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Effect of Energy Levels in the Diet of Large White Yorkshire Pigs on Economics of Production

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Abstract—*Experiment was conducted to study the effect of different levels of energy in the diet of Large White Yorkshire pigs on economics of production. Twenty weaned female Large White Yorkshire piglets were randomly divided into two groups and allotted to the two dietary treatments, T1-control ration: as per NRC, 2012 and T2-high energy ration: control ration + 400 kcal/kg of ME and maintained for 70 days. Overall cost per kg feed for the two rations was Rs. 17.13 and 18.74 and the cost of feed per kg body weight gain of pigs maintained on the two dietary treatments was Rs.49.23 and 48.13, respectively. The result of this study revealed that supplementation of animal fat at five per cent over and above the normal energy requirement significantly improved feed conversion efficiency. Cost of feed per kg weight gain is lower in T2 group (high energy diet) compared to control (T1 group: energy as per NRC, 2012). Numerically the cost of feed in T2 group was lower by Rs. 1.10, which comes about Rs. 100.00 per pig more profit to the farmer for rearing pigs from stage of weaning (10 kg) to market weight (100 kg). This study could be concluded that higher energy content in the diet of LWY pigs enhanced growth performance by improving feed conversion efficiency compared to control group leading to increased profit. This is more evident during finisher stage than growing stage and hence higher energy diet is suggested in the finisher stage.*

Keywords*: Energy, Pigs, Cost of production.*

1. INTRODUCTION

Animal husbandry is an important sub-sector of agriculture in India. Piggery directly influences the socio-economic status of the rural poor, more particularly the tribal population of the country as it acts as live insurance coverage for the downtrodden and socially weaker sections of the society. There are tremendous opportunities to use pig as a medium of poverty reduction in our country.

Pork is an important source of high quality animal protein. Mutton, beef, chicken and fish alone cannot meet the animal protein requirements of the growing human population as per the ICMR (2009) recommendations of 10.8 kg meat/year. In this context, the fast growing multiparous pig having high feed conversion efficiency is one of the best choices to fill up the large gap between animal protein requirement and availability in India.

In swine rearing, feed alone accounts more than 75 per cent of cost of production. Maize is major ingredient which provides energy and occupies 30 to 70 per cent in any of the pig ration. Due to variable composition, reducing availability and increasing price of maize, alternative sources of energy have to be considered, for example, the addition of animal fat (8000 kcal/kg of ME) and/or wheat bran (2200 kcal/kg of ME).

Energy is one of the costliest factors in commercial pork production. Indian Council of Agricultural Research (ICAR, 1985) recommended digestible energy (DE) levels of 3100 and 3000 kcal/kg feed for pigs weighing 5 to 10 and 10 to 60 kg, respectively. The National Research Council (NRC, 2012) recommended 3400 kcal of DE or 3265 kcal of ME per kg diet for pigs of all age groups. When pigs were given increasing levels of energy (13.3, 14.0 and 14.7 MJ of DE/kg feed) the average daily gain and gain to feed ratio increased linearly (Kyriazakis and Emmans, 1992; Nam and Aherne, 1994). Significant improvement in feed efficiency was observed in pigs as the energy level was increased from from 14.5 to 16.4 MJ of DE kg in barrows (Campbell, 2005) and from 3.09 to 3.57 Mcal of DE/kg feed (Beaulieu *et al*., 2009).

The availability of findings is scanty and also with high variation prompted to undertake this study to find out effect of different energy levels in the diet of large White Yorkshire pigs on economics of production.

2. MATERIALS AND METHODS

Twenty weaned female Large White Yorkshire piglets were randomly divided into two groups with five replicates in each group. Each replicates were allotted with two piglets and housed in a single pen. All piglets were maintained under identical management conditions throughout the experimental period of 70 days. Restricted feeding was followed by allowing them to consume as much as they could, within a period of one hour and the balance feed was collected and weighed after each feeding. Daily feed intake was recorded. The animals were fed with standard grower ration containing 18 per cent of crude protein (CP) and 3265 kcal of metabolizable energy (ME)/kg of feed up to 50 kg body weight and finisher ration with 16 per cent CP and 3265 kcal of ME /kg of feed from 50 kg body weight as per NRC (2012). The two groups of piglets were randomly allotted to the two dietary treatments, T1-control ration: as per NRC, 2012 and T2- high energy ration: control ration + 400 kcal/kg of ME. Ingredient and chemical composition of pig grower and finisher rations were given in the Table 1and 2.

Weighed quantities of feed were offered twice a day at 9.00 am and 3.00 pm. The feed intake was measured daily after collecting the leftover feed if any and body weight of the individual animals were measured fortnightly in the morning hours before feeding. Cost of production per kg gain was calculated based on body weight gain, total feed intake and feed cost to arrive at the economics of production. The cost of ingredients used for the study was as per the rate contract fixed by the College of Veterinary and Animal Sciences, Mannuthy for the year 2011-2012. Data collected on various parameters were statistically analyzed by Completely Randomized Design (CRD) method and means were compared by Duncan Multiple Range Test (DMRT) using Statistical Package for Social Studies (SPSS, 2008) 17.0.1V software.

3. RESULTS AND DISCUSSION

Data on total feed intake, body weight gain, cost per kg feed and cost of feed per kg body weight gain of pigs maintained on the two dietary treatments are presented in Table 3. The average weight gain, total feed intake and feed conversion efficiency of these pigs during growing stage were 25.49, 27.73 kg; 62.48, 61.43 kg; and 2.45, 2.22, respectively for the two treatments. Cost per kg feed for two grower rations was Rs. Rs. 17.66 and 19.37 and cost of feed per kg body weight gain of pigs maintained on the two dietary treatments was Rs.43.33 and 42.93, respectively during grower the stage. There was no significant difference between these two groups in weight gain, feed cost and cost of feed per kg weight gain, but T2 treatment recorded numerically lower feed intake than that of T1 treatment.

The average weight gain, total feed intake and feed conversion efficiency of these pigs during finisher stage were 28.40, 30.24 kg; 92.50, 87.18 kg; and 3.26, 2.89, respectively for two treatments. Cost per kg feed for two finisher rations was Rs. 16.77 and 18.30, and cost of feed per kg body weight gain of pigs maintained on the two dietary treatments was Rs.54.66 and 52.93, respectively during finisher stage. There was no significant difference between these groups in weight gain. However, high energy group significantly ($P<0.05$) reduced the feed intake in T2 group, thereby reduced the cost of feed per kg weight gain significantly.

The final weight gain, total feed intake and overall feed conversion efficiency for two treatment groups during grower and finisher period were 53.89, 57.97 kg; 154.98, 148.61 kg; and 2.88, 2.57, respectively. Overall cost per kg feed for the two rations was Rs. 17.13 and 18.74 and the cost of feed per kg body weight gain of pigs maintained on the two dietary treatments was Rs.49.23 and 48.13, respectively. The cost of T2 ration was high due to supplementation of animal fat at five per cent over and above the ration. Higher energy in the T2 ration reduced the total feed intake but maintained similar body weight, so could yield better feed conversion efficiency compared to control group. This is in agreement with the findings of Apple *et al.* (2008). Hence cost of feed per kg weight gain is lower in T2 compared to T1 group.

The result of this study revealed that supplementation of animal fat at five per cent level over and above the normal energy requirement significantly improved feed conversion efficiency. This is more evident during finisher stage than growing stage and hence high energy diet is suggested in the finisher stage and up to market age. Cost of feed per kg weight gain is lower in T2 group (high energy diet) compared to control (T1 group: energy as per NRC, 2012). Numerically the cost of feed in T2 group was lower by Rs. 1.10 (Table 3), which comes about Rs. 100.00 per pig more profit to the farmer for rearing pigs from stage of weaning (10 kg) to market weight (100 kg).

4. CONCLUSION

This study could be concluded that higher energy content in the diet of LWY pigs enhanced growth performance by improving feed conversion efficiency compared to control group leading to increased profit. High energy diet yielded Rs.1.10 more profit per kg weight gain. This is more evident during finisher stage than growing stage and hence higher energy diet is suggested in the finisher stage.

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Table 1: Ingredient composition of pig grower and finisher rations, %

Ingredients	Experimental grower rations1		Experimental finisher rations1	
	T1	T2	T1	T2
Yellow maize	35	70	37	74
Wheat bran	31	1.5	34.7	3.6
Soyabean meal	25.5	26.25	19.7	20.5
Animal fat	6.5	5	7	5
Salt	0.5	0.5	0.5	0.5
Dicalcium phosphate	0.4	0.9	0.10	0.65
Calcite	1.1	0.85	1.0	0.75
Total	100	105	100	105
Nicomix AB2D3K 1, g	25	25	25	25
Nicomix BE 2, g	25	25	25	25
Zinc Oxide3, g	13	45	0	30
Oxylock antioxidant 4, g	10	10	10	10
Cost per kg feed5, Rs.		19.37		18.30

1Nicomix A, B2, D3, K (Nicholas Piramal India Ltd, Mumbai) containing Vitamin A- 82,500 IU, Vitamin B2-50 mg, Vitamin D3-12,000 IU and Vitamin K-10 mg per gram.
2Nicomix BE (Nicholas Piramal India Ltd, Mumbai) containing Vitamin B1-4 mg, Vitamin B6-8 mg, Vitamin B12-40 mg, Niacin-60 mg, Calcium pantothenate- 40 mg and Vitamin E-40 mg per gram.
3Zinc oxide (Nice Chemicals Pvt. Ltd., kochi) containing 81.38% of Zn.
4Oxylock antioxidant (Vetline Ltd., Indore) contains Ethoxyquin, Butylated HydroxyToluene (BHT), Chelators and Surfactantant.

Table 2: Chemical composition*of grower and finisher rations

Parameters	Treatments (grower ration)[1]		Treatments (finisher ration)[1]	
	T1	T2	T1	T2
Dry matter, %	90.56±0.11	89.10±0.13	90.41±0.17	89.10±0.06
Crude protein, %	18.18±0.17	17.88±0.17	16.28±0.06	15.76±0.12
Ether extract, %	8.53±0.09	7.75±0.06	9.04±0.11	8.05±0.04
Crude fibre, %	6.58±0.13	3.41±0.07	6.54±0.10	3.52±0.13
Total ash, %	9.50±0.20	5.45±0.24	9.54±0.12	5.23±0.10
NFE, %	57.21±0.21	65.51±0.31	58.60±0.30	67.44±0.12
Acid insoluble ash, %	4.51±0.09	1.05±0.05	4.29±0.13	0.93±0.06
GE, kcal/kg	4134.95 ±14.98	4436.27 ± 10.62	4203.07 ±17.05	4390.61 ±31.34
Calcium, %	0.62±0.006	0.58±0.006	0.65±0.01	0.60±0.007
Phosphorus, %	0.71±0.01	0.64±0.06	0.72±0.02	0.54±0.02
Magnesium, %	0.24±0.009	0.14±0.004	0.25±0.01	0.13±0.01
Manganese, ppm	39.14±1.76	15.92±0.25	38.76±0.96	15.91±0.01
Copper, ppm	9.34±0.06	6.30±0.10	9.17±0.08	6.10±0.20
Zinc, ppm	67.19±2.23	65.56±0.91	64.95±1.47	67.45±2.18

* On DM basis
[1] Mean of four values with SE

Table 3: Cost of production of LWY pigs maintained on the two experimental rations

Parameters	T1	T2
Grower period Total weight gain, kg	25.49 ±0.92	27.73 ±0.82
Total feed intake, kg	62.48 ±2.01	61.43 ±1.88
Cost per kg feed, Rs.	17.66	19.37
Total feed cost, Rs.	1103.36 ±35.46	1189.86 ±36.36
Cost of feed per kg weight gain, Rs.	43.33 ±0.57	42.93 ±0.74
Finisher period Total weight gain, kg	28.40 ±0.29[a]	30.24 ±1.11[b]
Total feed intake, kg	92.50 ±2.50[b]	87.18 ±1.42[a]
Cost per kg feed, Rs.	16.77	18.30
Total feed cost, Rs.	1551.23 ±41.89	1595.40 ±25.96

Cost of feed per kg weight gain, Rs.	54.66 ±1.74[b]	52.93 ±1.24[a]
Overall period Total weight gain, kg	53.89 ±0.85[a]	57.97 ±1.88[b]
Total feed intake, kg	154.98 ±4.42[b]	148.61 ±3.12[a]
Cost per kg feed, Rs.	17.13	18.74
Total feed cost, Rs.	2654.59 ±75.85	2785.25 ±59.07
Cost of feed per kg weight gain, Rs.	49.23 ±0.78[b]	48.13 ±0.80[a]
[1]Mean of 5 observations with SE; a, b- Means with different superscripts within the same row differ significantly (P<0.05).		