



Effect of early and split weaning management on growth performance of Large White Yorkshire pigs

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ABSTRACT

Lactating Large White Yorkshire sows (18) with their litters were selected for the study and were divided into three groups (T₁, T₂, T₃). In T₁ and T₃ groups, piglets were weaned at day 24 and 28. In group T₂, heavier half of the litters were weaned at day 24 and remaining half were weaned at day 28. The piglets were reared up to 70 days of age and their performance was recorded. The result revealed that average body weight (kg) at day 70 and the ADG (g) from 1st to 10th week differed non-significantly among the groups. Nonsignificant difference was observed in pre-weaning, post-weaning and overall ADI among the different weaning groups. FCE from weaning to 10th week was similar among the different weaning groups. In conclusion, the whole litter or split litter weaning at day 24 or 28, had no effect on body weight gain, average daily gain, average daily feed intake and feed conversion efficiency of piglets. The findings may be helpful to develop managemental strategies for early weaning of piglets in Indian farm conditions.

Key words: Early weaning, Large White Yorkshire, Performance, Split weaning

Early weaning is a managemental tool which helps to improve the pig productivity. With the advancement of feed science and health management, it is now possible to wean piglets at an early day (14 to 18 days). On the other hand, piglets have very high potential of growth during the early age of their life (Mavromichalis 2006). From nutritional requirement point of view, the gap between supply and demand of nutrients started as early as 8th day of life (Mavromichalis 2006) in piglets and this gap further widen, when sow milk production started to decline from 3rd and 4th week of age.

Early weaning of piglets and managing them in better health condition with quality feed and housing may provide the opportunity to exploit higher growth potential of young piglets which is presently exploited only up to 50% under standard farming condition (Mavromichalis 2006). In some practical situations like nonuniform piglet sizes in a litter, split weaning helps in increasing the growth of lighter

piglets by removing their heavier counterparts few days before normal weaning (Pluske and Williams 1996, Abraham 2001). Competition among the piglets during sucking period is an important factor influencing their growth and split weaning may be helpful tool to support the smaller piglet's growth and survivable chances (Matte *et al.* 1992).

Because of associated advantages, early weaning of piglets between 10 to 35 days of age by improved feeding, housing and management is well adopted practice in most of the developed countries. In the European Union, weaning at 28 days is by law, except Sweden where weaning is done at 35 days. In Canada, weaning age is 21 days by law and in USA it starts as early as 10 days of age in some farms (Mavromichalis 2006). In Australia, weaning is practiced after 24 days of age. In India, few workers had already been successful in reducing the weaning age of pigs up to 28 days of age (Jayashree *et al.* 2013, Kalita *et al.* 2015) and reported a better performance record than the conventional weaning at 56 days. However no study on early weaning of piglets at 24 days of age or split weaning at 24 and 28 days of age had been reported under Indian condition.

MATERIALS AND METHODS

Experimental animals and design: The study was carried out at the Instructional Livestock Farm Complex, College of Veterinary Science and Animal Husbandry, Mizoram during the year 2016–17. A total of 18 lactating sows (Large White Yorkshire) along with their litter having minimum

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of 7 piglets were selected for the study. All the 18 sows along with their piglets were divided into three groups (T_1 , T_2 and T_3); in a manner that each group was represented by almost similar litter size at birth and of similar parity sows. To randomize sire effect, litters belonging to same sire were distributed in all the three groups. Weaning of piglets was done for T_1 and T_3 groups at day 24 and day 28 respectively. Split weaning was followed for the piglets under group T_2 , where in heavier half of the litters were weaned at day 24 and remaining half were weaned at day 28 of lactation. All the piglets were reared up to day 70 (10 weeks) of age.

Housing: One week before the expected date of farrowing, pregnant sows were shifted to farrowing pen. Lactating sows along with their litter were reared in the individual farrowing pen having creep area with proper brooding facilities. After weaning, piglets were shifted to weaner pen wherein temperature of the weaner pen was maintained with suitable heating device. Piglets of one litter were maintained together from weaning till the end of the experiment period.

Feeding: Balanced rations were prepared for different categories pigs under the study as per NRC (1998) standard, incorporating conventional feed ingredients and skim milk powder, sugar, soybean oil, molasses, feed additives etc. (Table 1). Piglets irrespective of groups were provided

ad lib. pre-starter (2nd to 5th week), starter (6th to 7th week) and grower feed (8th to 10th week).

The dry matter content of the feeds and residues left were estimated at weekly intervals. However, wet residue estimations were carried out immediately using a hot air oven. The daily voluntary feed intake was estimated after making correction for dry matter in feed as well as in residue. Body weight records of the piglets were recorded at weekly interval during the experiment period. Weekly average daily gain and feed conversion ratio were calculated out.

Statistical analysis: The data collected from the study were subjected to statistical analysis using suitable formula for meaningful and accurate comparison and interpretation (Snedecor and Cochran 1994).

RESULTS AND DISCUSSION

Statistical analysis revealed nonsignificant difference for the average body weight (kg) of piglets among the different weaning groups at 10th week (Table 2). However there was significant difference in the body weight at 5th week ($P<0.01$) and 6th week ($P<0.05$) due to the effect of weaning where the piglets suffered from post weaning diarrhoea, stress and post weaning growth check (Gerritsen *et al.* 2008, Sugiharto *et al.* 2014). The body weight of piglets at 10th week of age in the present study were similar to Kalita (2012) in Tamworth $\times$ Desi weaned at day 28; Kalita *et al.* (2015) weaned at 28 days and Ramyasree (2016) weaned at day 28 and split weaned at 28 and 56 days in Large White Yorkshire. The variations in findings might be due to differences in breed and management practices followed therein.

Statistical analysis revealed nonsignificant difference in ADG among the different weaning groups from 1st to 10th week of age and during pre and post weaning periods (Table 3). However, ADG between day 24–28 was significantly ($P<0.01$) different among the three groups and at 5th week ADG was varied significantly ($P<0.01$) in between T_1 and T_2 ; T_1 and T_3 , which might be due to the post weaning growth check as the T_1 group and half of the T_2 group were weaned at day 24 therefore overall ADG in T_1 and T_2 for the period of day 24–28 was less as compared to T_3 . On the other hand, T_3 and other half of the T_2 groups were weaned at day 28 which might be lead to decrease in overall ADG in group T_3 and T_2 at 5th week.

It was observed from the present findings (Table 3) that, the weekly ADG of piglets gradually decreased from third week till weaning in all the weaning groups. Instead, the weekly preweaning ADG should be gradually increased as explained by Mavromichalis (2006). The decreasing trend of ADG in piglets from 3rd week till weaning in the present study might be the reflection of insufficient nutrient uptake, because of either low sow milk production or creep ration intake by the piglets from 3rd week of lactation. Very slow rates of increasing and static or decreasing trend of weekly preweaning ADG were reported by Singh *et al.* (2001) in Landrace (LR), Tamworth (T) and their crosses with

Table 1. Composition of different rations used in the experiment

Ingredient	Pre-starter (2 nd -5 th week)	Starter (6 th -7 th week)	Starter (8 th -10 th week)
Maize	35.6	45.6	56.6
Soybean meal	10	20	20
Ground nut cake	5	8	8
Wheat bran	2	2	2
Fish meal	8	5	5
Skim milk powder	30	10	0
Sugar	1	1	0
Soybean oil	3	3	3
Molasses	2	2	2
DL methionine	0.15	0.15	0.15
L-lysine	0.30	0.30	0.30
Mineral mixture	2	2	2
Additives (ZnO ₄ and Probiotics)	0.65	0.65	0.65
Salt	0.30	0.30	0.30
Total	100	100	100
Cost per kg feed (₹)	100.45/-	63.97/-	43.76/-
Nutrient composition			
DM (%)	89.42	87.84	86.82
Energy(DE) (Kcal/kg)	3368	3349	3362
Crude protein	23.09	21.36	19.02
DCP (%)	20.41	18.15	15.78
Crude fibre (%)	2.53	3.71	3.94
Lysine (%)	1.77	1.43	1.19
Methionine (%)	0.74	0.56	0.47
Ca (%)	1.41	1.15	1.03
P (%)	0.60	0.44	0.37
Ether extract (%)	5.62	6.32	6.72

Table 2. Mean ($\pm$ SE) of body weight (in kg) of LWY piglets under different weaning groups

Age	Body weights of piglets (kg)			
	Weaning groups			F-value
	At day 24 (T ₁)	Split weaning at day 24 and 28 (T ₂)	At day 28 (T ₃)	
Day 0 (At Birth)	1.32 $\pm$ 0.03 (52)	1.33 $\pm$ 0.04 (55)	1.29 $\pm$ 0.02 (58)	0.33 ^{NS}
Day 7 (1 st week)	2.46 $\pm$ 0.05 (48)	2.40 $\pm$ 0.07 (55)	2.46 $\pm$ 0.05 (54)	0.36 ^{NS}
Day 14 (2 nd week)	3.85 $\pm$ 0.10 (48)	3.53 $\pm$ 0.12 (55)	3.67 $\pm$ 0.10 (54)	2.32 ^{NS}
Day 21 (3 rd week)	5.11 $\pm$ 0.16 (48)	4.65 $\pm$ 0.17 (53)	4.69 $\pm$ 0.17 (54)	2.28 ^{NS}
Day 24	5.60 $\pm$ 0.18 (48)	5.07 $\pm$ 0.19 (53)	5.07 $\pm$ 0.18 (54)	2.55 ^{NS}
Day 28 (4 th week)	5.65 $\pm$ 0.18 (48)	5.30 $\pm$ 0.18 (53)	5.57 $\pm$ 0.20 (54)	0.93 ^{NS}
Day 35 (5 th week)	6.61 $\pm$ 0.21 ^a (48)	5.60 $\pm$ 0.18 ^b (51)	5.95 $\pm$ 0.21 ^b (52)	6.28 ^{**}
Day 42 (6 th week)	7.90 $\pm$ 0.24 ^a (47)	6.99 $\pm$ 0.22 ^b (46)	7.18 $\pm$ 0.28 ^b (51)	3.61 [*]
Day 49 (7 th week)	9.56 $\pm$ 0.26 (47)	8.90 $\pm$ 0.28 (46)	8.87 $\pm$ 0.30 (51)	1.88 ^{NS}
Day 56 (8 th week)	11.47 $\pm$ 0.30 (47)	11.07 $\pm$ 0.37 (46)	11.02 $\pm$ 0.33 (51)	0.54 ^{NS}
Day 63 (9 th week)	13.92 $\pm$ 0.35 (47)	13.45 $\pm$ 0.49 (46)	13.47 $\pm$ 0.37 (51)	0.42 ^{NS}
Day 70 (10 th week)	16.70 $\pm$ 0.40 (46)	16.31 $\pm$ 0.60 (46)	16.42 $\pm$ 0.44 (49)	0.17 ^{NS}

*Significant (P<0.05); **Highly significant (P<0.01) and ^{NS}Non-significant. Means bearing at least one common superscript in each row do not differ significantly. Figures in parenthesis indicate the number of piglets.

desi (D); Chandrahas *et al.* (2008) in Landrace $\times$ Indigenous; Jayashree *et al.* (2013) and Kalita *et al.* (2015) in Large White Yorkshire. The weekly post weaning ADG in all the weaning groups were in increasing trend and better post weaning compensatory growth rates were observed in the lately weaned group (T₃). From the trend of ADG from 1st to 10th week under different treatment groups, it was observed that ADG for first week one or two after weaning, were depressed due to weaning stress in all the treatment groups.

The ADFI (g) in the present study during pre-weaning periods in T₁, T₂ and T₃ were 18.83 $\pm$ 2.82, 22.27 $\pm$ 2.81 and 20.69 $\pm$ 3.80 respectively and during post-weaning period in T₁, T₂ and T₃ were 532.95 $\pm$ 50.50, 524.27 $\pm$ 54.46 and 609.75 $\pm$ 51.70 respectively. The data revealed non-

significant difference in pre weaning, post weaning and overall ADFI among the different weaning groups. However there was significant (P<0.05) difference in ADFI at 5th week between T₁ & T₂, and T₁ & T₃, which might be due to post weaning effect (Gerritsen *et al.* 2008) as the half of the T₂ and complete T₃ groups were weaned at 4th week. Similar findings were reported by Bruininx *et al.* (2002) from weaning to day 62 for the piglets with creep feed (eaters) weaned at day 28; Sulabo *et al.* (2010) from day 21–49 weaned at day 21. Lower post weaning ADFI were reported by Bruininx *et al.* (2002) for the piglets without creep feed and with creep feed (non-eaters) from weaning to 62 days, where piglets were weaned at day 28; Ferhan *et al.* (2006) for 1st four weeks of post weaning weaned at day 21 and 28 fed on three types of diet containing soybean

Table 3. Mean ($\pm$ SE) of average daily gain (ADG in g) of LWY piglets under different weaning groups

Age	Average daily gain (g)			
	Weaning groups			F-value
	At day 24 (T ₁)	Split weaning at day 24 and 28 (T ₂)	At day 28 (T ₃)	
1 st (week)	163.87 $\pm$ 04.95	153.25 $\pm$ 06.15	165.64 $\pm$ 05.67	1.44 ^{NS}
2 nd (week)	198.54 $\pm$ 08.45 ^a	160.88 $\pm$ 08.88 ^b	173.33 $\pm$ 09.00 ^b	4.58 [*]
3 rd (week)	179.44 $\pm$ 10.94	158.76 $\pm$ 08.54	145.90 $\pm$ 11.11	2.66 ^{NS}
Day 21–24	163.40 $\pm$ 12.19	138.62 $\pm$ 14.54	127.22 $\pm$ 10.88	2.08 ^{NS}
Day 24–28	11.62 $\pm$ 10.60 ^c	57.59 $\pm$ 20.30 ^b	124.86 $\pm$ 10.11 ^a	15.30 ^{**}
5 th (week)	137.26 $\pm$ 11.75 ^a	57.84 $\pm$ 08.01 ^b	48.41 $\pm$ 08.26 ^b	26.43 ^{**}
6 th (week)	179.64 $\pm$ 11.00	186.62 $\pm$ 09.71	170.28 $\pm$ 14.44	0.47 ^{NS}
7 th (week)	237.14 $\pm$ 07.50 ^b	273.08 $\pm$ 15.61 ^a	242.07 $\pm$ 08.07 ^b	3.16 [*]
8 th (week)	272.89 $\pm$ 14.66	310.34 $\pm$ 15.93	307.37 $\pm$ 11.50	2.18 ^{NS}
9 th (week)	349.82 $\pm$ 11.12	339.78 $\pm$ 21.60	349.52 $\pm$ 11.81	0.14 ^{NS}
10 th (week)	408.42 $\pm$ 17.93	409.44 $\pm$ 20.41	428.80 $\pm$ 14.95	0.43 ^{NS}
Birth to 10 th week	209.27 $\pm$ 32.27	204.20 $\pm$ 34.45	207.58 $\pm$ 33.98	0.01 ^{NS}
Pre-weaning	176.31 $\pm$ 08.29	152.88 $\pm$ 05.02	147.39 $\pm$ 09.80	3.29 ^{NS}
Post weaning	228.11 $\pm$ 50.45	233.52 $\pm$ 52.04	257.74 $\pm$ 55.35	0.09 ^{NS}

*Significant (P<0.05), **Highly significant (P<0.01) and ^{NS}Non-significant. Means bearing at least one common superscript in each row do not differ significantly.

meal, sunflower meal and food waste. Higher post weaning ADFI than the present study were reported by Morrison *et al.* (2008) from weaning to day 68 with simple and complex creep feed weaned at day 22 and 29; Kalita (2012) in T&D from weaning to 13th week weaned at 4th, 5th, 6th and 8th week; Montsho *et al.* (2016) from weaning to day 70 weaned at day 21, 28, and 35; Collins *et al.* (2017) from weaning to day 68 with high complexity and low complexity diet weaned at day 27±3.

Overall feed conversion efficiency (FCE) of piglets from weaning to 10th weeks in T₁, T₂ and T₃ were 2.09±0.11, 2.02±0.17 and 2.37±0.14 respectively and statistical analysis revealed non-significant difference among the different weaning groups. The feed conversion efficiency values in T₂ during 1st four days of post weaning was negative, which might be due to body weight loss of the weaned piglets as only heavier half of the piglets were weaned at day 24 in T₂ group. The data revealed that the feed conversion efficiency values were in decreasing trend in the first one to two weeks post-weaning, and thereafter it got progressively increased with the advancement of age in all the weaning groups. Similar trends of FCE were also noticed by Fraser *et al.* (1994); Kalita (2012); Jayashree *et al.* (2013) and Kalita *et al.* (2015). That might be due to the weaning stress leading to poor growth after weaning. With the advancement of age, the water content in the body of animal decreases, which might leads to increase the requirement of feed per kg body weight gain (Whittemore, 1998).

Hence, from the present study, it can be inferred that whole litter or split litter weaning at day 24 or 28, had no effect on body weight gain, average daily gain (ADG), average daily feed intake (ADFI) and feed conversion efficiency (FCE) of piglets upto 10th week of age.

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