Biological Forum – An International Journal **15(5): 597-601(2023)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Reproductive Traits of Crossbred Pigs Reared under Two Accommodations

Jongpongrenla Jamir[1*], V.K. Vidyarthi[2], M.C. Rutsa[3], Drusilla Jishing Rengma[1], Thejanuo Rio[1] and Naorem Diana Devi[1]

[1]Ph.D. Scholar, Department of Livestock production and Management, School of Agricultural Sciences (SAS), Nagaland University, Medziphema (Nagaland), India.
[2]Professor, Department of Livestock production and Management, School of Agricultural Sciences (SAS), Nagaland University, Medziphema (Nagaland), India.
[3]Associate Professor, Department of Livestock production and Management, School of Agricultural Sciences (SAS), Nagaland University, Medziphema (Nagaland), India.

(Corresponding author: Jongpongrenla Jamir)*
(Received: 01 March 2023; Revised: 14 April 2023; Accepted: 18 April 2023; Published: 20 May 2023)
(Published by Research Trend)

ABSTRACT: A total of 12 female crossbreed pigs (Hampshire × Tenyivo) with a genetic ratio of 75:25 were raised for 28 fortnights in two different housing types, i.e., group housing (Group 1, T1) and individual housing (Group 2, T2), at ages of 42 days each. With the aim to see the effect of rearing space on the animal welfare in terms of reproduction. Pigs' average ages at first mating were 330 days and 350 days for T1 and T2, their average ages at first farrowing were 446.33 days and 465 days for T1 and T2, their average litter sizes were 6.83 and 6.00 for T1 and T2, and their average litter weights were 7.59 kg and 5.67 kg for T1 and T2, respectively. T1 and T2. Age at first mating, age at first farrowing, litter size, and litter weight results for reproductive traits showed no differences. Based on the findings, it can be said that the reproductive features of crossbred animals under two distinct accommodations in Hampshire × Tenyivo crosses with a ratio of 75:25 do not differ.

Keywords: Group accommodation, individual accommodation, reproductive traits, age at first mating, age at first farrowing, litter size and litter weight, crossbreed pigs, different housing, Hampshire, Tenyivo, animal welfare

INTRODUCTION

Animal welfare has become a growing concern in the livestock sector for producers, businesses, consumers, health care professionals, and politicians (Hewson 2003; Renggaman *et al*., 2015). Because housing systems might restrict one or more freedoms, which should be taken into account in animal wellbeing, they have become one of the topics in the animal welfare debate (FAWC 2012). Both types of group-based and individual housing have advantages and disadvantages. Animals living in separate accommodations have their own space and food, which reduces competition and, as a result, minimises hostility and injuries (Levis, 2007; AVMA 2015). In addition, feeding, vaccination and transferring a large number of sows is simpler in the individual housing (Levis, 2007).

Individual houses, however, may restrict the amount of room for social interaction, exercise, and movement (Levis, 2007; AVMA, 2015). First off, the public has a very poor opinion of the individual housing system because it is well known that it is bad for the welfare of animals. Due to growing concern for the welfare of gestating sows and their litters, the gestation housing system has been changed from the individual system to the group housing system (Schau *et al.,* 2013). The group housing system gives sows significantly greater room to walk around, exercise, and interact socially than the individual housing system does (Levis, 2007). Due to this, the European Union already enacted regulations to forbid pregnant sows from living in individual houses, which went into effect in 2013 (Schau *et al.,* 2013). Fighting during mealtimes in a system of group housing, however, has the potential to increase accidents and impair productivity (Levis, 2007; Schau *et al.,* 2013; AVMA, 2015). According to Gomez *et al.* (2021), it's critical for both producers and consumers to understand pig welfare. It's also becoming increasingly clear that animal production needs to address animals' behavioural demands (Lidfors *et al.,* 2005; Thornton, 2010; Hartung, 2013). A larger area may be more proficient for pigs health and welfare, however the financial considerations need to be factored in as well (Zeng *et al.,* 2022).

There was no clearly superior housing system between the gestation housing systems, according to scientific evidence from earlier studies that well-managed individual housing and group housing for gestating sows had comparable welfare states in terms of physiology, behaviour, health, and performance (McGlone *et al.,* 2004; 2005; Rhodes *et al.,* 2005). Although various studies on the reproductive success of pregnant sows have produced conflicting results and animal welfare issues connected to housing systems are still debatable, group housing has become the dominant

norm in the modern pig industry. Given the aforementioned knowledge, the current research investigation proposed, "Reproductive traits of crossbred pigs reared under two accommodations," to examine how different accommodations affect crossbred pigs in Nagaland.

MATERIALS AND METHODS

At the age of 42 days, 12 crossbred females were chosen from the pig farm of the Livestock Production and Management Department, Nagaland University, SASRD, Medziphema Campus, Nagaland, with a genetic ratio of 75:25 (Hampshire × Tenyivo). The farm is situated 310 metres above sea level between the longitudes of 93.20 and 95.15 east and the latitudes of 25.60 and 27.40 north. The 12 pigs, all of which were female, were divided into two groups of six each, with the first group being housed in a single sty and the second being housed in individual stalls, with each of the six pigs being given their own space in six stalls. The housing for both treatments had concrete floors, and the side walls of the sites were also built of concrete. The roof was composed of a nine-foot-high CGI sheet. All pigs in both treatments were fed the normal standard feeding regimen recommended by ICAR (2013).

The reproductive traits were observed when the pigs attain sexual maturity and some after parturition. The observation of the pigs becoming sexually mature was when its vulva turned pinkish red, discharge and swelling of the vulva, a characteristic grunting and one of the distinctive observation was standing reflex-response to pressure on its back. The reproductive traits were observed under the following:

1. Age at first mating
2. Age at first farrowing
3. Litter size
4. Litter weight

Age of first mating was recorded when the female gilt was mated for the first time. The female pig was allowed to mate twice, next day after the mating in order to avoid pregnancy failure and not to wait for the next oestrus cycle. Age of first farrowing was recorded in number of days. Litter size was recorded in total number of the piglets the sow farrowed. For recording of litter weight, each piglet was weight individually using a digital balance and was noted. All the method for reproductive trait was applied for both the treatments.

RESULT AND DISCUSSION

The various reproductive traits were depicted in Table 1 (Age at first mating); Table 2 (Age at first farrowing); Table 3 (Litter size) and Table 4 (Litter weight).

1. Age at first mating. From the perusal of data (Table 1), it was revealed that the mean value for age at first mating of the pigs was 330 days and 350 days in T1 and T2 group respectively. From the statistical analysis, it was observed that the values for age at first mating did not differ significantly; though the mean value showed that animals in group accommodation was mated 20 days earlier than animals in individual accommodation. The result of the present study was in agreement with the observations of Mavrogenis and Robinson (1976) who reported that gilts which were penned in groups considerably exhibited a variation of 14 days in age at puberty than gilts penned individually (207.4 vs. 222.2 days). Christenson (1981) also observed a difference of 5 days between individual and group housed gilts. Nakamura *et. al.* (1993) observed a still higher difference of 24.5 days between individual stalls and group stalls. Gilts kept in individual pens had higher incidence of irregular oestrus cycles than gilts kept in group pens (England and Spurr 1969). Sommer (1980) reported that the females housed individually showed more contact seeking activity and stronger reaction to the observer during oestrus than group housed females, although a typical oestrus behaviour such as mounting was possible only in group. Pigs reared in group housing had higher in conception rate than individual housing. Knap (1969) found a higher conception rate of 87.2 per cent for sows housed in groups of 5-6 than for sows individually housed 84.2 per cent. Schlegal and Sklenar (1972) observed a conception rate of 73.5 per cent and 62.2 per cent in group housed sows and gilts respectively in comparison with the 69.4 and 58.8 per cent in individually housed sows and gilts, respectively. On the contrary, Klatt and Schlisske (1974) found a 90 per cent conception rare in individually housed gilts, when the conception rate for group housed gilts was only 81.9 per cent. Teodornovic *et al.* (1984) observed a higher difference of 18.5 per cent of conception rate between individual stalls and group stalls.

Table 1: Influence of accommodation on age at first mating (days).

Age At First Mating (Days)	Litter	Treatment	
		T1	T2
	1	337	392
	2	320	364
	3	327	390
	4	338	292
	5	310	339
	6	349	325
Mean		330.17 ± 5.72	350.33 ± 15.99
Remark		NS	

2. Age at first farrowing. According to the data (Table 2), the mean value for age at first farrowing of the pigs was 446.33 days and 465 days in the T1 and T2 groups, respectively. The statistical analysis revealed that the age at first farrowing did not differ significantly; however, the mean value revealed that animals in group accommodation farrowed 18 days earlier than animals in individual accommodation, most likely due to earlier mating in group accommodations as compared to individual accommodation, as observed in the current study. It has been demonstrated that group living can improve sow reproductive success (Weng *et al.,* 2009). Similarly, Bates *et al.* (2003) discovered that sows kept in groups fared better. Similarly, Bates *et al.* (2003) discovered that sows housed in groups outperformed sows placed in separate stalls. In contrast to our findings, other research found that individually housed sows performed better than group-housed sows (Barbari 2000; Boyle *et al.,* 2002). Lynch et al. (1984) indicated that decreased performance of sows housed in groups could be due to a combination of failure to show estrus and reduced conception rates induced by injuries sustained during group housing conflict.

Table 2: Influence of accommodation on age at first farrowing (days).

Age at First Farrowing (Days)	Litter	Treatment	
		T1	**T2**
	1	453	509
	2	435	477
	3	442	504
	4	452	408
	5	431	452
	6	465	440
Mean		**446.33 ± 5.19**	**465 ± 15.96**
Remark		**NS**	

3. Litter size. According to the results (Table 3), the mean litter size of the pigs was 6.83 and 6.00 in the T1 and T2 groups, respectively. According to the statistical study, the value for litter size did not differ considerably. The current findings agreed with those of Kim *et al.* (2016), who found no changes in litter size and litter weight at birth between group housed and stall fed sows. Furthermore, it was obvious from the mean value that there was no or less distinct variance for both treatments, which was strongly substantiated by the findings of Zhao *et al*. (2013), who stated that group housed sows had similar litter size and litter weight at birth to sows in gestational stalls. Similarly, for sows confined in pens or gestation stalls, there were no variations in the overall number of piglets born or born alive per litter (Bates *et al.,* 2003). Den Hartog *et al*. (1993) found that the number of piglets born alive was lower in group housed sows than in gestation stalls. There was also a significant difference in the percentage of piglets born alive from sows in different gestation housing types, with individual housing having a greater percentage than group housing (95.5 vs. 90.4%; P 0.05). Gunn and Friendship (2003) found that sows in group housing had more litters per year than sows in gestation stalls. Furthermore, further studies found that sows in individual stall housing produced more piglets delivered alive at birth during the entire productive cycle than sows in other housing types (Barbari, 2000). However, consistent results showed that gestation housing types (stall vs. group) had no effect on the number of total piglets at birth, particularly piglets born alive, regardless of other treatments (Den Hartog *et al.,* 1993; Bates *et al.* 2003; Johnston and Li 2013; Li *et al.,* 2014).

Table 3: Influence of accommodation on litter size.

Litter Size	Litter	Treatment	
		T1	**T2**
	1	8	6
	2	5	5
	3	10	7
	4	9	8
	5	5	4
	6	4	6
Mean		**6.83 ± 1.01**	**6 ± 0.58**
Remark		**NS**	

4. Litter weight. According to the results (Table 4), the mean litter weight of the pigs was 7.59 kg and 5.67 kg in the T1 and T2 groups, respectively. According to the statistical analysis, the data for litter weight did not differ significantly (P0.05). The current study's findings were strongly supported by Kim *et al.* (2016), who showed that there were no variations in litter size and litter weight at birth between group housed and stall fed sows. Furthermore, according to the table (Table 4), the mean value for litter weight was statistically similar in group accommodation, which contradicted the findings of Bates *et al.* (2003), who found lower litter weight among group housed sows than sows in gestation stalls. Previous research found that the reproductive performance of group housed sows is comparable to or better than that of stall sows in terms of back fat, litter size, piglet birth weight, piglet weaning weight, and wean to estrus interval (McGlone *et al.*, 2004; Rhodes *et al*., 2005). The social environment was discovered to have a positive effect on litter performance. Wechsler *et al.* (1991) discovered that offering a natural social atmosphere and non-stressful circumstances increased litter performance. However, according to some consistent data, gestation housing styles (stall vs. group) had no effect on the number of total piglets at birth regardless of other treatments (Den Hartog *et al.*, 1993; Li *et al.*, 2014).

Table 4: Influence of accommodation on litter weight.

Litter Weight (Kg)	Litter	Treatment	
		T1	**T2**
	1	7.73	5.46
	2	6.47	5.17
	3	12.45	5.12
	4	10.07	8.15
	5	4.78	4.87
	6	4.01	5.25
Mean		**7.59 ± 1.31**	**5.67 ± 0.5**
Remark		**NS**	

CONCLUSIONS

The study was carried out to evaluate the reproductive features of crossbred pigs grown in two different environments. Twelve crossbred pigs were separated into two groups for this investigation, T1 for group living and T2 for individual housing. All of the animals were raised utilising the same food regimen and housing scheme. The average age at first mating recorded in the T1 and T2 groups was 330.17±5.72 vs. 350.17±5.72 (days). Statistical analysis demonstrated that there was no difference between the T1 and T2 groups, regardless of treatment. The average age at first farrowing recorded in T1 and T2 groups was 446.33±5.19 vs. 465.17±15.96 (days). Statistical analysis found no differences between the T1 and T2 groups. The average value for litter size recorded was 6.83±1.01 vs. 6.00±0.58 in the T1 and T2 groups, respectively. Statistical analysis demonstrated that there was no difference between the T1 and T2 groups, regardless of treatment. The average litter weight recorded was 7.59±1.31 (kg) in the T1 group and vs. 5.67±0.5 (kg) in the T2 group. Statistical analysis demonstrated that there was no difference between the T1 and T2 groups, regardless of treatment.

FUTURE SCOPE

1. To study different kinds of stress and its effects related to group accommodation and individual accommodation.
2. To study the agonistic behaviour, eliminative behaviour and explorative behaviour in different types of accommodation in pigs.

REFERENCES

AVMA (2015). Welfare Implications of Gestation Sow Housing. American Veterinary Medical Association, Schaumburg, IL; [cited 12 May 2023]. Available from URL: https:// www.avma.org/KB/Resources/LiteratureReviews/Pages/ Welfare-Implications-of-Gestation-Sow-Housing.aspx

Barbari, M. (2000). Analysis of reproductive performances of sows in relation to housing systems. In: American Society of Agricultural Engineers (ed.), Swine housing Proceedings of the First International Conference, 188– 196.

Bates, R. O., Edwards, D. B. and Korthals, R. L. (2003). Sow performance when housed either in groups with electronic sow feeders or stalls. *Livestock Production Science*, *79*, 29 –35.

Boyle, L. A, Leonard, F.C., Lynch, P. B. and Brophy, P. (2002). Effect of gestation housing on behaviour and skin lesions of sows in farrowing crates. *Applied Animal Behaviour Science*, *76*, 119–134.

Christenson, R. K. (1981). Influence of confinement and season of the year on puberty and oestrus activity of gilts. *Journal of Animal Science*. *52* (4), 821-829.

Den Hartog, L. A., Backus, G. B. and Vermeer, H. M. (1993). Evaluation of housing systems for sows. *Journal of Animal Science*, *71*, 1339–1344.

England, D. C. and Spurr, D. T. (1969). Litter size of swine confined during gestation. *Journal Animal Science*, *28*, 220.

FAWC (2012). Five Freedoms. Farm Animal Welfare Council, Westminster, London; [cited 12 May 2023]. Available from URL: http://webarchive.nationalarchives.gov.uk/20121010012427/http://www.fawc.org.uk/freedoms.htm

Gómez, Y., Stygar , H. A., Boumans, J. M. M. I., Bokkers, A. M. E., Pedersen, J. L., Niemi, K. J., Pastell, M., Manteca, X. and Llonch, P. (2021). A systematic review on validated precision livestock farming technologies for pig production and its potential to assess animal welfare. *Frontiers in veterinary science,8*.

Gunn, H. and R. Friendship (2003). Gestation sows housing in Ontario. In: Proceedings of the American Association of Swine Veterinarians, Orlando, USA, 61-65

Hartung, J. (2013). A short history of livestock production. In: Aland A. and Banhazi T. (Eds.), Livestock housing: Modern management to ensure optimal health and welfare of farm animals. Wageningen Academic Publishers, the Netherlands, 21-34.

Hewson, C. J. (2003). What is animal welfare? Common definitions and their practical consequences. *Canadian Veterinary Journal*, *44*, 496–499.

ICAR (2013). Nutrient Requirement of Livestock. Indian Council of Agriculture Research, New Delhi, India.

Johnston, L. J. and Li, Y. Z. (2013). Performance and well-being of sows housed in pens retrofitted from gestation stalls. *Journal of Animal Science*, *91*, 5937–5945.

Kim, S., Kim, B., Kim, Y., Jung, S., Kim, Y. and Park, J.(2016). Value of palm kernel co-products in swine diets. *Korean Journal of Agricultural Science*, *43*, 761–768.

Klatt, G. and Schlisske, W. (1974). The effects on performance of minimal exercise of sows pregnant after an extremely short suckling period. *Archives Animal Breeding*, *17*(5), 287-298.

Knap, J. (1969). Effect of group and individual housing of sows after weaning on length of the interval to the first mating and conception rate. *Animal Breeding Abstracts*, *38*, 641-642.

Levis, D. G. (2007). Gestation sow housing options, Des Moines, Iowa. In: Institute of Agriculture and Natural Resources (ed.), Sow Housing Forum. Institute of Agriculture and Natural Resources, Des Moines, IA.

Li, X., Baidoo, S. K., Li, Y. Z., Shurson, G. C. and Johnston, L. J. (2014). Interactive effects of distillers dried grains with soluble and housing system on reproductive performance and longevity of sows over three reproductive cycles. *Journal of Animal Science*, *92*, 1562–1573.

Lidfors, L., Berg, C. and Algers, B. (2005). Integration of Natural Behavior in Housing Systems. *AMBIO: A Journal of the Human Environment*, *34*, 325-330.

Lynch, P. B., O'Grady, J. F. and Kearney, P. A. (1984). Effect of housing system on sow productivity. *Annals de Recherches Veterinaries*, *15*, 181–184.

Mavrogenis, A. P. and Robison, O. W. (1976). Factors affecting puberty in swine. *Journal of Animal Science*, *42*(5), 1251-1255.

Mcglone, J. J., von Borell, E. H., Deen, J., Johnson, A. K., Levis, D. G. and Meunier-Salaun, M. (2004). Reviews: compilation of the scientific literature comparing housing systems for gestating sows and gilts using measures of physiology, behavior, performance and health. *Professional Animal Scientist*, *20*, 105–117.

Nakamura, M., Yamada, Y. and Misaidzu, Y. (1993). Swine reproductive traits under different housing systems through prepuberty to fifth parity. *Animal Science Technology*,*64*(10), 964-970.

Renggaman, A., Choi, H. L., Sudiarto, S. I. A., Alasaarela, L. and Nam, O. S. (2015). Development of pig welfare assessment protocol integrating animal-, environment, and management-based measures. *Journal of Animal Science and Technology*, *57*, 1.

Rhodes, R. T., Appleby, M. C., Chinn, K., Douglas L., Firkins, L. D. and Houpt, K. A. (2005). A comprehensive review of housing for pregnant sows. *Journal of the American Veterinary Medical Association*, *227*, 1580–1590.

Schau, J. D., Brue, D. J. and Rosentrater, A. K. (2013). Review of housing options for gestating sows. In: American Society of Agricultural and Biological Engineers (ed.), Agricultural and Biosystems Engineering Conference Proceedings and Presentations. ASABE Annual International Meeting, Kansas City, MO, 328.

Schlegal, W. and Sklenar, V. (1972). The effect of different management systems on reproductive performance in sows. *Tierzucht*, *26*(11), 409-410.

Soramer, B. (1980). Sows in individual pens and group housing oestrus behaviour, parturition, fertility and' damage to limbs. *Animal Breeding Abstracts*, *48*, 619.

Teodorovic, M., Lipozencic, J., Hajdu, B. and Senji, M. (1984). Management and feeding of sows, and their reproduction. 1. The effect of restricted movement of gilts on reproduction and performance. *Veterinarski-Glasnik*, *38*(1), 3-9.

Thornton, P. K. (2010). Livestock production: recent trends, future prospects. Philosophical Transactions of the Royal Society B: *Biological Sciences*, *365*, 2853-2867.

Wechsler, B., Schmid, H. and Moser, H. (1991). The stolba family pen for domestic pigs. An ethical management system for breeding and growing pigs. *Animal breeding Abstracts*, *59*(7), 4993.

Weng, R. C., S. A. Edwards, and L. C. Hsia. (2009). Effect of individual, group or ESF housing in pregnancy and individual or group housing in lactation on sow behavior. Asian Australas. *Journal of Animal Science*, *22*, 1574-1580.

Zeng, Y., Wang, H., Ruan, R., Li, Y., Liu, Z., Wang, C. and Liu, A. (2022). Effect of Stocking Density on Behavior and Pen Cleanliness of Grouped Growing Pigs. *Agriculture*, *12*(3), 418.

Zhao, Y., W. L. Flowers, A. Saraiva, K. J. Yeum, and S. W. Kim. (2013). Effect of social ranks and gestation housing systems on oxidative stress status, reproductive performance, and immune status of sows. *Journal of Animal Science*, *91*, 5848-5858.

How to cite this article: Jongpongrenla Jamir, V.K. Vidyarthi, M.C. Rutsa, Drusilla Jishing Rengma, Thejanuo Rio and Naorem Diana Devi (2023). Reproductive Traits of Crossbred Pigs Reared under Two Accommodations. *Biological Forum – An International Journal*, *15*(5): 597-601.