Biological Forum – An International Journal **16(3): 04-08(2024)**

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

Growth Performance of Large White Yorkshire Pigs in Swill and Concentrate Feeding Systems

Vijin V.L.[1*], John Abraham[2], Balusami Chinnappan[3], Sabin George[3], Biju Chacko[4] and Namratha Valsalan[1]

[1]Ph.D. Scholar, Department of Livestock Production Management,
College of Veterinary and Animal Sciences, Pookode, Wayanad (Kerala), India.
[2]Professor and Head, Department of Livestock Production Management,
College of Veterinary and Animal Sciences, Pookode, Wayanad (Kerala), India.
[3]Professor, Department of Livestock Production Management,
College of Veterinary and Animal Sciences, Mannuthy, Thrissur (Kerala), India.
[4]Associate Professor and Head, Department of Animal Nutrition,
College of Veterinary and Animal Sciences, Pookode, Wayanad (Kerala), India.

(Corresponding author: Vijin V.L.)*
(Received: 02 January 2024; Revised: 17 January 2024; Accepted: 10 February 2024; Published: 15 March 2024)
(Published by Research Trend)

ABSTRACT: This study investigates the growth performance of Large White Yorkshire (LWY) pigs under two feeding systems: a conventional concentrate-based diet (T_1) and a swill feeding system (T_2). Over a period of 373 days, twelve male weaned piglets were randomly assigned to each treatment group. Weekly measurements of body weight, average daily weight gain, feed intake, and feed conversion ratio were recorded. While both feeding systems generally resulted in similar growth trends, significant differences were observed at certain intervals, particularly in weeks 13 and 49, where T_1 displayed higher body weight and more efficient feed conversion compared to T_2. These findings suggest that both feeding systems can yield high-quality pork and lard, with T_1 showing a slight advantage in terms of efficiency. However, the swill feeding system presents an environmentally friendly approach by utilizing food waste. Overall, this study provides valuable insights into the potential of swill feeding as a sustainable alternative for pig farming, contributing to the optimisation of pork production in India.

Keywords: Growth performance, concentrate-based diet, swill feeding system, feed conversion, body weight.

INTRODUCTION

Pig farming in India has vast untapped potential to meet the non-vegetarian population's food and nutritional needs. Pigs offer advantages like high prolificacy, efficient feed conversion and low initial investment, making it beneficial for rural farmers. They provide a valuable source of protein-rich food, manure, bristles, and fat. The 20th Livestock Census revealed a pig population of 9.06 million, constituting 1.7% of India's total livestock. Pork production accounts for 9% of animal protein sources, primarily concentrated in North-Eastern states and backyard farming (BAHS, 2022). The Census states that Kerala has witnessed a surge in pig farming, with a notable increase in population across all districts. Pigs have traditionally served as food waste recyclers, and swill-feeding facilitates the conversion of food waste into high-quality pork, providing benefits to farmers and the environment by reducing land demand and greenhouse gas emissions. Swine production has emerged as a financially lucrative livestock venture over the years.

MATERIALS AND METHODS

The study was carried out utilising the facilities of the Department of Livestock Production Management, School of Bioenergy and Farm Waste Management, Department of Animal Nutrition, Department of Veterinary Pharmacology and Toxicology and Pig farm, ILFC, CVAS, Pookode.

The study was carried out on from January 2021 to August 2022. The animals were reared from 31st January 2021 to 21st December 2021. The experiment was carried out on twelve male weaned Large White Yorkshire (LWY) piglets. The piglets were weaned at 49 days of age and were randomly allotted to two treatments (T_1 and T_2) as uniformly as possible with respect to their age and body weight of six each. The animals were maintained under similar housing on different feeding systems. Other management practices prevailing in the farm were followed uniformly to both groups throughout the experimental period.

To ensure uniformity between the groups, split weaning was carried out. Heavier piglets were removed from their mothers on the 35th day. So that almost uniform body weight could be obtained at weaning on the 49th day.

After complete weaning, the two groups were fed different diets as detailed below. Treatment 1 (T_1) was fed a grower ration upto 60 kg body weight, followed

by finisher ration (as per ICAR feeding standards 2013) until slaughter. Treatment 2 (T_2) was fed with swill feed collected from hostels and canteen of the College of Veterinary and Animal Sciences Pookode until slaughter. Standard management practices adopted at ILFC, Pookode were followed for both the groups.

Table 1: Type specification of different types feeds.

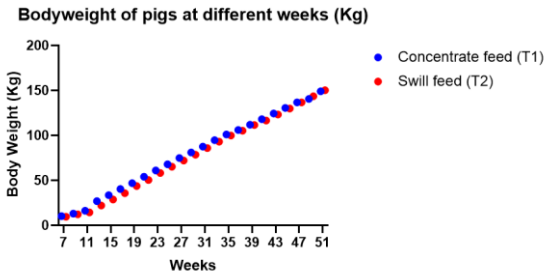
Treatment	Ration
T_1	Grower feed (up to 60 kg body weight) with CP 18% and DE 3086.3 kcal/kg Finisher feed (from 60 kg body weight) with CP 16% and DE 3086.3 kcal/kg, as per ICAR feeding standards (2013)
T_2 (day 49-day 373)	Swill feeding alone

Data pertaining to feeding such as daily feed intake were recorded and average daily gain, feed conversion efficiency were worked out. Growth rate in the two different systems were analysed by recording the body weight at weaning and thereafter at fortnightly intervals. Weight of each piglet were recorded in fortnight intervals to get growth performance of the piglets in both treatment groups. The body weight of all the piglets were recorded using a digital weighing machine at the time of weaning. There after fortnightly body weight were recorded up to the twelfth month.

The animals were fed twice daily, in the morning and in the evening. Weighed quantity of feed was provided in group feeding system and the residue was weighed after feeding to calculate the Average Daily Feed Intake (ADFI).

RESULTS AND DISCUSSIONS

Body weight. The comparison of bodyweight between two groups, concentrate-fed (T_1) and swill-fed (T_2) pigs, over different weeks generally revealed similar bodyweights. Notably, in week 13, a significant difference emerged, with T_1 displaying higher body weight, while other weeks showed no substantial disparities.



This finding corresponds with the research conducted by Muthuramalingam *et al*. (2011), which investigated the effects of heat-treated swill feed on the performance of Large White Yorkshire pigs. The study found no significant differences in weight gain, feed intake, or feed conversion ratio between pigs fed heat-treated swill and those fed commercial concentrate feed.

This contradicts the findings of Ramesh *et al*. (2010); Muthulakshmi *et al*. (2015), who reported that swill-fed pigs had significantly higher body and carcass weights compared to those fed concentrate.

Body weight gain. When comparing the biweekly bodyweight gain of two groups, namely concentrate-fed (T_1) and swill-fed (T_2) pigs, both groups generally displayed similar growth trends with statistically non-significant variations.

Table 2: Comparison of bodyweight at different weeks between two groups.

Period	T 1	T 2	t-value	P-value
Week 7	10.26 ± 0.78	9.54 ± 0.68	0.691^{ns}	0.505
Week 9	13.12 ± 1.03	12.30 ± 0.78	0.638^{ns}	0.538
Week 11	16.24 ± 1.32	14.44 ± 0.87	1.135^{ns}	0.283
Week 13	26.93 ± 1.28	22.12 ± 1.17	2.770*	0.02
Week 15	33.51 ± 1.64	28.80 ± 1.39	2.188^{ns}	0.053
Week 17	40.48 ± 1.92	35.72 ± 1.89	1.771^{ns}	0.107
Week 19	46.98 ± 2.33	43.70 ± 1.91	1.090^{ns}	0.301
Week 21	54.00 ± 2.84	50.40 ± 2.45	0.959^{ns}	0.36
Week 23	61.08 ± 3.28	58.20 ± 2.88	0.66^{ns}	0.524
Week 25	67.97 ± 3.64	65.28 ± 3.56	0.527^{ns}	0.61
Week 27	74.90 ± 4.08	72.12 ± 3.86	0.496^{ns}	0.631
Week 29	81.00 ± 4.44	78.55 ± 4.31	0.395^{ns}	0.701
Week 31	87.50 ± 5.09	85.87 ± 4.82	0.232^{ns}	0.821
Week 33	94.73 ± 5.61	93.03 ± 5.21	0.222^{ns}	0.829
Week 35	101.13 ± 6.20	99.87 ± 5.93	0.147^{ns}	0.886
Week 37	106.08 ± 5.57	105.23 ± 6.31	0.100^{ns}	0.922
Week 39	111.89 ± 5.14	111.58 ± 6.04	0.039^{ns}	0.97
Week 41	118.01 ± 5.69	116.56 ± 5.72	0.180^{ns}	0.861
Week 43	124.47 ± 6.14	123.31 ± 5.99	0.135^{ns}	0.895
Week 45	130.53 ± 6.24	129.97 ± 6.90	0.061^{ns}	0.953
Week 47	136.78 ± 6.79	136.80 ± 7.54	0.002^{ns}	0.999
Week 49	140.50 ± 6.86	143.58 ± 7.43	0.305^{ns}	0.767
Week 51	149.10 ± 6.04	150.28 ± 7.34	0.125^{ns}	0.903

* Significant at 0.05 level (P<0.05); ns non-significant (P>0.05)

This finding agrees with the study of Muthuramalingam *et al.* (2011), where they examined pigs fed concentrate feed, untreated swill feed, and heat-treated swill feed, finding no significant differences in weight gain among the groups.

However, in contrast, both Ranjan *et al.* (2003); Ramesh *et al.* (2010) reported significantly higher weight gain and greater final body weight in pigs fed concentrate feed compared to those on a mixed diet or locally available feed in their respective studies.

Average daily weight gain. Both groups generally exhibited similar patterns in their daily growth, with variations that were not statistically significant. These results highlight weeks 11, 13, and 49 as periods where significant differences in average daily weight gain between the groups were observed, while the other weeks showed comparable daily growth trends with no notable disparities.

In contrast, both Ranjan *et al*. (2003); Ramesh *et al*. (2010) reported significantly higher average daily gain in pigs fed a concentrate feed compared to those receiving a mixed diet or locally available feed in their studies.

Feed intake. In this study, we observed variations in biweekly feed intake between Treatment 1 (T_1) and Treatment 2 (T_2) over the weeks, with T_2 consistently consuming more feed than T_1. These findings align with previous research conducted by Giamouri *et al.* (2021); Akdağ *et al.* (2008), where the impact of swill feed versus concentrate feed on pig feed intake was investigated, and no significant differences were noted.

Table 3: Biweekly feed intake in two treatment groups.

Period	Treatment 1		Treatment 2	
	total feed intake by 6 pigs	Feed intake /pig	total feed intake by 6 pigs	Feed intake /pig
Week 9	44.310	7.385	52.310	8.718
Week 11	62.360	10.393	69.640	11.607
Week 13	78.600	13.100	80.610	13.435
Week 15	91.360	15.227	92.310	15.385
Week 17	112.190	18.698	106.590	17.765
Week 19	129.800	21.633	125.800	20.967
Week 21	142.850	23.808	157.370	26.228
Week 23	158.000	26.333	188.040	31.340
Week 25	170.840	28.473	217.510	36.252
Week 27	181.710	30.285	252.130	42.022
Week 29	190.980	31.830	280.200	46.700
Week 31	200.440	33.407	319.950	53.325
Week 33	208.500	34.750	345.920	57.653
Week 35	218.980	36.497	349.320	58.220
Week 37	230.430	38.405	370.045	61.674
Week 39	239.470	39.912	388.050	64.675
Week 41	251.890	41.982	400.350	66.725
Week 43	264.110	44.018	409.740	68.290
Week 45	276.490	46.082	430.870	71.812
Week 47	289.150	48.192	437.340	72.890
Week 49	313.370	52.228	451.840	75.307
Week 51	338.230	56.372	475.030	79.172
Week 53	363.710	60.618	492.250	82.042
Total	4557.770	759.628	6493.215	1082.203

Furthermore, Saikia and Bhar (2010) conducted an experiment demonstrating that pigs fed with food waste had a noticeably lower daily dry matter intake compared to a control group fed a standard ration. However, the food waste-fed pigs showed significantly higher average daily gain, suggesting that the nutritional value of food waste as a pig feed source exceeded that of the concentrate mixture-based diet utilized in the control group.

In contrast, Adebiyi *et al.* (2017) explored the influence of food waste on weaned pig performance and hematological profiles. They found that incorporating food waste into the diet significantly improved feed intake in weaned pigs compared to diets comprising only concentrate. This improvement was attributed to the palatability and nutrient density of the concentrate.

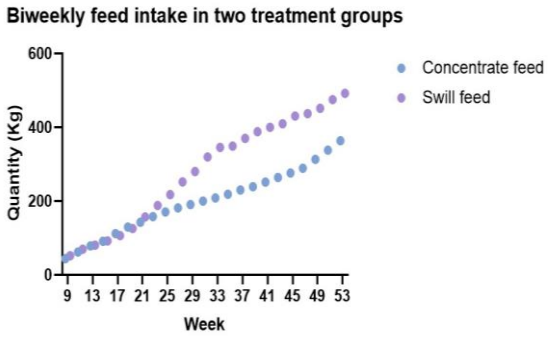


Table 4: Comparison of feed conversion ratio at different weeks between two groups.

Period	T_1	T_2	t-value	P-value
Week 9	6.80 ± 4.55	3.33 ± 0.34	0.760^{ns}	0.481
Week 11	3.49 ± 0.29	6.00 ± 1.02	2.380*	0.039
Week 13	1.24 ± 0.07	1.79 ± 0.12	3.968**	0.003
Week 15	2.39 ± 0.20	2.40 ± 0.25	0.030^{ns}	0.977
Week 17	2.71 ± 0.14	2.88 ± 0.50	0.311^{ns}	0.762
Week 19	3.51 ± 0.37	2.67 ± 0.15	2.118^{ns}	0.060
Week 21	3.52 ± 0.28	4.19 ± 0.52	1.138^{ns}	0.281
Week 23	3.86 ± 0.34	4.13 ± 0.33	0.570^{ns}	0.582
Week 25	4.20 ± 0.24	5.61 ± 0.92	1.491^{ns}	0.167
Week 27	4.46 ± 0.28	6.22 ± 0.32	4.142**	0.002
Week 29	5.36 ± 0.40	7.64 ± 0.78	2.615**	0.033
Week 31	5.77 ± 0.89	7.72 ± 0.79	1.641^{ns}	0.132
Week 33	5.08 ± 0.56	8.63 ± 1.02	3.041*	0.012
Week 35	6.03 ± 0.68	9.48 ± 1.46	2.142^{ns}	0.058
Week 37	8.85 ± 1.15	12.71 ± 1.55	1.998^{ns}	0.074
Week 39	8.51 ± 1.73	10.44 ± 0.73	1.033^{ns}	0.326
Week 41	8.14 ± 1.50	26.09 ± 13.91	1.283^{ns}	0.228
Week 43	8.15 ± 1.64	10.70 ± 1.09	1.299^{ns}	0.223
Week 45	9.39 ± 2.00	13.02 ± 2.81	1.054^{ns}	0.317
Week 47	9.90 ± 2.27	12.32 ± 2.35	0.740^{ns}	0.476
Week 49	18.11 ± 3.15	11.73 ± 1.26	1.877^{ns}	0.105
Week 51	7.40 ± 1.39	13.66 ± 2.74	2.037^{ns}	0.069
Total	5.52 ± 0.24	7.80 ± 0.44	4.574**	0.001

** Significant at 0.01 level (P<0.01); * Significant at 0.05 level (P<0.05); ns non-significant (P>0.05)

Feed conversion ratio. In this study, T_1 and T_2 displayed varying feed efficiency over the observation period, with each group outperforming the other at different times. However, on the whole, T_2 consistently exhibited a significantly higher feed conversion ratio (FCR) compared to T_1, indicating substantial differences in feed efficiency between the two groups.

These findings align with previous research conducted by Ramesh *et al.* (2014), who investigated the impact of different feeding regimes on the growth performance of piglets. Their study revealed that the group exclusively fed a 100% concentrate diet demonstrated superior feed conversion efficiency compared to other groups.

Similarly, Kumar *et al.* (2010) conducted an experiment involving indigenous growing pigs fed different feed types over 135 days. They noted that the group receiving 100% kitchen waste exhibited significantly higher feed conversion efficiency compared to other dietary groups.

Furthermore, a study conducted by Kayastha *et al.* (2013) compared the performance of grower pigs fed various feed types. The group receiving a diet consisting of kitchen waste and supplements demonstrated the highest body weight gain, average daily gain, and the most efficient feed conversion. Conversely, the group exclusively fed kitchen waste exhibited the lowest body weight gain, average daily gain, and the least efficient feed conversion.

CONCLUSIONS

The results of your study indicate that both concentrate and swill feeding systems can yield high-quality pork and lard with comparable results. Specifically, in the concentrate feeding system, 105 kg of lean pork was produced, while in the swill feeding system, 103.64 kg of lean pork was generated. These outcomes were achieved over a period of 373 days. This data suggests that both feeding systems are effective for producing lean pork and lard with comparable results.

FUTURE SCOPE

Future scopes of this study include further analysis of pork's nutritional composition under different feeding systems, comprehensive assessments of the environmental impact and cost-effectiveness of swill feeding, investigations into health and food safety aspects, initiatives to promote adoption among farmers, and policy recommendations for sustainable agricultural practices.

Acknowledgement. Authors are thankful to Kerala Veterinary and Animal Sciences University and Government of Kerala for the funding provided for the research project.
Conflict of Interest. None.

REFERENCES

Adebiyi, O. A., Dare, A. M., & Bankole, T. O. (2017). Effect of food waste on the performance and haematological profile of weaned pigs. *Journal of Animal Production Research*, *29*(1), 128-135.

Akdağ, F., Elmaz, O., Kutay, C., & Demir, H. (2008). Effect of different diets on growth performance and feed efficiency in early weaned piglets. *Turkish Journal of Veterinary & Animal Sciences*, *32*(1), 7-11.

Basic Animal Husbandry Statistics (2022). Ministry of Fisheries, Animal Husbandry and Dairying, Government of India.

Giamouri, E., Pappas, A. C., Papadomichelakis, G., Tsiplakou, E., Sotirakoglou, K., Markakis, N. & Zervas, G. (2021). The food for feed concept. Performance of broilers fed hotel food residues. *British Poultry Science*, *62*(3), 452-458.

Kayastha, T. B., Dutta, S., Kayastha, R. B., & Deka, R. S. (2013). Performance of grower pigs raised on kitchen waste based ration supplemented with protein sources. *Indian Journal of Animal Nutrition*, *30*(3), 330-333.

Kumar, S., Sinha, A. P., Thakur, S., Singh, R. N., & Singh, S. K. (2010). Growth performance of indigenous pigs reared on kitchen waste. *Animal Nutrition and Feed Technology*, *10*(1), 139-142.

Muthulakshmi, M., Murugan, M., Gopi, H., Ilavarasi, R., & Salomi, G. M. Effect of age on carcass characteristics of 75% LWY pigs under different feeding system.

Muthuramalingam, T., Gnanaraj, P., Sivakumar, T., Murallidharan, R., & Murugan, M. (2011). Influence of Heat-treated swill feed on the performance of large white yorkshire pigs. *Indian J. Vet. Anim. Sci*, *7*, 312-314.

Ramesh, V., Kumar, V., Sivakumar, K., Singh, D. P., & Muralidharan, J. (2010). Effect of feeding regimens on the growth and carcass traits of large white yorkshire pigs. *Indian Journal of Field Veterinarians*, *6*(2).

Ramesh, V., Edwin, S. C., & Murugan, M. (2014). Effect of different feeding systems on growth performance and carcass traits of growing and finishing pigs. *Indian Journal of Veterinary Sciences & Biotechnology*, *9*(3), 60-64.

Ranjan, R., Singh, S. K., & Singh, S. S. (2003). Growth performance on different feeding and rearing practices in pigs. *The Indian Journal of Animal Sciences*, *73*(2).

Saikia, P., & Bhar, R. (2010). Influence of Kitchen/food waste on growth performance of grower piglets. *Veterinary World*, *3*(1).

How to cite this article: Vijin V.L., John Abraham, Balusami Chinnappan, Sabin George, Biju Chacko and Namratha Valsalan (2024). Growth Performance of Large White Yorkshire Pigs in Swill and Concentrate Feeding Systems. *Biological Forum – An International Journal*, *16*(3): 04-08.