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Productive performance of crossbred pigs reared under two accommodations

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Abstract

Total of 12 crossbreed female pigs (Hampshire x Tenyivo) in the genetic ratio of 75:25 at the age of 42 days each were reared in two different accommodation, i.e., (Group 1, T₁) group accommodation and (Group 2, T₂) individual accommodation under standard management conditions for 28 fortnights. The values for feed intake (11.33 kg Vs 9.95 kg) were significantly ($p>0.05$) higher in group accommodation as compared to individual ones; however the other parameters like body weight, body weight gain, feed conversion efficiency and performance index were same in both the accommodations. 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 has affect on feed intake.

Keywords: Group accommodation, individual accommodation, productive traits, body weight, body weight gain, feed intake, feed conversion efficiency, performance index, crossbreed pigs

Introduction

According to the 20th Livestock Census of India (2019), pig population is estimated to be 9.06 million. NE region has 38.42% of the total pig population of India with a total population of 57, 56,306 numbers. In Nagaland, the state pig population is 5, 03,688 of which 75.99% are crossbreds and 24.41% are indigenous. The Nagaland Indigenous are small to medium in body size, alert eyes, small erect ears, exhibit early sexual maturity and thrive well in the climatic condition of the place. There had been major improvement in the recent years in the quality of pigs through crossbreeding of indigenous and exotic pigs. The importance in crossbred pigs had gained widely in commercial sector of piggery mainly because of its genetic phenomena known as heterosis which feature to increase the reproductive and productive trait in pigs. Upgrading Tenyi Vo with exotic Hampshire breeds are becoming popular among the farmers of Nagaland because of its better performance in growth rate and higher return. Pig rearing in India is common to tribal people of Northeast region and piggery is an important integral part of the livelihood of the people (Patr *et al.*, 2014) [2].

Group confinement is believed to reduce stress, increase social interaction and promote the general wellbeing of the animals as compared to the individual accommodation. The two different types of accommodations have been examined by several researchers and scientists to see if the differences exist. Several factors have been examined including group size, space requirements, feeding options and the economic differences between the two types of accommodations. However, quantifying them for social welfare has been quite difficult. (Fraser, 2008) [5]

Competition at the feeder, social facilitation, and social stress are all factors that may be responsible for the differences in feeding behaviour and production parameters between group housed and individually housed pigs. Social facilitation in group housed pigs results in synchronised feeding, but can lead to increased competition for feeder space in pigs kept in groups, caused by the motivation to feed simultaneously. Therefore, a balance between the amount of competition and the amount of social facilitation that occurs in a group situation must be found if the maximum food intake is to be achieved (Hisa and WoodGush, 1983) [3]. Keeping the above facts in view, the present research work entitled "Productive performance of crossbred pigs reared under two accommodations" was postulated to see the effects of different accommodation on crossbreed pig in Nagaland.

Materials and Methods

A total of 12 crossbred 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 is located 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). 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.

Body weight was recorded at fortnightly intervals till 28th fortnights by following standard procedure. Feed intake was recorded daily and the feed residue if any was recorded the next morning for both the groups.

The feed conversion efficiency (FCE) of both the treatments was calculated by adopting the following formula:

$$\text{Feed Conversion Efficiency (FCE)} = \frac{\text{Quantity of feed consumed (g)}}{\text{Total body weight gain (g)}}$$

Performance index (PI) was calculated by adopting the following formula

$$\text{PI} = \frac{\text{Average body weight (g)} \times \% \text{Liveability}}{\text{Cumulative FCE} \times \text{No. of days}} \div 10$$

The observation was taken in the morning to avoid environmental stress. The data so recorded were subjected to statistical analysis by using SPSS (version 16.0). The overall level of statistical significance was compared at 5% probability.

Results and Discussion

Body weight

From the perusal of data (Table 1), it was revealed that the mean value of body weight of the pigs was 6.75 kg and 4.58 kg at first fortnight in T₁ and T₂ group, respectively. With advancement of age the corresponding value of body weight at 28th fortnight was 80.37 kg and 72.31 kg. From the statistical analysis it was observed that the values of body weight did not differ ($p > 0.05$) and it was same in both the group. The result of the present study was in agreement of the findings of Wei *et al.* (2019) who also reported that there was no difference ($p > .05$) in the initial body weight, and the final body weight for pigs housed in two different group housing. Bruininx *et al.* (2001) [7] also reported that body weight distribution within group accommodation had only limited effects on pig performance. Furthermore Morrison *et al.* (2007) who reported that the growth rates of the animals were not influence by the housing system. The result might be due to competition at the feeder, social facilitation and social

stress like factors that might be responsible for the differences in feeding behaviour and production parameters between group housed and individually housed pigs. Social facilitation in group housed pigs' resulted in synchronised feeding, but could lead to increased competition for feeder space in pigs kept in groups, caused by the motivation to feed simultaneously. Therefore, a balance between the amount of competition and the amount of social facilitation that occurred in a group situation must be found if the maximum food intake is to be achieved (Hisa and WoodGush, 1983) [3].

Table 1: Influence of accommodation on body weight

FORTNIGHT	TREATMENT		REMARK
	T1	T2	
1	6.75 ^a	4.58 ^b	S*
2	7.34 ^a	5.14 ^b	S*
3	7.97 ^a	5.57 ^b	S*
4	8.43 ^a	6.19 ^b	S*
5	9.30 ^a	7.06 ^b	S*
6	10.43 ^a	7.99 ^b	S*
7	11.43 ^a	9.16 ^b	S*
8	12.89	10.56	NS
9	14.5	13.15	NS
10	15.67	19.19	NS
11	17.43	15.13	NS
12	18.79	16.42	NS
13	21.72	18.3	NS
14	24.4	19.25	NS
15	26.47	20.53	NS
16	28.16	21.8	NS
17	31.89	23.07	NS
18	34.35	25.6	NS
19	36.28	27.52	NS
20	38.59	27.57	NS
21	41.51	31.1	NS
22	45.96	34.62	NS
23	51.18 ^a	35.23 ^b	S*
24	55.1	43.27	NS
25	59.72	50.67	NS
26	65.85	58.62	NS
27	73.17	64.78	NS
28	80.37	72.13	NS
MEAN	80.37 ± 7.20	72.13 ± 7.30	NS

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

From the perusal of data (Table 2), it was observed that the mean value of feed intake of the pigs was 1.59 kg and 0.88 kg at first fortnight in T₁ and T₂ group, respectively. With advancement of age, the corresponding value of feed intake at 28th fortnight was 24.50 kg and 20.22 kg. From the statistical analysis, it was observed that the feed intake differed significantly ($p < 0.05$) among the two treatments. The feed intake was significantly ($p < 0.05$) higher in T₁ as compared to T₂ group. The results of the present study were well corroborated with the observations of De Haer and Merks (1992) [8] who also observed higher feed intake in group housed pigs as compared to individual housing. However Bruininx *et al.* (2001) [7] reported that average daily feed intake was not affected ($P > 0.1$) by weight distribution within different groups accommodation. Wei *et al.* (2019), also reported that there was no difference ($P > .05$) in the average daily feed intake for pigs housed in two different group housing, explaining furthermore the reason could be that the

actuality for different housing systems often involve multiple factors that may affect pig behaviour, such as pen space, group size, flooring, enrichment, stress etc.

This could be the reason that group housed pigs modified their feeding behaviour by eating less frequently; consuming more food at a time and at a faster rate compared to pigs housed individually (de Haer and Merks, 1992) [8] and leaves no residue.

Table 2: Influence of accommodation on feed intake (kg/pig)

FORTNIGHT	TREATMENT		REMARK
	T1	T2	
1	1.59 ^a	0.88 ^b	S*
2	3.3 ^a	1.74 ^b	S*
3	4.32 ^a	2.89 ^b	S*
4	4.90 ^a	3.79 ^b	S*
5	5.39 ^a	4.77 ^b	S*
6	5.74 ^a	5.39 ^b	S*
7	5.69	6.26	NS
8	7.05 ^a	6.39 ^b	S*
9	7.70 ^a	6.78 ^b	S*
10	9.24 ^a	7.53 ^b	S*
11	9.91 ^a	8.64 ^b	S*
12	10.51 ^a	9.51 ^b	S*
13	11.14 ^a	10.28 ^b	S*
14	11.84 ^a	10.67 ^b	S*
15	12.45 ^a	10.70 ^b	S*
16	12.60 ^a	11.51 ^b	S*
17	12.79 ^a	12.27 ^b	S*
18	12.60 ^a	12.20 ^b	S*
19	12.60 ^a	12.29 ^b	S*
20	12.6	12.49	NS
21	13.44 ^a	13.18 ^b	S*
22	13.72 ^a	13.50 ^b	S*
23	14.00 ^a	13.54 ^b	S*
24	14.00 ^a	13.82 ^b	S*
25	19.60 ^a	13.77 ^b	S*
26	21.00 ^a	15.61 ^b	S*
27	23.10 ^a	18.10 ^b	S*
28	24.50 ^a	20.22 ^b	S*
MEAN	11.33^a ± 0.32	9.95^b ± 0.53	S*

^{a, b} means bearing different superscripts in a row differ significantly (P<0.05)

Body weight gain

From the perusal of the data (Table 3), it was perused that the mean value of body weight gain of the pigs was 0.59 kg and 0.55 kg at first fortnight in T1 and T2 group, respectively. With advancement of age, the corresponding value of body weight gain at 28th fortnight was 7.20 kg and 7.35 kg. From the statistical analysis it was observed that the body weight did not differ significantly irrespective of various accommodations during 28th fortnight periods. The results of the present study were in agreement with the findings of Bruininx *et al.* (2001) [7] who also reported that average daily gain was not affected ($p>0.1$) by weight distribution within different group accommodations. Wei *et al.* (2019) also reported that there was no difference ($p>.05$) in the average daily body weight gain for pigs housed in two different group housing. The reason could be that the actualities for different

housing systems often involve multiple factors that might affect pig behaviour, such as pen space, group size, flooring, enrichment, stress etc. In conclusion, previous reports had shown that a highly competitive environment resulted in a large variation in daily weight gain among the pigs.

Table 3: Influence of accommodation on body weight gain (kg/pig)

FORTNIGHT	TREATMENT		REMARK
	T1	T2	
1	0.59	0.55	NS
2	0.63	0.43	NS
3	0.46	0.62	NS
4	0.86	0.87	NS
5	1.14	0.94	NS
6	1.00	1.16	NS
7	1.46	1.41	NS
8	1.62	2.59	NS
9	1.17	6.04	NS
10	1.76	-4.05	NS
11	1.36	1.29	NS
12	2.93	1.88	NS
13	2.68	0.95	NS
14	2.06	1.28	NS
15	1.70	1.27	NS
16	3.73	1.27	NS
17	2.46	2.53	NS
18	1.93	1.92	NS
19	2.31	0.05	NS
20	2.92	3.53	NS
21	4.45	3.52	NS
22	5.22	0.62	NS
23	3.92	8.03	NS
24	4.61	7.40	NS
25	6.13	7.95	NS
26	7.32	6.17	NS
27	7.20	7.35	NS
MEAN	2.73 ± 0.22	2.50 ± 0.27	NS

Feed conversion efficiency

From the perusal of data (Table 4), it was revealed that the mean value of feed conversion efficiency of the pigs was 2.68 and 1.58 at first fortnight in T1 and T2 group respectively. With advancement of age, the corresponding value of feed conversion efficiency at 28th fortnight was 3.16 and 4.27. From the statistical analysis it was observed that feed conversion efficiency did not differ significantly. The result of the present study was in agreement with the observations Wei *et al.* (2019) who also reported that there was no difference ($p>.05$) in feed conversion efficiency for pigs housed in two different systems of housing. However, there were other factors involved which affected FCE, such as body composition, initial and final body weight, the level of feed intake, growth rate, the thermal environment, and immunological status and finally, feed processing and delivery (Pateince *et al.* 2015).

Table 4: Influence of accommodation on feed conversion efficiency

FORTNIGHT	TREATMENT	
	T1	T2
1	2.68	1.58
2	5.21	4.05
3	9.38	4.64
4	5.68	4.38
5	4.75	5.09
6	5.76	4.64
7	4.32	4.45
8	4.00	2.47
9	6.61	1.12
10	5.24	-1.86
11	9.59	-2.80
12	8.35	5.97
13	3.81	5.46
14	4.41	11.23
15	6.03	8.39
16	7.42	9.03
17	3.43	9.68
18	5.12	4.82
19	6.53	6.41
20	5.46	8.33
21	4.60	3.73
22	3.09	3.84
23	2.68	2.20
24	3.57	1.72
25	4.25	1.86
26	3.42	1.96
27	3.16	2.94
MEAN	5.13 ± 0.51	4.27 ± 0.50
REMARK	NS	

Performance Index

From the perusal of data (Table 5), it was perused that the mean value for performance index of the pigs was 157.41 and 250.64 at first fortnight in T1 and T2 group, respectively. With advancement of age, the corresponding value for performance index at 28th fortnight was 1628.94 and 1788.43. From the statistical analysis, it was observed that performance index did not differ. Performance could be affected by social ranking position which might have influenced by feed intake pattern (Hansen *et al.*, 1982; Jonsson and Jorgensen, 1988; McBride *et al.* 1964). The results were in agreement with Kim (2017) who confirmed that no significant effect of space allowance on growth performance and serum cortisol concentrations were observed between two different treatments of accommodations. The scientific literature is deficient in information as to why there are differences in growth performance between pigs housed in two different housing systems. Morrison *et al.*. (2003) suggested that feeding behaviour of pigs in deep-litter, group housed systems might be implicated in their poorer growth performance. Bruininx *et al.*. (2001) [7] also suggested that body weight

distribution within group accommodation had only limited effects on pig performance. Furthermore, Morrison (2007) reported that there was no impact on treatment in growth performance. Their comparability is limited, knowing that there is an interaction between the housing system and the local climatic conditions, and there were many more factors that could affect the performance of pigs i.e., the breed, nutrition, season etc. (Ludwiczak *et al.* 2021) [16].

Table 5: Influence of accommodation on performance Index

FORTNIGHT	TREATMENT	
	T1	T2
1	157.41	250.64
2	86.82	75.78
3	35.01	95.99
4	108.65	141.18
5	170.59	131.34
6	123.57	179.25
7	241.64	225.36
8	288.15	748.82
9	125.90	3838.13
10	240.48	1556.30
11	101.45	-327.40
12	250.09	225.21
13	502.98	124.26
14	334.17	81.09
15	201.29	108.51
16	359.04	100.24
17	512.73	186.88
18	269.33	284.29
19	252.56	5.57
20	382.32	303.10
21	690.20	673.52
22	1208.37	114.73
23	1045.22	2614.13
24	923.45	3072.79
25	1031.16	3052.66
26	1526.38	2242.60
27	1628.94	1788.43
MEAN	474.00 ± 1.81	810.87 ± 3.08
REMARK	NS	

Conclusions

The study was carried out to assess the effect of accommodation on productive behaviour of pigs. For this study 12 crossbred 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 weight recorded at the end of 28th fortnight was 80.37±2.07 vs. 7213±2.07 (kg) in T₁ and T₂ group, respectively. Statistical analysis revealed that there was no significant (P>0.05) difference in body weight between the T₁ group and T₂ group. Overall mean feed intake 11.33±0.32 vs. 9.95±0.53 kg in T₁ and T₂ group, respectively. Statistical analysis revealed that there were

significant ($p < 0.05$) difference in feed intake between T₁ group and T₂ group. Overall mean body weight gain was 2.73 ± 0.22 vs. 2.50 ± 0.27 kg in T₁ and T₂ group respectively. Statistical analysis revealed that there were no difference between T₁ group and T₂ group, irrespective of the treatments. The mean values of feed conversion efficiency were 5.13 ± 0.51 vs. 4.27 ± 0.50 in T₁ and T₂ group respectively. Statistical analysis revealed that there were no difference among the T₁ group and T₂ group, irrespective of the treatments. The average performance index was 474.00 ± 1.81 vs. 810.81 ± 3.08 in T₁ and T₂ group respectively. Statistical analysis revealed that there were no difference among the T₁ group and T₂ group, irrespective of the treatments. From the results, it may be concluded that different types of accommodation had no affect on body weight, gain in body weight, feed conversion efficiency and performance index. So, group accommodation rearing system can be advocated instead of individual rearing.

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