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Comparative Study on Performance of Young Pigs Fed with Diet Containing Skimmed Milk and Milk Replacer during Pre and Post Weaning Periods

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ABSTRACT

Background: Pig rearing is the main income source for many unemployed people in India, particularly for the people in the north-east part of the country. It was found that the morbidity as well as mortality of young pigs immediately after weaning is high due to weaning stresses, mainly due to diet changes causing them to suffer from severe diarrhoea. For these reasons, providing creep feed along with dairy products during the period of pre-weaning and post-weaning is recommended. The majority of the farmers used skimmed milk powder which is commonly available in the market places, but since it is expensive, it may diminish the return for small-scale farmers.

Methods: Present study was conducted to compare the growth performance of Large White Yorkshire young pigs (LWY) fed with diet containing skimmed milk and milk replacer during the pre and post weaning periods *i.e*., from 0 to 56 days of age. Parameters recorded were body weight in kilogram (kg), average daily gain (ADG) in gram (g), average daily feed intake (ADFI) in gram (g), feed conversion ratio (FCR) and cost of feed/kg gain (`/kg).

Result: Statistical analysis of all the parameters revealed non-significant (P≥0.05) differences between the three groups during pre-weaning, post-weaning and overall periods. It may be concluded that skimmed milk powder (SMP) can be replaced by milk replacer powder (MRP) in the diet of weaned pigs without any clinical complications.

Key words: Growth performance, LWY pig, Milk replacer powder, Skimmed milk powder.

INTRODUCTION

Piglets are subjected to rapid and simultaneous stresses during weaning, which can result in low and variable feed consumption, sub-optimal weight gain, diarrhoea episodes and increased morbidity and mortality (Pluske *et al*., 1997). Appropriate creep feeding during the pre and post-weaning periods, in addition to maintaining optimum hygiene and a microclimatic environment, helps the piglet's adjustment to early weaning stress. Milk's inclusion in creep and weaner diets aids acceptance and palatability by providing a familiar smell, taste and digestibility. Young pigs who have not been exposed to creep feeding are challenged with novel nutrients (mostly of vegetable origin) that are difficult to digest with the available milk-oriented enzymes at the time of weaning. Therefore, it is advisable to offer young pigs a post weaning diet based on milk-derived products like whey, skim milk and lactose. Depending on the usage of other animal protein sources like fish meal and synthetic amino acids in the diet and the stages of growth, the amount of dairy-based products in the diets of piglets ranges from 20% to 40% (Mavromichalis, 2006). Due to the higher price of skimmed milk powder, pig farmers are either not adding or adding at a lower quantity.

Commercial milk replacer powder for feeding calf has accessible in Indian market at lower prices. Keeping in view of the above mentioned facts, the present study was conducted to compare the growth performance of young pigs fed with diet containing skimmed milk and milk replacer during pre and post-weaning periods.

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MATERIALS AND METHODS

Location and period of the study

The experiment was conducted in the Livestock Farm Complex, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram, India. The present study was conducted for a period of four months *i.e*., January, 2021 to April, 2021. For the present study, 129 numbers of Large White Yorkshire

young pigs from 12 litters having at least 6 young pigs/litter were selected. All the young pigs were identified individually just after birth and their body weights were recoded. Considering the litter size and litter weight at birth, parity number and sire number, all the twelve litters were subdivided into three homogenous groups (Control-C, T1- Treatment 1 and T2- Treatment 2). Young pigs of all the experimental groups were weaned at 28 days of age. After weaning, young pigs from the litter (without mixing of different litters) were shifted to weaner pens and reared till the end of the experiment, *i.e*., day 56 of age. The feeding trial was conducted for a period of 42 days. Young pigs under Control (C), treatment 1 (T1) and treatment 2 (T2) groups were fed starter ration containing 30% SMP, 15% SMP + 15% MRP and 30% MRP during 3rd to 5th week of age respectively, Grower-I ration containing 15% SMP, 7.5% SMP + 7.5% MRP, 15% MRP respectively during 6th and 7th week of age and Grower-II ration without milk-based ingredients were fed on 8th week. Parameters recorded were body weight in kilogram (kg), average daily gain (ADG) in gram (g), average daily feed intake (ADFI) in gram (g), feed conversion ratio (FCR) and cost of feed/kg gain (`/kg). All the experimental animals were fed with standard rations prepared as per NRC (2012) specification using conventional feed ingredients. The data collected from the study was statistically analysed with appropriate design (Snedecor and Cochran, 2004).

Parameters recorded

Body weight (BW) of young pigs

The body weight (kg) of all the young pigs in the experiment was taken in the morning prior to feeding with the use of an electronic platform weighing balance (30 kg capacity) on day 0, 7, 14, 21, 28, 35, 42, 49 and 56 of age.

Average daily gain (ADG) of young pigs

The average daily gains (ADG in gram) of young pigs were estimated by subtracting the initial body weight from the final body weight for the particular period using the formula given below:

$$R = \frac{W_2 - W_1}{T_2 - T_1} \times 1000 \text{ g}$$

Where,
R= Average daily gain (ADG) (in gram).
W_1= Initial body weight in kilogram.
W_2= Final body weight in kilogram.
T_1 = Initial age in day.
T_2= Final age in day.

Average daily feed intake (ADFI) of young pigs

The daily feed offered (morning and evening) and the residual feed left over the next morning were recorded. The dry matter (DM) content of the feed given and residual feed were estimated at regular intervals using a hot air oven. The daily DM intake were calculated after making corrections to the DM of feed offered and the DM of residual feed left.

Feed conversion ratio (FCR) of young pigs

The FCR of young pigs was estimated by dividing the feed consumed (kg) by body weight gain (kg) over the particular time period using the formula:

$$FCR = \frac{\text{Feed consumed (kg)}}{\text{Body weight gain (kg)}}$$

Cost of feed/kg gain (`/kg) of young pigs

Cost of feed consumed by the young pigs during the research was recorded. Considering the body weight, costs of feed per kg weight gain were calculated. Calculation of feed cost per kg gain was estimated after the completion of experimental period by using the formula given below:

Feed cost/kg gain =

$$\frac{\text{Total cost of feed consumed during the period}}{\text{Weight gain during the rearing period}}$$

RESULTS AND DISCUSSION

Body weight (BW)

The mean ± SE body weight (kg) of LWY young pigs under C, T1 and T2 groups from day 0 (birth) to day 56 (end of the rearing period) of age has shown in the Table 1. The mean body weight (kg) of LWY young pigs at birth (day 0), day 28 of age (weaning) and at day 56 of age (end of the rearing period) under C, T1 and T2 groups were 1.22±0.05, 1.19±0.04 and 1.23±0.04; 5.99±0.21, 5.13±0.17 and 5.07±0.17 and 11.31±0.40, 10.77±0.34 and 11.25±0.44 respectively. Statistical analysis revealed non-significant differences (P≥0.05) in body weights of young pigs between the three groups under study on the day of birth (day 0), weaning (day 28) and end of the rearing period (day 56). Similar body weights at birth were also reported by Prakash *et al.* (2008) in LWY-Crossbred, Saikia (2017) in LWY pigs and Huting *et al.* (2018) in Large White × Landrace × Hylean pigs. Similar body weights at weaning (day 28) were also reported by Cinq-March *et al.* (1986) in Large Black × Duroc × Landrace × Yorkshire, Chandrahas *et al.* (2008) in Landrace × Indigenous, Kalita (2012) in T and D (Tamworth

Table 1: Mean (±SE) body weight (in kilogram) of LWY young pigs under control and treatment groups.

Age (Days)	Control	Treatment 1	Treatment 2	P-value
0	1.22±0.05	1.19±0.04	1.23±0.04	0.821^{NS}
7	2.39±0.08	2.18±0.07	2.20±0.06	0.091^{NS}
14	3.38±0.12	3.30±0.13	3.28±0.11	0.841^{NS}
21	4.30±0.14	4.26±0.14	4.17±0.16	0.796^{NS}
28	5.99±0.21	5.13±0.17	5.07±0.17	0.865^{NS}
35	7.06±0.14	5.96±0.18	5.71±0.16	0.519^{NS}
42	7.76±0.30	7.37±0.25	7.21±0.26	0.347^{NS}
49	9.18±0.33	8.84±0.29	9.16±0.36	0.724^{NS}
56	11.31±0.40	10.77±0.34	11.25±0.44	0.587^{NS}

(^{NS}) Non-significant (P≥0.05).

× Desi), Jayashree *et al*. (2013) in LWY, Kalita *et al.* (2015) in LWY and Saikia (2017) in LWY. Similar body weights at day 56 of age were also reported by Kalita *et al.* (2015) and Saikia (2017) in LWY.

Differences in body weights at birth, weaning and 56 days of age observed by different researchers with the current findings might be attributed to differences in sow parity, breed, feeding, weaning age and other managemental techniques.

Average daily gain (ADG)

The mean ± SE ADG of LWY young pigs under C. T1 and T2 groups from day 0 (birth) to week 8 (end of the rearing period) of age has shown in the Table 2. The mean ADG (g) during week 1 of age for the young pigs under C group was found to be significantly (P≤0.01) higher than the mean ADG of young pigs under T1 and T2 groups, which might be due to the variations in sow's milk consumption by the young pigs. However, during week 7 of age, the mean ADG of young pigs under the C and T1 groups were significantly lower (P≤0.05) compared to the young pigs reared under T2 group, which might be attributed to higher diarrhoeal incidence in young pigs reared under C and T1 groups. The mean ADG (g) of LWY young pigs under C, T1 and T2 groups during the pre-weaning (week 1 to 4) and post-weaning (week 5 to 8) periods were 141.8±4.9, 139.7±6.0 and 137.0±5.7 and 218.3±10.4, 191.2±13.8 and 213.5±15.8 respectively. Statistical analysis revealed non-significant differences (P≥0.05) in ADG of young pigs between the three groups during the pre-weaning and post-weaning periods. Present findings of pre-weaning ADG are similar with the reports of Chandrahas *et al.* (2008) in Landrace × Indigenous pigs from birth to day 28 of age and Saikia (2017) in LWY pigs weaned on day 28 of age. Similar post-weaning ADG were reported by Cinq-March *et al*. (1986) for pigs fed without whey protein for the period of 28 to 70 days of age and Mahan (1992) for pigs fed with dried whey from 23 to 51 days of age.

Differences in pre-weaning and post-weaning ADGs observed by different researchers with the current findings might be attributed to differences in sow parity, breed, feeding, weaning age and other managemental techniques.

Average daily feed intake (ADFI)

The mean±SE ADFI (g) of LWY young pigs under C, T1 and T2 groups from week 3 to week 8 of age has shown in the Table 3. The mean ADFI (gram) of LWY young pigs under C, T1 and T2 groups during pre-weaning (week 3 to 4) and post-weaning (week 5 to 8) periods were 3.88±1.36, 8.87±6.56 and 3.61±1.97 and 418.49±30.14, 412.75±47.28 and 419.54±25.8 respectively. Statistical analysis revealed non-significant differences (P≥0.05) in pre-weaning and

Table 2: Mean (±SE) average daily gain (ADG in gram) of LWY young pigs under control and treatment groups.

Age (Weeks)	Control	Treatment 1	Treatment 2	P-value
1	166.3±6.4^{b}	137.8±8.5^{a}	137.7±6.8^{a}	0.007**
2	141.2±9.8	159.9±9.9	155.2±10.4	0.395^{NS}
3	132.2±7.0	133.9±9.2	126.0±13.2	0.850^{NS}
4	127.5±7.4	124.1±12.7	129.9±12.8	0.936^{NS}
5	113.1±14.8	118.9±15.2	92.3±18.7	0.487^{NS}
6	253.8±18.3	200.4±19.2	212.8±23.8	0.157^{NS}
7	202.9±13.5^{a}	204.0±21.7^{a}	278.8±24.2^{b}	0.011*
8	304.0±17.7	274.2±23.1	297.6±22.0	0.577^{NS}
Pre-weaning Week 1-4)	141.8±4.9	139.7±6.0	137.0±5.7	0.823^{NS}
Post-weaning (Week 5-8)	218.3±10.4	191.2±13.8	213.5±15.8	0.329^{NS}
Overall (Week 1-8)	180.0±6.7	165.2±7.7	173.9±9.1	0.425^{NS}

(**) Highly significant (P≤0.01), (*) significant (P≤0.05) and (^{NS}) Non-significant (P≥0.05).

Note: Means bearing at least one common superscript in each row do not differ significantly.

Table 3: Mean (±SE) average daily feed intake (ADFI in gram) of LWY young pigs under control and treatment groups.

Age (Weeks)	Control	Treatment 1	Treatment 2	P-value
3	1.59±0.67	2.79±1.71	1.18±0.29	0.566^{NS}
4	6.18±2.10	14.95±11.43	6.03±3.67	0.608^{NS}
5	162.54±22.42	178.66±42.20	115.90±5.16	0.300^{NS}
6	338.9±36.32	335.09±64.73	313.14±29.26	0.914^{NS}
7	523.33±38.45	489.53±61.51	555.04±44.57	0.655^{NS}
8	666.12±41.6	647.71±53.19	694.08±44.31	0.784^{NS}
Pre-weaning (Week 3-4)	3.88±1.36	8.87±6.56	3.61±1.97	0.600^{NS}
Post-weaning (Week 5-8)	418.49±30.14	412.75±47.28	419.54±25.8	0.990^{NS}

(^{NS}) Non-significant (P≥0.05).

Table 4: Mean (±SE) feed conversion ratio (FCR) of LWY young pigs under control and treatment groups.

Age (Weeks)	Control	Treatment 1	Treatment 2	P-value
5	1.57±0.32	3.30±1.94	3.78±2.78	0.711^{NS}
6	1.35±0.11	1.62±0.11	2.37±1.12	0.545^{NS}
7	2.52±0.24	2.48±0.18	1.95±0.14	0.113^{NS}
8	2.19±0.16	2.31±0.17	2.35±0.29	0.861^{NS}
Post-weaning (Week 5-8)	1.99±0.4	2.17±0.05	1.97±0.14	0.291^{NS}

(^{NS}) Non-significant (P≥0.05).

Table 5: Mean (±SE) cost of feed per kg weight gain (` /kg) of LWY young pigs under control and treatment groups.

Parameter	Control	Treatment 1	Treatment 2	P-value
Cost of feed per kg weight gain (`/kg)	` 91.84±4.23^{b}	` 74.76±3.49^{a}	` 66.06±4.16^{a}	0.004**

(**) Highly significant (P≤0.01).

Note: Means bearing at least one common superscript in each row do not differ significantly.

post-weaning ADFI of young pigs between the three groups. Similar pre-weaning ADFI with the present results were also observed by Wattanakul *et al*. (2005) in suckling piglets from day 14 to 28 of age which provided creep feed in commercial creep hoppers. Similar post-weaning ADFI with the present results were also recorded by Mahan (1992) in post-weaning pigs fed with dried whey from 23 to 51 days of age.

Differences in ADFIs during pre-weaning and post-weaning periods observed by different researchers with the current findings might be attributed to differences in sow parity, breed, feeding, weaning age and other managemental techniques.

Feed conversion ratio (FCR)

The mean ± SE FCR of LWY young pigs under control C, T1 and T2 groups from week 5 to 8 of age and post-weaning period (week 5 to 8) has shown in the Table 4. The mean FCR of LWY young pigs under C, T1 and T2 groups during the post-weaning (week 5 to 8) period was found to be 1.99±0.4, 2.17±0.05 and 1.97±0.14 respectively. Statistical analysis revealed non-significant differences (P≥0.05) in post-weaning FCR. Similar post-weaning FCR were reported by Wahlstrom *et al*. (1974) in pigs fed died containing dried skim milk and delactosed whey during the period of 5 weeks post-weaning, Cinq-March *et al.* (1986) in pigs fed without whey protein during 4-10 weeks (weaned at week 4 of age) and Brus *et al*. (2013) in crossbred (Swedish Landrace × Large White) pigs during 23-82 days of age.

Differences in post-weaning FCRs observed by different researchers with the current findings might be attributed to differences in sow parity, breed, feeding, weaning age and other managemental techniques.

Cost of feed/kg weight gain (` /kg) of LWY young pigs

The mean ± SE cost of feed/kg weight gain of LWY young pigs under C, T1 and T2 groups during the period of day 0 (birth) to day 56 of age (end of the rearing period) has presented in the Table 5.

The mean cost of feed (consumed by young pigs) per kg BW gain of LWY young pigs under C, T1 and T2 groups during the period of day 0 (birth) to day 56 of age (end of the rearing period) were ` 91.84±4.23, ` 74.76±3.49 and ` 66.06±4.16 respectively. The statistical analysis revealed highly significant (P≤0.01) increased in the cost of control (C) group compared to the cost of treatment 1 (T1) and treatment 2 (T2) groups. Kalita (2012) recorded similar feed cost (Rs. 60.32 to 87.83) in T and D (Tamworth × Desi) weaner pigs.

In the present study, the higher cost of feed/kg gain in the control (C) group was mainly due to the higher cost of skimmed milk powder involved in the feeding of young pigs of control group.

CONCLUSION

In the present study, the growth performance of LWY young pigs at day 0, day 28 and 56 of age were comparable when diet containing skimmed milk powder and milk replacer powder were fed during pre and post-weaning periods. Considering the cost per kg weight gain, using of milk replacer powder in place of skimmed milk powder in the feeding of young pigs will be economical. Therefore, milk replacer powder can be used as a substitute to skimmed milk powder for feeding of LWY young pigs to minimize the feed cost during pre and post weaning periods.

Conflict of interest

All authors declare that they have no conlfict of interest.

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