki *et al*. (2007), who reported social mixing of unacquainted piglets after weaning was a stressful event resulting in vigorous aggression among the piglets. This indicated that aggression increased with weaning age. This is in accordance with Suryanarayana and Suresh (2011) as they investigated the behaviour of 36, 45 and 56 days old Large White X Desi crossbred weaned piglets. They discovered that piglets weaned at 46 and 56 days of age had a higher fighting tendency (32 and

Table 2: Effect of enrichment facilities on duration of levering behaviour in piglets weaned at 45 days (s/h/day)

Day	Piglets weaned at 45 days				(P-value)
	T_2	T_4	T_6	T_8	
1	164.67±3.19^{b}	194.33 ±3.35^{a}	54.33 ±3.23^{c}	64.33±3.39^{bc}	0.001**
2	164.57±3.09^{b}	194.13 ±3.88^{a}	54.13 ±3.68^{c}	64.13 ±3.34^{bc}	0.001**
3	81.33 ± 3.48^{b}	106.12 ±3.01^{a}	17.67 ±3.11^{c}	30.33 ±3.85^{bc}	0.001**
4	31.53±3.72^{b}	48.67 ±3.39^{a}	6.68 ±3.01^{c}	14.80 ±3.13^{bc}	0.001**
5	31.51±3.65^{b}	48.63 ±3.64^{a}	6.65 ±3.04^{c}	14.75 ±3.01^{bc}	0.004**
6	31.48±3.25^{b}	48.57 ±3.78^{a}	6.61 ±3.08^{c}	14.68 ±3.27^{bc}	0.005**
7	31.43±3.62^{b}	48.57 ±3.23^{a}	6.55 ±3.01^{c}	14.63 ±3.13^{bc}	0.018**
8	31.37±3.71^{b}	48.53 ±3.63^{a}	6.53 ±3.02^{c}	14.57 ±3.53^{bc}	0.002**
9	31.33±3.23^{b}	48.47 ±3.67^{a}	6.48 ±3.06^{c}	14.53 ±6.41^{bc}	0.001**
10	14.63±3.02^{b}	23.67 ±3.46^{a}	1.67 ±1.05^{c}	5.48 ±2.78^{bc}	0.017**
11	14.58±2.77^{b}	23.61 ±3.19^{a}	1.62 ±1.01^{c}	5.43 ±2.39^{bc}	0.001**
12	14.43±3.19^{b}	23.57 ±3.16^{a}	1.57 ±1.15^{c}	5.37 ±2.18^{bc}	0.020*
13	14.35±3.42^{b}	23.47 ±3.05^{a}	1.47 ±1.02^{c}	5.33 ±2.17^{bc}	0.021*
14	14.33±3.36^{b}	23.39 ±3.14^{a}	1.37 ±1.03^{c}	5.31 ±2.08^{bc}	0.022*

**Significant at 0.01level; *Significant at 0.05 level

Means having different letter as superscript differ significantly within a row

45 min, respectively) compared to those weaned at 36 days (25 min).

EFFECT OF ENVIRONMENTAL ENRICHMENT ON THE FREQUENCY OF LEVERING AGGRESSIVE BEHAVIOUR OF PIGLETS

Levering aggressive behaviour of piglets weaned at 35 days

The effect of environmental enrichment on the frequency of levering behaviour of piglets weaned at 35 days is presented in table 3. Results revealed that except on the 8th day, there was a significant difference in the frequency of levering behaviour of LWY piglets weaned at 35days in various treatment groups.

On the first day of the experiment, comparison between different groups revealed that the frequency of levering behaviour was highest in T_3 (8.33 ± 0.92) and lowest in T_5 (2.43 ± 0.68). Similar trend followed on the subsequent days. However, T_5 and T_7 showed significantly lower frequency compared to T_1 and T_3 ($P<0.01$). The study is in agreement with Bolhuis *et al*. (2005) as they reported that in comparison to barren housing conditions, an enriched housing environment, such as the availability of straw bedding, promoted welfare by increasing play behaviour and decreasing the frequency of aggressive behaviour directed towards pen mates in weaned piglets ($P<0.05$). The frequency

Table 3: Effect of enrichment facilities on frequency of levering behaviour in piglets weaned at 35 days(nos./h/day)

Day	Piglets weaned at 35 days				(P-value)
	T_1	T_3	T_5	T_7	
1	5.35 ± 0.73^{b}	8.33 ± 0.92^{a}	2.43 ± 0.68^{c}	3.88 ± 0.89^{bc}	0.002**
2	4.67 ± 0.76^{b}	8.22 ± 0.93^{a}	1.67 ± 0.56^{c}	2.67 ± 0.62^{bc}	0.001**
3	3.33 ± 0.33^{b}	5.33 ± 0.62^{a}	0.87 ± 0.33^{c}	2.33 ± 0.33^{c}	0.001**
4	2.63 ± 0.62^{b}	3.77 ± 1.02^{a}	0.43 ± 0.21^{c}	1.37 ± 0.37^{bc}	0.013*
5	2.61 ± 0.84^{b}	3.75 ± 0.62^{a}	0.41 ± 0.11^{c}	1.35 ± 0.45^{bc}	0.005**
6	2.58 ± 0.72^{b}	3.73 ± 1.12^{a}	0.37 ± 0.31^{c}	1.34 ± 0.26^{bc}	0.021*
7	2.53 ± 1.23^{b}	3.71 ± 0.76^{a}	0.35 ± 0.41^{c}	1.33 ± 0.52^{bc}	0.023*
8	2.51 ± 1.05	3.70 ± 1.23	0.33 ± 0.21	0.82 ± 0.32	0.103^{ns}
9	2.48 ± 0.99	3.68 ± 1.33	0 ± 0^{c}	0.78 ± 0.52	0.011*
10	2.21 ± 1.00^{b}	3.33 ± 0.88^{a}	0 ± 0^{c}	0.68 ± 0.13^{bc}	0.024*
11	2.19 ± 0.93^{b}	3.31 ± 1.02^{a}	0 ± 0^{c}	0.66 ± 0.33^{bc}	0.017*
12	2.18 ± 0.90^{b}	3.31 ± 0.28^{a}	0 ± 0^{c}	0.64 ± 0.53^{bc}	0.005**
13	2.17 ± 0.79^{b}	3.33 ± 0.84^{a}	0 ± 0^{c}	0.63 ± 0.42^{bc}	0.015*
14	2.15 ± 0.91^{b}	3.30 ± 0.64^{a}	0 ± 0^{c}	0.61 ± 0.21^{bc}	0.013^{*}

** Significant at 0.01 level; * Significant at 0.05 level; ns non-significant Means having different letter as superscript differ significantly within a row

of levering behaviour was more during the first two days of the experiment. It decreased gradually from the third day onwards until it was seen to be totally absent in T_5 on 9th day. Using balls as enriching objects resulted in improvement in animal well-being by reducing the frequency of agonistic behaviour of piglets (Brown *et al*., 2015).

Levering aggressive behaviour of piglets weaned at 45 days

The effect of environmental enrichment on the duration of levering behaviour of piglets weaned at 45 days old is given in table 4. From the result, it was found that there existed significant difference in the frequency of levering behaviour of the piglets among different treatment groups throughout the entire period of 14 days in case of the piglets weaned at 45 days old.

Pair wise comparison revealed that frequency of levering behaviour was highest in T_4 (9.33 ± 0.76) and lowest in T_6 (2.67 ± 0.18). A similar pattern was observed until the end of the trial. This is in agreement with the findings of Cornale *et al*. (2015) as they evaluated the effect of space allowance on aggressive behaviour of weaned piglets by comparing two floor spaces *viz.* 1 m^2/pig and 1.5 m^2/pig and reported that the piglets

Table 4: Effect of enrichment facilities on frequency of levering behaviour in piglets weaned at 45 days (nos./h/day)

Day	Piglets weaned at 45days				(P- value)
	T_2	T_4	T_6	T_8	
1	7.33 ± 0.42^b	9.33 ± 0.76^a	2.67 ± 0.18^c	3.33±0.42^{bc}	0.001**
2	7.12 ± 0.45^b	9.13 ± 0.45^a	2.33 ± 0.56^c	3.22±0.68^{bc}	0.001**
3	5.33 ± 0.33^b	7.67 ± 0.56^a	1.04 ± 0.52^c	2.67±0.56^{bc}	0.001**
4	3.43 ± 0.63^b	5.24 ± 0.97^a	0.67 ± 0.43^c	1.63±0.42^{bc}	0.004**
5	3.41 ± 0.86^b	5.22 ± 0.78^a	0.66 ± 0.33^c	1.61±0.67^{bc}	0.004**
6	3.37 ± 0.63^b	5.20 ± 1.24^a	0.65 ± 0.42^c	1.60±0.33^{bc}	0.009**
7	3.34 ± 0.93^b	5.19 ± 1.16^a	0.64 ± 0.23^c	1.59±0.42^{bc}	0.024*
8	3.31 ± 0.73^b	5.18 ± 0.58^a	0.63 ± 0.32^c	1.58±0.72^{bc}	0.002**
9	3.30 ± 0.52^b	5.16 ± 0.86^a	0.61 ± 0.13^c	1.57±0.62^{bc}	0.002**
10	2.67 ± 0.96^b	4.33 ± 0.99^a	0.33 ± 0.51^c	1.33±0.52^{bc}	0.018*
11	2.65 ± 0.49^b	4.32 ± 0.96^a	0.32 ± 0.21^c	1.32±0.45^{bc}	0.002**
12	2.64 ± 0.96^b	4.31 ± 1.12^a	0.31 ± 0.41^c	1.31±0.22^{bc}	0.019*
13	2.63 ± 0.91^b	4.30 ± 0.99^a	0.30 ± 0.11^c	1.30±0.32^{bc}	0.021*
14	2.65 ± 0.99^b	4.28 ± 1.12^a	0.28 ± 0.21^c	1.29±0.52^{bc}	0.023*

**Significant at 0.01level; *Significantat0.05level

Means having different letter as superscript differ significantly within a row

raised in lower space allowance showed greater frequency of aggressive behaviour ($P<0.05$) compared to those provided with larger space. According to Marchant-Forde (2010), when unknown piglets are mixed together at the time of weaning, they developed intense aggression that lasted for 24-28 h until a dominance hierarchy was established. However, T_6 and T_8 showed significantly lower frequency compared to T_2 and T_4 ($P<0.01$). The frequency of levering behaviour was more during the first two days of the experiment and then it decreased gradually from the third day onwards.

CONCLUSION

The effect of environmental enrichment on levering aggressive behaviour of the weaned piglets was assessed in piglets. In piglets weaned at 35 days, the duration and frequency of levering behaviour was highest when weaned at 35 days on concrete floor of 6 sq. m (1mx1m) and lowest in 35 days with paddy straw for 2.5 cm on concrete floor, followed by piglets weaned at 35 days with free balls on concrete floor in day one. The piglets weaned at 45 days differed in the duration of levering behaviour throughout 14 days. Enriching barren pens with straw and balls had minimized the aggressive behaviour between pigs.

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