

Original Research Article

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Dry Vs. Liquid Feeding: Growth Performance, Nutrient Digestibility and Economics in Large White Yorkshire (LWY) Grower-Finisher Pigs

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ABSTRACT

The study made comparative assessment of dry vs. liquid feeding on growth, nutrient digestibility and economics of grower-finisher LWY pigs. Twelve weaned piglets (11.45±2.42 to 11.46±2.37 kg, 42-days of age) were assigned to two treatments - dry feeding (DF) and liquid feeding (LF) for 180 days. The LF was prepared by mixing basal ration with water at 1:2 (w/w) immediately before feeding. No significant difference was observed for feed intake. Body weight gain was statistically insignificant in growing, but was significantly high in LF in finishing period. No significant (P>0.05) difference was observed for nutrient digestibility, but was comparatively better in LF than DF. There was improvement of fortnightly FCR in LF, but without any significant difference. The feed cost/kg body weight gain was significantly (P<0.05) reduced in LF. Considering the parameters studied, it was concluded that feeding of LF might be recommended over dry feeding for grower-finisher LWY pigs.

Keywords

Dry and liquid feeding, Growth, Nutrient digestibility FCR, LWY Pig

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Introduction

Piggery is an important animal husbandry activity supporting livelihood to millions of rural poor farmers, particularly the tribal communities, throughout India. The present shortfall of 0.48 million tonnes of pork or a deficit of 48.38% (DARE report, 2012-13)

signifies the importance of piggery sector towards economic sustainability of the Indian farmers. With the increasing awareness created by the KVKs, State/Central Agricultural Universities through various scientific/vocational training programmes, scientific feeding has replaced the traditional backyard feeding system. In this regard,

however, the main hindrance is the high feeding cost for the soaring prices of feed ingredients day-by-day. This has narrowed down the profit margin as feeding cost represents nearly two-third of the total production cost in piggery (Liao and Nyachoti, 2017). Therefore, enhancing feed efficiency is very crucial for remunerative pig production (Patience, 2015) which necessitates for development of a feeding strategy which will be cost-effective, but can also ensure remunerative profit to the pig farmers.

Traditionally, in intensive rearing, ration/feed and drinking water are provided separately to the pigs in separate feeding and watering troughs. However, in recent decades, feeding of ration/feed in liquid form (i.e. mixing with water at a particular ratio immediately before feeding) is gaining popularity among the pig farmers for manifold advantages. Weaned piglets adapt more easily to a diet having some liquid in the initial post-weaning stage (Choct *et al.*, 2004). Liquid feeding also reduces feed wastage as dust, increases acidity of the diet and availability of phosphorous, improves accessibility to substrates by the digestive enzymes, and reduces viscosity of gut resulting in improvement of the feed efficiency of pigs (Brooks, 1994 and Geary *et al.*, 1996). Therefore, considering the importance of piggery for the livelihood of the rural people, and cost-effective feeding for remunerative pig husbandry, the present study was undertaken for comparative assessment between dry and liquid feeding regimes on growth performance, nutrient digestibility and economics of grower-finisher LWY pigs under intensive system of management.

Materials and Methods

The study was conducted at the Instructional Livestock Farm Complex, College of Veterinary Sciences & Animal Husbandry,

Central Agricultural University, Selesih, Aizawl, Mizoram as per MOU signed between Assam Agricultural University, Jorhat, Assam and Central Agricultural University, Imphal, Manipur. The study was approved by Institutional Animal Ethics Committee (Approval No. 770/ac/CPCSEA/FVSc/AAU/IAEC/17-18/481 dated 09.08.2017).

Total 12 weaned piglets (42-days of age, body weight ranging from 11.45 ± 2.42 to 11.46 ± 2.37 kg) were selected and randomly assigned to two treatments (3 males and 3 females in each groups). Pigs of treatment I (designated as DF) were offered basal ration in dry form and pigs of treatment II (designated as LF) were offered liquid feed i.e. Basal ration mixed with water at 1:2 ratio (w/w) without any bacterial culture immediately before feeding to the pigs. The pigs were housed individually considering each piglet as one replicate. Feeding was done twice daily (morning 8.00 – 9.00 A.M. and evening 2.00 – 3.00 P.M.).

Four basal experimental rations were formulated as per NRC (2012) (Ration for 11-25 kg, 25-50 kg, 50-75 kg and 75-100 kg body weight of pigs). The feeding trial was conducted for 180 days. The records of daily individual feed intake and fortnightly body weight gain were recorded throughout the experiment. Two digestion trials were conducted. The first digestion trial was conducted in the growing period i.e. at the end of 17th week of age and the 2nd one in the finishing period i.e. at the end of 29th week of age. For each of the digestion trial, three animals from each group were randomly selected. Daily individual feed intake and faeces voided by the animals were recorded. A suitable aliquot of faeces was taken for dry matter estimation and was stored in labelled container for further laboratory analysis. A separate aliquot of faeces mixed with sulphuric acid (1:4) was preserved for 3 days

in previously weighed wide - mouth stoppered glass bottles for nitrogen estimation.

The samples feed and faeces were analysed for proximate principles following AOAC (2012), calcium by Talapatra *et al.*, (1940) and phosphorous by AOAC (1975). Analysis of basal feed for fibre fraction was carried out following method of Goring and Van Soest (1970). The data generated was analysed following students' t-test adopting standard statistical procedures of Snedecor and Cochran (1994).

Results and Discussion

The ingredient and nutritional composition of the basal experimental rations are presented in table 1. All the nutrients were as per the recommended levels of NRC (2012) for grower-finisher pigs. The cost of the ration was calculated based on the feed ingredient price during the 2018-2019. As the prices of the feed ingredients were comparatively higher at Aizawl, Mizoram compared to other places of the mainland for the cost involved in transportation due to remoteness and geographical constraints, the cost (Rs./kg) of the rations were calculated to be higher.

The way the feed is delivered has great influence on intakes (Choct *et al.*, 2004) of the post-weaning pigs. Providing a liquid diet is known to produce a regular eating pattern after weaning increasing the dry matter intakes (Russell *et al.*, 1996). The improvement of average daily feed intake and total feed intakes during the growing and finishing period in LF might for feeding of feed and water together also reported by Thacker (1998). This might also be for reduced feed wastage and changes of physical and chemical nature of feed liquid form (Brooks and Tsourgiannis, 2003). In our present study, there was improvement of 2.10% in feed

consumption during growing, 1.10% during the finishing and 1.44% in overall consumption of LF than pigs fed DF. Pedersen and Stein (2010) observed that when feed was offered in liquid form by mixing feed and water at 1:1 ratio stimulated feed consumption in the post weaning period. However, no significant ($P>0.05$) difference was observed in feed consumption during the feeding trial period between the groups.

Sustainable growth indicates efficient utilization of nutrients with better gut health and immunity of the animals. Potential growth is a continuous process and discontinuity of growth can be assumed as the reflection of external influences as the genetic make-up of the animal will be same at all the times. In the present study, total body weight gain in the growing phase was found to be higher in LF, but without any significant difference from DF. However, in the finishing period, body weight gain was significantly ($P<0.05$) higher in LF indicating the positive effect of feeding liquid feed. Improvement in growth rate under the liquid feeding regime might be for improvement in feed intake and digestibility of nutrients in LF compared to DF. This might also be for reduced feed wastage and improvement of accessibility of the substrates to digestive enzymes and reduced viscosity of the gut for feeding of LF (Brooks, 1994 and Geary *et al.*, 1996).

The body weight at the end of 6th fortnight were recorded as 44.08 ± 1.04 and 46.00 ± 2.29 kg and at the end of 12th fortnight were recorded as 91.55 ± 1.55 and 96.53 ± 3.04 kg, respectively in LF and DF indicating a 6.23% improvement in overall body weight gain for feeding of feed in liquid form to the pigs. Kim *et al.*, (2001) also observed 21% higher body weight and 44% greater average daily gain in body weight in pigs fed liquid feed than pigs fed dry pellets (Table 2 and 3).

Table.1 Ingredient (%) and nutritional composition (on DM basis) of experimental ration

Name of Ingredient	Experimental Ration			
	Ration I (11-25 kg)	Ration II (25-50 kg)	Ration III (50-75 kg)	Ration IV (75-100 kg)
Ingredient composition (%)				
Yellow Maize	52.45	59.06	62.00	66.00
Wheat Bran	-	-	6.00	8.00
Soyabean meal	27.00	21.00	15.00	11.00
De-oiled ground nut cake (SE)	8.00	8.00	7.00	5.60
Fish Meal	5.00	5.00	4.00	3.00
L-Lysine	0.50	0.40	0.30	0.30
DL- Methionine	0.05	0.04	-	-
Vegetable oil	4.00	3.50	3.20	3.60
Iodised Salt	0.50	0.50	0.50	0.50
Vitamin-Min premix	2.50	2.50	2.00	2.00
Total	100	100	100	100
Cost (Rs./kg)	40.31	35.45	32.41	30.55
Nutritional composition (% on DM basis)				
Dry matter (%)	89.98	89.23	89.55	89.34
Crude Protein (%)	22.52	19.49	17.26	15.22
Ether Extract (%)	4.84	3.28	3.25	4.67
Crude Fibre (%)	3.42	4.02	4.11	4.53
Total Ash (%)	9.15	8.81	9.49	8.37
Nitrogen Free Extract (%)	60.07	64.40	65.89	67.21
Organic Matter (%)	90.85	91.19	90.51	91.63
Acid Insoluble Ash (%)	0.98	0.85	1.36	1.22
Neutral Detergent Fibre (%)	14.86	15.40	19.36	23.04
Acid Detergent Fibre (%)	4.87	3.45	4.99	4.97
Hemi-cellulose (%)	9.99	11.95	14.37	18.06
Calcium (%)	3.34	3.12	2.96	2.97
Total Phosphorous (%)	0.87	0.75	0.60	0.79
Energy* (Kcal ME/kg)	3332.28	3315.93	3266.00	3272.88
Lysine* (%)	1.37	1.16	0.93	0.81
Methionine* (%)	0.48	0.45	0.37	0.34
* Calculated value.				

Table.2 Growth performance of LWY pigs on dry and liquid feeding

Parameter	Treatment Group		t/p value
	DF	LF	
Growing Phase			
Average daily feed intake (kg)	1.132±0.02	1.156±0.05	0.47/0.65
Total feed intake (kg)	101.87±1.55	104.01±4.25	0.47/0.65
Initial body weight (kg)	11.45±0.97	11.46±0.98	<0.001/0.99
Body weight at 6 th fortnight (kg)	44.08±1.04	46.00±2.29	0.76/0.47
Total body weight gain (kg)	32.63±1.31	34.54±1.40	0.99/0.34
Feed conversion ratio (FCR)	3.16±0.17	3.01±0.07	0.76/0.47
Finishing phase			
Average daily feed intake (kg)	2.266±0.02	2.291±0.08	0.31/0.77
Total feed intake (kg)	203.97±1.72	206.22±7.18	0.31/0.77
Body weight at 7 th fortnight (kg)	51.23±1.18	53.19±2.49	0.71/0.50
Body weight at 12 th fortnight (kg)	91.55±1.15	96.53±3.04	1.53/0.16
Total body weight gain (kg)	47.47 ^a ±0.79	50.53 ^b ±0.81	2.71/0.02*
Feed conversion ratio (FCR)	4.30±0.08	4.08±0.08	1.99/0.08
Overall			
Total feed intake (kg)	305.83±2.16	310.22±11.33	0.38/0.71
Total body weight gain	80.09±0.94	85.08±2.12	2.15/0.06
Feed conversion ratio (FCR)	3.82±0.07	3.64±0.05	2.06/0.07
Feed cost/kg gain (Rs./kg)	128.36 ^a ±2.82	120.43 ^b ±1.67	2.41/0.04*

Means bearing different superscripts (a,b) in a row differs significantly (**P<0.01, *P<0.05)

Table.3 Apparent Nutrient Digestibility of pigs on dry and liquid feeding

Digestibility Co-efficient	Treatment group		t/p-value
	DF	NFLF	
Growing Phase			
Dry matter (DM)	74.77±2.03	75.55±0.91	0.35/0.74
Crude Protein (CP)	78.38±2.51	79.43±1.99	0.33/0.76
Ether extract (EE)	48.60±1.37	51.10±2.59	0.85/0.45
Crude fibre CF)	51.03±1.82	51.63±4.93	0.11/0.92
Nitrogen Free Extract (NFE)	78.02±2.70	80.79±1.59	0.88/0.43
Organic matter (OM)	77.01±1.77	77.52±0.95	0.25/0.81
Finishing Phase			
Dry matter (DM)	81.53±1.69	82.06±1.78	0.22/0.84
Crude Protein (CP)	81.65±1.77	82.06±1.72	0.16/0.88
Ether extract (EE)	50.44±2.26	50.10±1.50	0.12/0.91
Crude fibre CF)	47.50±4.78	46.75±1.44	0.15/0.89
Nitrogen Free Extract (NFE)	86.38±1.24	87.91±1.16	0.89/0.42
Organic matter (OM)	83.21±1.55	84.13±1.53	0.42/0.69

No significant differences ($P>0.05$) were observed for apparent digestibility of nutrients in both the growing and finishing periods. However, positive trends were observed for nutrient digestibility with numerically higher values in LF fed-pigs than the DF fed-pigs both in the growing and finishing periods. This improvement might be for physical changes of the diet for offering feed in liquid form as also reported by Tonheim *et al.*, (2007). Insignificant effect of feeding liquid feed on nutrient digestibility was also reported by Han *et al.*, (2006) in growing crossbred (Landrace X Yorkshire) pigs.

The feed conversion ratio (FCR) calculated as the ratio of total feed consumed (kg) divided by total body weight gain (kg) was found to be comparatively better in LF than the DF. The feed cost per kg gain in body weight was calculated as Rs. 128.36 ± 2.82 and Rs. 120.43 ± 1.67 , respectively for LF and DF indicating significantly ($P<0.05$) reduced feeding cost for feeding feed in liquid form. Jensen and Mikkelsen (1998) also reported 4.4% improvement in weight gain and 6.9% improvement in feed efficiency with the feeding of liquid feed.

From the findings of the study, it was concluded that as improvements were observed in feed consumption, apparent nutrient digestibility, growth rate, FCR and feed cost/kg gain in body weight in LF than the DF, offering feed in liquid form (1:2 w/w) might be advocated instead of conventional dry feeding regime to LWY grower-finisher pigs.

Conflict of interest

There is no any conflict of interest.

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