EFFECT OF THREE INDIGENOUS PIG BREEDS AND CREEP FEEDING ON PRE-WEANING LITTER PERFORMANCE

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ABSTRACT

*The aim of this study was to determine the litter performance of three indigenous pig breeds in Lesotho based on birth weight and weaning weight. Twenty-seven suckling pigs weighing (0.90 – 1.30 kg) were assigned to three treatments of three levels of feeds. The experiment was designed as a randomised 3*3 factorial of three breeds and three dietary treatments of Makhulo feeds. Three piglets from each breed received the experimental diet (Makhulo commercial feeds) of 200g/day, 100g/day and 0g/day (control) for a period of six weeks. Mean birth weight was 1.13, 0.97 and 1.23kg for Breed 1 (black with smooth coat), Breed 2 (black with rough coat) and Breed 3 (black and white) and were significantly different (P<0.05). The mean weight at weaning (11.62, 7.85 and 10.72kg) was significantly different among the three breeds. The average weaning weight was 11.74, 10.13, and 8.32kg for the 200g/day, 100g/day and 0g/day, respectively. The GLM procedure was used for analyzing the dataset.*

INTRODUCTION:

Pigs and chickens, raised in intensive farming systems, are becoming more important in developing countries with high annual growth rates, while stock levels have fallen slightly in the industrialized countries (Pig Progress, 2001). The rise in demand for pork has resulted in a rapid intensification of pig farming in Lesotho. According to the BOS (1999/2000), there was an increase in pig production of approximately 42% for the last eight years due to few cases of theft in pigs as compared to other types of livestock. However, there is still high pre-weaning mortality rate of 18% (BOS, 1995). There are many factors contributing to mortality in piglets and they include, among others: poor nutrition, low temperatures, poor health conditions and poor mothering ability (English et al., 1988). It was observed that most of the farmers keeping pigs in Lesotho do not practise creep feeding and that leads to decreased weaning weights.

Livestock research in Lesotho has over the years focused mainly on cattle, poultry and wool and mohair production. As the indigenous pig breeds account for 92% of the total population of pigs in Lesotho (LASIP, 1997), it is necessary to investigate the appropriate indigenous pig breeds in Lesotho and the correct way of feeding since the indigenous pigs have already acclimatized to the conditions of Lesotho. The demand in pork products in Lesotho has shown an almost linear increase in recent years (LASIP 1997). The need to improve the indigenous pig breeds cannot be over emphasized.

Milk production from the sow does not meet the requirement of the litter until weaning, and results in low weaning weight. At three weeks of lactation, milk production of the sow starts to decline while nutrient demand keeps increasing, therefore creep feed must take care of the gap or deficit.

The purposes of the study were:

To determine the physical phenotypic differences of the pigs; and

to determine the potential of indigenous pigs and the effect of creep feeding under Lesotho conditions.

MATERIALS AND METHODS

Nine sows of approximately the same age (9 months) and weight (52-75kg) were randomly selected in rural areas of Butha-Buthe district. The animals were selected based upon the physical characteristics of the pigs as shown in Table 1. The characteristics were taken or observed when the animals were at rest. The general linear model (GLM) procedure (SPSS10.00) was used to establish the means and the standard errors for the traits of the three different breeds.

Table1: Selection Characteristics

Trait	Description
Skin colour	Visual observation (Black, white, pink)
Coat Description	Visual observation (Rough, smooth)
Face profile	Visual observation (Concave, straight, convex)
Ear orientation	Visual observation (Drooping, Erect)
Ear size:	
Length (cm)	Measured from base using a ruler
Width (cm)	Measured laterally across the ear at the widest point.
Snout size (cm)	Measured using a ruler
Tusks	Visual observation (Present, Absent)
Body frame:	
Length (cm)	Measured from the base of the tail to the neck using a ruler.
Depth (cm)	Measured laterally across the body using a ruler
Weight (kg)	Measured using a balanced scale
Back profile	Visual observation (Concave, straight)
Leg size (cm)	Measured using a ruler from the body to the hoof.
Tail length (cm)	*Measured using the ruler from the body*
Teat number	*Numerically counted*

Twenty-seven piglets were randomly selected from the 9 sows of three indigenous pig breeds. The piglets were all weaned at six weeks (42 days).

The experimental design that was used is a completely randomized factorial design (Steel and Torrie, 1960). Three treatments (breeds) replicated three times were allotted to three treatments (feed) replicated three times. Thus, there were nine treatments in total.

The animals were fed as a group of three animals in all treatments. The milk intake in suckling pigs was taken by weighing the piglets before suckling and after suckling on weekly basis.

The Makhulo commercial feeds (creep feeds and pig breeder) manufactured by the Lesotho Farm Feed Manufacturers were used. (Table 2). The nutrient composition of the feed was determined by using the proximate analysis.

Table 2: Nutrient composition of experimental feeds

Composition	Creep feeds (%)	Pig Breeder (%)
Crude protein	18	14
Fibre	2	8
Moisture	12	12
Calcium	0.95	0.11
Phosphorus	0.60	0.55
Fat	2.5	2.51

EXPERIMENTAL MODEL

$$Yij=\mu + B_i + C_j + (B*C)_{ij} + E_{ij}$$

Where:

Y_{ij} *= observation for litter performance (weight traits), piglets milk consumption, and mortality.*

μ *= overall mean.*

B_i *=* i^{th} *effect of the pig breed.* $(i=1, 3)$

$C_{j=j}{}^{th}$ *effect of the creep feed.* $(j = 1, 3)$

$(B*C)_{ij}$ *= interaction between the* i^{th} *pig breed and* j^{th} *creep feed.*

E_{ij} *= Error component*

The litter size was used as the covariate in the model in order to correct the weight of suckling piglets up to weaning. The litter size at birth included the piglets born dead (still births).

RESULTS AND DISCUSSION:

The data in table 3 show the characteristics of the three indigenous pig breeds. The characteristics of the three indigenous pig breeds were significantly different ($p<0.05$)

Table 3: Characteristics of Indigenous Pig Breeds

Trait	Breed 1	Breed 2	Breed 3
Coat colour	Black	Black	Black with white patches
Coat Description	Smooth	Rough	Rough
Face profile	Concave	Concave	Concave
Ear orientation:	Drooping	Drooping	Drooping
Ear size:			
Length (cm)	21.33[a]	18.33[a]	16.67[a]
S.E	1.86	0.88	1.33
Range	17.60-25.07	14.60-22.07	12.93-20.40
Width (cm)	13.33[a]	11.67[a]	11.33[a]
S.E	1.20	0.88	1.33
Range	10.51-16.16	8.84-14.49	8.51-14.16
Snout size (cm)	0.83[a]	1.00[a]	0.70[a]
S.E	0.67	0.00	0.10
Range	0.56-1.11	0.73-1.28	0.43-0.98
Body frame:			
Length (cm)	91.61[a]	80.67[b]	100.00[c]
S.E	1.67	0.67	2.89
Range	86.86-96.50	75.86-85.47	95.20-104.80
Depth (cm)	43.33[ab]	35.67[a]	49.33[b]
S.E	3.33	2.96	1.20
Range	36.81-49.86	29.14-42.19	42.81-55.86
Weight (kg)	57.57[ab]	54.00[a]	61.33[a]
S.E	1.45	1.00	1.86
Range	54.05-61.28	50.38-57.62	57.72-64.95
Back profile	Hollow	Straight	Straight
Leg size (cm)	38.33[a]	32.67[b]	47.00[c]
S.E	1.67	1.45	1.73
Range	34.37-42.30	28.70-36.64	43.07-50.978
Tail length (cm)	33.00	32.67	47.00

S.E	1.32	1.45	1.73
Range	29.77-36.23	24.11-30.56	19.11-25.56
Teat number	12.00[a]	10.00[a]	12.00[a]
S.E	0.67	0.67	0.67
Range	12.00-14.00	10.00-12.00	12.00-14.00

[a,b,c] Means within rows with superscripts with different letters are significantly different (p<0.05).

There were significant differences (P<0.05) in sows body length, body weight, leg length, tail length and the teat number between the breeds. The study clearly demonstrated that Breed 2 registered significantly (P<0.05) lower body depth, body weight and teat number than the other two breeds. Breed 3 had significantly (P<0.05) higher body length (100 cm) than breeds 1 and 2 (91.61 and 80.67), respectively.

The results showed that body weight is positively correlated with body length and body depth (0.69 and 0.62), respectively, while the correlation between the body length and depth was 0.79. Breed 1 and 2 although similar in colour, have certain overt phenotypic differences, e.g. on the feel of coat (smooth versus rough for breeds 1 and 2 respectively), shape of the back (hollow versus straight for breeds 1 and 2 respectively).

Breed 3, on the other hand, is different from breeds 1 and 2 in coat colour, and is different from breed 2 in body shape (lean for breed 2 and pot belly for breed 3). These overt phenotypic differences suggest that there could be differences in genes affecting these traits. Should this be the case, these traits could serve as phenotypic markers, however, to ascertain genetic differences, there would be a need to develop pure breeding lines and determine DNA markers.

EFFECT OF BREED ON WEEKLY WEIGHTS.

The results for the influence of breed on weight from birth up to weaning are presented in Table 4. There was significant difference in weights between breeds from farrowing to weaning.

Table 4: Weekly mean weights of different breeds of indigenous pigs from birth to weaning at six weeks

Breed	Birth weight		3 Weeks weight		Weaning weight	
	Mean	S.E	Mean	S.E	Mean	S.E

1	1.11[b]	0.02	4.82[a]	0.09	11.38[a]	0.48
2	1.25[c]	0.03	3.89[b]	0.10	7.91[b]	0.44
3	1.18[a]	0.02	4.22[c]	0.17	10.68[c]	0.65

a,b,c *Means within columns with superscripts with different letters are significantly different (p<0.05)*

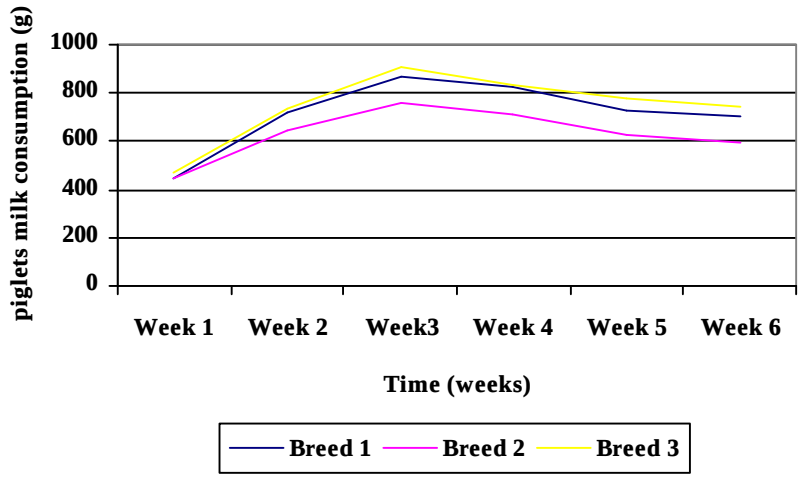
The mean weight of piglets at birth was 1.11, 1.25 and 1.18kg for Breed 1, 2 and 3, respectively, each differing significantly (P<0.001). This observation is in agreement with the findings reported by Kirkwood et al. (1998). At 3 weeks, the suckling piglets weights were 4.80, 3.80 and 4.20kg, for the Breeds 1, 2 and 3 respectively. Breed 1 performed significantly (P<0.01) better than the other two breeds. Breed 2 had the lowest weight up to three weeks post-partum. The weaning weight for Breed 1 was significantly (P<0.01) higher than that of Breeds 2 and 3. These results compare favourably with previous findings that indicated that there are some genetic differences among breeds (Harrel et al., 1993).

This explains that the weight gain differences between the three breeds could be due to some variation in sows body length and depth (Table 3). The significance of treatment indicates that weaning weight is influenced by creep feed intake (Table 7)

EFFECT OF BREED ON SUCKLING PIG MILK CONSUMPTION:

The results for the impact of three indigenous pig breeds on the weekly milk consumption of suckling pigs are summarized in Figure 1. The results show that the indigenous pig breeds consume milk differently from week one up to weaning stage (P<0.05).

Figure 1: Effects of breed on suckling pigs milk consumption up to weaning (g)



The piglet's milk consumption increases from week one up to third week. Breed 2 had the least milk consumption of the three breeds. Breed 3 tended to consume the most milk although it was not significantly (P>0.05) different from Breed 1. In all three breeds, the milk consumption rate reached a maximum between 21 and 28 days after farrowing. The results indicated that the milk consumption at this point was 866.88, 757.50 and 909.58g/day in Breeds 1,2, and 3, respectively and that breed was a significant source of variation in weeks 2,3,4,5 and 6. These findings agree with the results of Turker (1987) and Noblet and Etienne (1987). Turker (1987) further reported that the smaller breeds produce proportionally less milk and the piglets are slower at growing.

Milk consumption decreases as lactation period lengthens from three weeks until weaning age (Koketsu et al., 1997). The findings agree with the results of Auldist et al. (1995). Breed 2 had low milk consumption rate as compared to breeds 1 and 3 (Figure 1). This might explain why the weekly growth rate of Breed 2 was significantly poor.

EFFECT OF BREED ON TOTAL LITTER WEIGHT

Table 5 shows the average total litter weights at birth, three weeks and at weaning age. The results reflect that the weekly live weights increase with age. There are different weights of the pigs depending on the performance of the breed in all three stages.

Table 5: Effect of breed on total litter weight from birth to weaning:

Breed	Week 1		Week 3		Week 6	
	Mean	S.E	Mean	S.E	Mean	S.E
1	5.03[a]	0.06	16.20[a]	1.29	32.40[a]	7.10
2	1.18[a]	0.54	11·03[b]	0.36	22.67[b]	8.08
3	1.17[a]	0.49	17.13[a]	0.23	44.10[c]	1.83

[a,b,c] *Means within columns with superscripts with different letters are significantly different (p<0.05)*

There was no significant effect of breed on birth litter weight. The average litter weights at birth were 5.03, 3.63 and 5.70kg for Breed 1, 2,and 3, respectively. Breed 2 had the lowest number of teats and registered the lowest litter size at birth due to the fact that it had a smaller litter size as compared to Breed 1 and 3. Breed 1 and 3, on the other hand, had higher number (12) of teats and higher litter size at birth. These observations suggest that the number of teats may be related to litter size at birth. If true, teat number could be used in selection for litter size at birth. In the third week, post farrowing, breed had an effect on litter weight (p<0.05). Breed 3 litter weight was significantly (P<0.05) heavier than other two breeds, and Breed 2 seemed to have lowest weights at all stages. Breed 1 and 3 did not differ significantly (P> 0.05) at birth and three weeks.

At weaning, the litter weight was 32.40kg, 22.67kg and 44.10kg ($P<0.05$) for Breeds 1, 2 and 3, respectively. The total litter weight at birth up to weaning was lowest in Breed 2 and highest in Breed 3. The total litter weight corresponds positively to milk consumption because the breed that consumes more milk produces heavier total litter weight (Drum et al., 1998). There is also justification that the birth weights play an important role in weaning weight. Holness (1995) indicated that the piglets with high birth weights would survive better and reach weaning weight within a shorter time. The sows with high body weight resulted in heavier total weaning weights. Therefore, the differences in the litter performance (weight traits) could be due to some sow traits; body length and body depth.

The effect of breed on litter size showed no significant difference ($P>0.5$) though there were differences between the breeds, thus the litter size did not affect the litter performance up to weaning (Table 6).

Table 6: Effect of breed on litter size from birth to weaning:

Breed	At Birth Mean	S.E	At weaning Mean	S.E
1	6.33[a]	1.15	5.00 [a]	0.33
2	5.67[a]	1.33	4.33 [b]	1.49
3	5.00[a]	0.58	5.00 [c]	0.58

[a,b,c] *Means within columns with superscripts with different letters are significantly different (p<0.05)*

EFFECT OF TREATMENT (CREEP FEED) ON WEEKLY WEIGHTS:

The mean weekly weight of the piglets subjected to three different feeding levels are presented in Table 7. The treatments were 200g / d, 100g / d and 0g / d being Treatment 1,2, and 3, respectively.

Table 7: Weekly weights in response to three levels of creep feeding (200g, 100g and 0g)

Treatments	Week 1		Week 3		Week 6	
	Mean	S.E	Mean	S.E	Mean	S.E
1 (200g)	1.12[a]	0.04	4.85 [a]	0.34	11.69[a]	0.66
2 (100g)	1.18[a]	0.03	4.87[ab]	0.35	10.14[b]	0.53
3 (0g)	1.17[a]	0.06	4.44[b]	0.40	8.35[c]	0.53

[a,b,c] *Means within columns with superscripts with different letters are significantly different (p<0.05)*

The weight for the six weeks period tended to be the highest for piglets given 200g feed per day (P<0.01), while the lowest level of feeding had the lowest weekly weight throughout the whole experiment. Similarly, Evans (1985) stated that creep feeding resulted in improved piglet performance prior to weaning. The work of English et al. (1988) also indicated that supplementary creep feed help to attain greatest possible growth rate during the suckling phase. The piglets that were fed more (200g / day) performed better than those in other levels of feeding.

CONCLUSION:

The results of the study showed that the phenotypic differences of the animals play an important role in the performance of the litter in the pre-weaning period. The large difference in the phenotypes and performance weight traits, suggest that there could be distinct breeds. Breed 1 (black with smooth coat) had heavier weaning weights though not significantly heavier than Breed 3 (black and white) while Breed 2 (black with rough coat) performed poorly (P<0.01). The study

further demonstrated that the piglets that were assigned to Treatment 1 (200g/day) gained more ($P<0.05$) weight at weaning than those in the other two treatments (100g/day and 0g/day). Treatment 3 (0g/day) resulted in piglets with lowest average weaning weight.

The study showed a possible relationship between the average milk consumption by the suckling pigs and the weight gains. Breed 1 and 3 were found to consume more milk than Breed 2 though not significant ($P>0.05$) and had a higher total weaning weights (32.40kg and 44.10kg) respectively.

The litter size was the same in the three breeds at birth and at weaning. This suggests that the differences in weaning weights between the breeds could be due to the mothering ability and milk production of the sows represented in the respective breeds.

Considering the litter performance (weight traits) the ranking of the breeds were 1, 3 and 2 respectively however, the ranking changes to 3, 1 and 2 with total litter weight.

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APPENDICES

Appendix 1: Breed 1(Black with smooth coat)

Appendix 2: Breed 3(Black and White)

Appendix 3: Breed 2 (Black with rough coat)