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Growth performance of Large White Yorkhsire Pigs under different feeding regimes in hot-humid climatic conditions of South India

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Abstract

Feeding trials were conducted to evaluate the growth performance of Large White Yorkshire Pigs (LWY Pigs) in hot-humid climatic conditions of Kerala, South India, under different feeding regimes. There was no significant (P> 0.05) difference in monthly body weight, body measurement, average daily weight gain and average daily feed intake between pigs fed with farm concentrate and swill feed. However, pigs fed with farm concentrate had significantly (P<0.01) higher dressing percentage, lesser back fat thickness and gut weight, while pigs fed with swill feed had significantly (P<0.01) lesser loin eye area and meat-bone ratio than the other treatment groups. Pigs fed with swill feed with 1% organic minerals attained significantly (P<0.01) higher slaughter weight, hot carcass weight and carcass length. It was concluded that swill feed was found to be equally effective compared to concentrate feed in promoting growth of the fattener pig under field conditions Carcass characteristics and growth promotion can be improved by supplementation of minerals in the swill feed of fattener pigs.

Keywords : carcass traits, concentrate feed, growth, LWY Pigs, mineral supplementation, performance, swill

INTRODUCTION

Pigs are considered to be highly prolific amongst meat producing livestock as they are efficient converters of feed to valuable animal protein with faster growth rate within a short span of six months. However, to produce pigs with higher growth rate, the farmer has to maintain superior genetic group having better adaptability and quality feeding. Pig rearing based on a commercial pig ration with conventional feed ingredients is not profitable considering the present market values of pork, cost of feed ingredients and feed conversion efficiency. So any attempt to reduce the feed cost will be of benefit to farmers. Hence this trial was designed to study the impacts of rearing pigs under different feeding regimes i.e., under different nutritional status and its implications in commercial pig farming.

MATERIALS AND METHODS

The feeding trials to evaluate the growth performance and carcass characteristics of Large White Yorkshire Pigs (LWY Pigs) under different feeding regimes were conducted at the Centre for Pig Production and Research, Mannuthy, Kerala, South India. The nature of climatic conditions in this region is hot-humid. Twenty four weaned piglets (56th day) were selected at random and were allotted to four treatment groups (T1, T2, T3 and T4) comprising six animals in each group with equal sex ratio and with the male piglets castrated. The Piglets belonging to control (T1) group were fed with standard concentrate ration having 18 per cent crude protein up to the age of five months and with 14 per cent crude protein during the rest of the study period (Table 1). The piglets belonging to T2, T3 and T4 groups fed with swill feed. They were supplied to three progressive farmers from neighbouring Panchayats of Thrissur District, Kerala and the animals were fed with left over food from hotels, restaurants, slaughter house waste and waste available from agricultural fields. In addition to this, T3 group was supplemented with inorganic minerals (Ca, P, Mn, Zn, Fe, Cu, Co, Iodine, Sulphur and Fluorine) and T4 group was supplemented with organic minerals (Ca, P, Mn, Zn, Fe, Cu, Co and Iodine) @ one per cent level on dry matter basis throughout the experimental period. Two times feeding was followed every day. Details of the proximate compostion feed of samples and dry mater basis is given in table 1. Management practices prevailing in the farm were followed throughout the experimental period with respect to all the treatment groups. Monthly deworming and spraying for ectoparasite control were practiced. Management system followed was uniform for all the treatment groups except the feeding systems. Data on monthly body weight, linear body measurements, average daily feed intake, and feed efficiency were recorded and carcass traits were assessed at the end of the trials. The data obtained from the study were analysed statistically by following Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

Monthly body weight

The monthly body weights (kg) of LWY Pigs under different feeding systems revealed that upto the 4th month there was no significant difference (P>0.05) in the monthly body weights between the four treatment groups

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Table 1. Proximate composition (%) of feed samples on dry matter basis

Proximate principle	Farm ration		Field ration		
	Grower	Finisher	Chicken waste	Hotel waste	Vegetable waste
Moisture	9.79	9.62	70.10	80.34	73.57
Crude protein	17.90	14.15	24.13	9.81	10.10
Crude fibre	7.11	11.21	7.81	6.95	9.41
Ether extract	6.05	4.13	35.40	19.58	18.52
Total ash	10.91	10.13	7.01	6.75	6.05
N.F.E	58.03	60.38	25.65	56.91	55.92
Acid insoluble ash	5.49	5.31	2.41	0.51	1.05

Table 2. Body weight (kg) of LWY Pigs, ($\overline{X} \pm S.D.$) in different months of growth under different feeding regimes. See text for explanations of the feeding regimes T1, T2, T3 and T4

Age (Month)	Feeding Regimes			
	T1	T2	T3	T4
2	$10.10^{a} \pm 0.34$	$10.22^{a} \pm 0.33$	$10.00^{a} \pm 0.34$	$10.10^{a} \pm 0.37$
3	$14.50^{a} \pm 0.42$	$14.67^{a} \pm 0.40$	$14.50^{a} \pm 0.45$	$14.91^{a} \pm 0.40$
4	$23.62^{a} \pm 0.54$	$23.88^{a} \pm 0.52$	$24.23^{a} \pm 0.55$	$25.81^{a} \pm 0.47$
5	$34.10^{a} \pm 0.65$	$34.60^{a} \pm 0.61$	$36.02^{ab} \pm 0.66$	$38.60^{b} \pm 0.53$
6	$46.13^{a} \pm 0.73$	$46.67^{a} \pm 0.69$	$49.90^{ab} \pm 0.76$	$53.31^{c} \pm 0.64$
7	$60.50^{a} \pm 0.79$	$61.25^{a} \pm 0.75$	$65.25^{b} \pm 0.76$	$69.43^{c} \pm 0.71$
8	$74.02^{a} \pm 0.86$	$74.87^{a} \pm 0.82$	$79.55^{b} \pm 0.78$	$84.20^{c} \pm 0.77$
9	$87.12^{a} \pm 0.92$	$88.00^{a} \pm 0.91$	$93.05^{b} \pm 0.85$	$98.70^{c} \pm 0.80$
10	$99.77^{a} \pm 1.01$	$100.95^{a} \pm 1.06$	$106.28^{b} \pm 0.97$	$112.55^{c} \pm 0.89$

Mean values bearing different superscript in a row differ significantly ($P < 0.01$) (Duncan's Multiple Range Test)

Table 3. Body length (cm) of LWY Pigs ($\overline{X} \pm S.D.$) in different months of growth under different feeding regimes. See text for explanation of the feeding regimes T1, T2, T3 and T4

Age (Month)	Feeding Regimes			
	T1	T2	T3	T4
2	$40.55^{a} \pm 0.22$	$41.30^{a} \pm 0.25$	$40.23^{a} \pm 0.29$	$40.85^{a} \pm 0.24$
3	$45.80^{a} \pm 0.26$	$47.00^{a} \pm 0.33$	$46.28^{a} \pm 0.31$	$47.45^{a} \pm 0.27$
4	$51.85^{a} \pm 0.35$	$53.20^{a} \pm 0.40$	$52.95^{a} \pm 0.37$	$55.15^{b} \pm 0.31$
5	$58.17^{a} \pm 0.41$	$60.20^{a} \pm 0.48$	$60.43^{a} \pm 0.43$	$63.25^{c} \pm 0.39$
6	$64.40^{a} \pm 0.47$	$65.00^{a} \pm 0.53$	$67.40^{b} \pm 0.48$	$70.23^{c} \pm 0.45$
7	$70.45^{a} \pm 0.53$	$71.22^{a} \pm 0.60$	$73.95^{b} \pm 0.55$	$76.90^{c} \pm 0.50$
8	$75.60^{a} \pm 0.62$	$76.90^{a} \pm 0.67$	$79.77^{b} \pm 0.61$	$83.17^{c} \pm 0.57$
9	$80.32^{a} \pm 0.70$	$80.97^{a} \pm 0.76$	$85.05^{b} \pm 0.69$	$88.35^{c} \pm 0.62$
10	$84.27^{a} \pm 0.79$	$85.15^{a} \pm 0.84$	$89.32^{b} \pm 0.77$	$93.12^{c} \pm 0.69$

Mean values bearing different superscript in a row differ significantly ($P < 0.01$) (Duncan's Multiple Range Test)

(Table 2). From the 5th month onwards the minerals supplemented groups (T3 and T4) attained significantly higher body weights than T1 and T2 groups. There was a linear increase in body weight from 2nd month to ten months of age in all treatment groups indicating that the feeding system adopted in different treatment groups has not affected the standard growth pattern in pigs (Kannan, 1995).

At the end of the tenth month, there was no significant difference in the body weight between the pigs reared with concentrate feeding (T1) and with swill feeding (T2). This indicated that swill feed was equally effective in promoting growth of the pigs. Similar findings were reported by Gustafson and Stern (2003) also. On the contrary Anil (2005) reported a significantly higher body weight in pigs maintained in the field with swill feed when compared to concentrate feed fed group in the farm.

The piglets fed with swill feed supplemented with minerals (T3 and T4) attained significantly (P<0.01) higher body weights than the other treatment groups, T2 and T1. The organic mineral supplemented group (T4) attained significantly (P<0.01) higher body weight than all the other treatment groups. Importance of the bioavailability of minerals for various metabolic process in the growth performance of pigs have been brought out earlier by Sekar *et al*. (2006), as well.

Linear body measurements

There was no significant difference (P > 0.05) in the body measurements of LWY Pigs between the treatment groups upto the 3rd month (Tables 3, 4 and 5). From the 4th month onwards minerals supplemented groups (T3 and T4) began to show significant differences (P<0.05) in body measurements. There was no significant difference (P >0.05) in body length, girth and height of pigs between T1 and T2 groups. Swill feed supplemented with minerals attained significantly (P<0.01) higher body measurements than concentrate (T1) and swill feed (T2) fed groups. Organic mineral supplemented group (T4) attained significantly (P<0.01) higher body measurements than all the other treatment groups. This higher body measurements in T3 and T4 pigs might be attributed to the significantly (P<0.01) higher body weight in pigs fed with mineral supplements diet described in the earlier section on monthly body weight.

Average daily gain

The average daily weight gains (g) of different treatment groups did not differ significant by (P>0.05) between concentrate (T1) and swill feed (T2) fed groups (Table 6). Similar findings were reported by Gustafson and Stern (2003). However, Anil (2005) found that LWY Pigs in the field had significantly higher (P<0.01) average daily weight gain than LWY Pigs in the farm. Swill feed supplemented with minerals attained significantly (P<0.01) higher average daily gain than T1 and T2 groups. Organic mineral supplemented group (T4) attained significantly (P<0.01) higher average daily gain than all the other treatment groups. Sekar *et al*. (2006) also found the mineral supplements to significantly alter the growth performance of LWY Pigs.

Average daily feed intake

The average daily feed intakes (g) of pigs differed significantly (P<0.05) T1 and T2 (Table 7). Swill feed supplemented with minerals had resulted in significantly (P<0.01) higher average daily feed intake than the other treatment groups. Higher moisture content and palatability of the swill feed might have favoured the higher intake of swill feed. This is in agreement with the findings of Adesehinwa and Ogunmodede (2004). However, contrary results were reported by Anil (2005) and Anton (2005) in crossbred pigs and Kannan (2006) in Large White Yorkshire pigs.

Feed efficiency

Feed efficiency of LWY Pigs differed a significant (P<0.01) between the feed concentrate (T1) and swill feeding (T2, T3 and T4) groups (Table 8). Through there was no significant difference (P>0.05) between swill feed supplemented with minerals and without supplementation, there was a trend for better feed efficiency in animals supplemented with organic minerals. This is in accordance with Adesehinwa and Ogunmodede (2004). However, Large White Yorkshire and their crossbreds (75 % Large White Yorkshire x 25 % Desi) had a significantly higher (P<0.01) feed conversion efficiency in the field fed with swill than the animals fed on concentrate feed in the farm (Anil, 2005).

Carcass characteristics

Slaughter weight and carcass length did not differ significantly (P>0.05) between the treatment groups T1 and T2 (Tables 9). This is in agreement with report of Anil (2005) who found that carcass length did not vary significantly between concentrate and swill feeding in LWY Pigs. Experimental groups fed with swill feed supplemented with minerals (T3 and T4) attained higher slaughter weight than concentrate feed fed groups. Since the swill had better palatability over concentrate feed the pigs might have fed more and thereby contributing to the higher slaughter weight (Anil, 2005). However, Kannan (2006) did not observe such a difference.

Pigs fed with concentrate feed had significantly (P<0.01) higher hot carcass weight, dressing percentage and loin eye area, meat-bone ratio and lesser back fat thickness and gut weight than those fed with swill feed. This is in agreement with the reports of Sinha *et al*. (1993) with regard to back fat thickness and Harikumar (2001) who observed that pigs fed on concentrate ration attained a

Table 4. Body girth (cm) of LWY Pigs ($\overline{X} \pm S.D.$) in different months of growth under different feeding regimes. See text for explanation of the feeding regimes T1, T2, T3 and T4

Age (Month)	Feeding regimes			
	T1	T2	T3	T4
2	$44.85^{a} \pm 0.31$	$45.25^{a} \pm 0.33$	$44.65^{a} \pm 0.34$	$45.20^{a} \pm 0.30$
3	$52.90^{a} \pm 0.35$	$53.50^{a} \pm 0.37$	$52.75^{a} \pm 0.36$	$53.75^{a} \pm 0.32$
4	$60.98^{a} \pm 0.40$	$61.75^{a} \pm 0.41$	$62.55^{a} \pm 0.39$	$64.35^{b} \pm 0.37$
5	$70.15^{a} \pm 0.46$	$71.45^{a} \pm 0.49$	$72.40^{a} \pm 0.44$	$74.90^{b} \pm 0.41$
6	$77.50^{a} \pm 0.53$	$78.10^{a} \pm 0.56$	$80.43^{b} \pm 0.49$	$83.45^{c} \pm 0.45$
7	$84.60^{a} \pm 0.58$	$85.70^{a} \pm 0.63$	$88.20^{b} \pm 0.55$	$91.63^{c} \pm 0.47$
8	$90.87^{a} \pm 0.64$	$91.25^{a} \pm 0.71$	$95.10^{b} \pm 0.61$	$98.80^{c} \pm 0.53$
9	$95.70^{a} \pm 0.75$	$96.43^{a} \pm 0.79$	$100.45^{b} \pm 0.68$	$104.60^{c} \pm 0.60$
10	$99.95^{a} \pm 0.86$	$100.32^{a} \pm 0.83$	$105.60^{b} \pm 0.73$	$110.00^{c} \pm 0.64$

Mean values bearing different superscript in a row differ significantly ($P< 0.01$) (Duncan's Multiple Range Test)

Table 5. Height (cm) of LWY Pigs ($\overline{X} \pm S.D.$) in different months of growth under different feeding regimes. See text for explanation of the feeding regimes T1, T2, T3 and T4

Age (Month)	Feeding regimes			
	T1	T2	T3	T4
2	$27.50^{a} \pm 0.24$	$27.95^{a} \pm 0.22$	$27.40^{a} \pm 0.24$	$27.65^{a} \pm 0.23$
3	$31.65^{a} \pm 0.28$	$32.30^{a} \pm 0.25$	$31.85^{a} \pm 0.27$	$32.60^{a} \pm 0.26$
4	$36.65^{a} \pm 0.35$	$37.50^{a} \pm 0.32$	$37.63^{a} \pm 0.29$	$38.60^{b} \pm 0.30$
5	$43.16^{a} \pm 0.41$	$43.45^{a} \pm 0.39$	$44.02^{a} \pm 0.34$	$46.32^{b} \pm 0.33$
6	$50.20^{a} \pm 0.46$	$51.00^{a} \pm 0.43$	$50.80^{b} \pm 0.38$	$53.40^{c} \pm 0.36$
7	$56.20^{a} \pm 0.50$	$57.17^{a} \pm 0.47$	$58.05^{b} \pm 0.45$	$60.08^{c} \pm 0.39$
8	$60.75^{a} \pm 0.56$	$61.20^{a} \pm 0.52$	$62.50^{b} \pm 0.49$	$64.18^{c} \pm 0.45$
9	$63.90^{a} \pm 0.63$	$64.70^{a} \pm 0.57$	$66.30^{b} \pm 0.52$	$68.13^{c} \pm 0.47$
10	$66.30^{a} \pm 0.69$	$66.65^{a} \pm 0.66$	$69.70^{b} \pm 0.57$	$71.63^{c} \pm 0.51$

Mean values bearing different superscript in a row differ significantly ($P< 0.01$) (Duncan's Multiple Range Test)

Table 6. Average daily weight (g) gain of LWY Pigs ($\overline{X} \pm S.D.$) in different months of growth under different feeding regimes. See text for explanation of the feeding regimes T1, T2, T3 and T4

Age (Month)	Feeding regimes			
	T1	T2	T3	T4
3	$146.67^{a} \pm 9.56$	$148.33^{a} \pm 7.57$	$150.00^{b} \pm 8.96$	$160.33^{c} \pm 9.53$
4	$303.89^{a} \pm 13.90$	$307.22^{a} \pm 8.37$	$324.45^{b} \pm 10.38$	$363.33^{c} \pm 12.27$
5	$349.44^{a} \pm 15.02$	$357.22^{a} \pm 14.68$	$392.78^{b} \pm 14.15$	$426.33^{c} \pm 15.26$
6	$401.11^{a} \pm 14.92$	$402.22^{a} \pm 13.07$	$462.78^{b} \pm 13.30$	$490.33^{c} \pm 14.61$
7	$478.89^{a} \pm 13.85$	$486.11^{a} \pm 17.97$	$511.67^{b} \pm 17.45$	$537.45^{c} \pm 15.17$
8	$452.22^{a} \pm 11.04$	$453.89^{a} \pm 12.46$	$476.67^{b} \pm 13.33$	$492.22^{c} \pm 14.09$
9	$436.67^{a} \pm 8.42$	$437.78^{a} \pm 11.65$	$450.00^{b} \pm 15.05$	$483.33^{c} \pm 15.81$
10	$421.67^{a} \pm 10.56$	$431.67^{a} \pm 11.07$	$441.11^{b} \pm 13.09$	$461.67^{c} \pm 16.19$
Mean ± *S.E.*	$371.63^{a} \pm 14.34$	$378.06^{a} \pm 15.40$	$401.18^{b} \pm 16.11$	$426.87^{c} \pm 15.24$

Mean values bearing different superscript in a row differ significantly ($P< 0.01$) (Duncan's Multiple Range Test)

Table 7. Daily feed intake (g) of LWY Pigs ($\overline{X} \pm S.D.$) in different months of growth under different feeding regimes. See text for explanation of the feeding regimes T1, T2, T3 and T4

Age (Month)	Feeding regimes			
	T1	T2	T3	T4
3	469.36[a] ± 18.50	516.23[b] ± 19.52	513.01[b] ± 18.18	545.13c ± 19.34
4	1036.25[a] ± 21.25	1121.36[b] ± 22.39	1168.00[b] ± 20.88	1315.26[c] ± 22.16
5	1244.03[a] ±25.07	1346.13[b] ± 25.46	1488.62[c] ± 23.69	1590.23[d] ± 20.52
6	1476.10[a] ± 28.65	1637.04[b] ± 30.42	1855.73[c] ± 25.31	1912.13[d] ± 26.85
7	1819.62[a] ± 32.73	2114.58[b] ± 31.31	2205.27[c] ± 29.22	2300.26[d] ± 29.21
8	1921.94[a] ± 26.94	2178.67[b] ± 33.78	2259.41[c] ± 31.18	2313.44[d] ± 25.63
9	1943.17[a] ± 27.48	2342.11[b] ± 30.28	2389.49[c] ± 29.91	2368.33[d] ± 27.38
10	1981.83[a] ± 29.63	2447.56[b] ± 28.77	2492.27[c] ± 30.95	2446.83[d] ± 28.09
Mean ± *S.E.*	1486.55[a] ± 29.10	1712.96[b] ± 30.14	1796.48[c] ± 31.45	1848.95[d] ± 31.73

Mean values bearing different superscript in a row differ significantly (P< 0.01) (Duncan's Multiple Range Test)

Table 8. Feed efficiency[a] of LWY Pigs ($\overline{X} \pm S.D.$) in different months of growth under different feeding regimes. See text for explanation of the feeding regimes T1, T2, T3 and T4

Age (Month)	Feeding regimes			
	T1	T2	T3	T4
3	3.20[a] ± 0.09	3.48[b] ± 0.09	3.42[b] ± 0.09	3.40[b] ± 0.07
4	3.41[a] ± 0.10	3.65[b] ± 0.09	3.60[b] ± 0.10	3.62[b] ± 0.10
5	3.56[a] ± 0.11	3.84[b] ± 0.12	3.79[b] ± 0.14	3.73[b] ± 0.14
6	3.68[a] ± 0.11	4.07[b] ± 0.13	4.01[b] ± 0.14	3.90[b] ± 0.11
7	3.80[a] ± 0.14	4.35[b] ± 0.14	4.31[b] ± 0.15	4.28[b] ± 0.13
8	4.25[a] ± 0.11	4.80[b] ± 0.12	4.74[b] ± 0.13	4.70[b] ± 0.14
9	4.45[a] ± 0.13	5.35[b] ± 0.11	5.31[b] ± 0.11	4.90[b] ± 0.11
10	4.70[a] ± 0.12	5.67[b] ± 0.16	5.65[b] ± 0.17	5.30[b] ± 0.14
Mean ± *S.E.*	3.88[a] ± 0.11	4.40[b] ± 0.12	4.35[b] ± 0.13	4.23[b] ± 0.12

Mean values bearing different superscript in a row differ significantly (*P*< 0.01) (Duncan's Multiple Range Test)
[a]Feeding efficiency = Feed intake / weight gain

Table 9. Carcass characteristics of LWY Pigs under different feeding regimes. See text for explanation of the feeding regimes T1, T2, T3 and T4

Parameters	Feeding regimes			
	T1	T2	T3	T4
Slaughter weight (kg)	97.90[a]	98.85[a]	104.72[b]	111.20[c]
Hot carcass weight (kg)	73.60[b]	70.90[a]	75.80[c]	80.10[d]
Dressing percentage	75.18[b]	71.72[a]	72.38[a]	72.03[a]
Carcass length (cm)	73.15[a]	73.86[a]	78.25[b]	83.10[c]
Back fat thickness (mm)	32.90[a]	37.80[b]	38.35[b]	39.30[b]
Loin eye area (cm^2)	21.64[b]	18.80[a]	21.90[b]	22.10[b]
Meat-bone ratio	4.20[b]	3.91[a]	4.42[b]	4.50[b]
Gut weight (kg)	8.10[a]	10.90[b]	11.70[b]	12.05[b]

Mean values bearing different superscript in a row differ significantly (*P*< 0.01) (Duncan's Multiple Range Test)

maximum loin eye area and minimum back fat thickness. However contrasting results were shown with regard to dressing percentage (Sinha *et al*., 1993; Chen *et al*., 1997; Harikumar, 2001) and back fat thickness (Sarma *et al*., 1996; Jha *et al*., 1999).

Among the swill feed fed groups (T2, T3 and T4) there was no significant difference in gut weight, back fat thickness and dressing percentage. This is in agreement with the findings of Kannan (2006) who observed that there was no significant difference between treatments under different forms of swill feeding in LWY Pigs. However meat-bone ratio and loin eye area was improved in mineral supplemented groups as the addition of minerals might have enhanced the metabolic process in the system by virtue of their bioavailability.

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