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# Soya Bean Milk: Alternative Milk Source for Nursing Piglets

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## Abstract
*Piglet mortality also known as the death of piglets from time of birth to the Weaning age (8 weeks) and preweaning is the period just before the young animal is weaned. It has been observed that 31% of piglets born alive per litter that die starvation before weaning. , More than 50% of the preweaning losses occur before the end of the second day of life. Lactation failure in sow is a world-wide problem .Insufficient milk production by the sow and consequent malnourishment of the piglets may be directly responsible for between 6 to 17% of all pre-weaning mortality in commercial pig farm and agalactia is considered a primary cause of starvation when more than 3 piglets from a litter die. Soya bean is a tropical Soya bean meal balanced for all amino acids except lysine and methionine and also low in vitamin and minerals especially calcium, carotene, and vitamin D . Soya bean meal and corn make excellent combination for all ages of swine. This study was carried out to know and show the benefit of using soya bean milk as a cheaper alternative for feeding nursing piglets when there is need. Coincidently during this research study eight piglets that were farrowed in the same litter from a sow that died of uterine rupture third day after farrowing were placed on soya bean milk. Two piglets out of the eight in the litter died due to starvation as a result of hypoglycaemia. The remaining six were weaned successfully on soya milk which was added to maize pap and glucose. The piglets did very well on this meal. This means when there are conditions that result into milk scarcity, Soya bean milk can be used as replacer to enhance survival of piglets.*

**Keywords:** Piglets, Soya milk, Nutrition, Growth Weaning

## INTRODUCTION
Historically, meat comprised an important part of human diet and it is still the centerpiece of most diets in developed countries. In the western world like the USA and UK, the most important source of meat are pigs, sheep and cattle while in developing regions of the world such as India, the Middle East and those in Africa, goats and camels are the main meats consumed Kearney,(2010.) Piglet mortality which is synonymously referred to as the death of

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piglets from time of birth to the Weaning age (8 weeks) and preweaning is the period just before the young animal is weaned. This includes the neonatal period and is the period during which most deaths occur (Abutarbush *et. al.*,2007). It is the number of piglets born alive per litter that die before weaning.Preweaning mortality in pigs is caused by scours (14%).starvation (31%),crushing (43%), others (7%)and unknown factors (5%) (McManus, 2011). It ranges from 5-48%, with averages ranging from 12-19%, of all pigs born alive. More than 50% of the preweaning losses occur before the end of the second day of life (Radostits *et. al.,* 2007). Mortality increases as the mean litter size increases and as the mean birth weight of the pig decreases. In most herd environments the minimal viable weight is approximately 1 kg. The mean number of piglets weaned is related to the size of the litter up to an original size of 14 and increases with parity of sows up to their fifth farrowing. Preweaning mortality is negatively correlated with herd size and farrowing crate utilization, and positively correlated with the number of farrowing crates per room (Radostits *et. al.*,2007). Preweaning mortalities often exceed 10% of live-born piglets, and most of these occur during the first week after parturition. The advancement made in modern swine production that has resulted into increase in litter sizes has resulted to the increasing number of piglet losses at birth and during lactation (Boulot *et. al.*, 2008). Surveys of neonatal mortality in piglets have repeatedly indicated that the most important causes of death in piglets from birth to weaning are non-infectious in origin. The major causes are starvation and crushing (75-80%). Congenital abnormalities (5%) and infectious disease (6%). Infectious diseases may be important on certain individual farms but do not account for a major cause of mortality (Radostits*et.al.*,2007).Postmortem examinations have typically identified trauma (usually crushing) and starvation as the two leading causes of piglet deaths (Alonso-Spilsbury *et. al.*,2007). A piglet that is debilitated by being excluded from teat ownership or otherwise failing to establish adequate milk intake is likely to be crushed, but if crushing is prevented the animal may die from malnutrition some time later (Alonso-Spilsbury *et. al.*, 2007).Lactation failure in sow is a world-wide problem .Insufficient milk production by the sow and consequent malnourishment of the piglets may be directly responsible for between 6 to 17% of all pre-weaning mortality in commercial pig farm and agalactia is considered a primary cause of starvation when more than 3 piglets from a litter die (Alonso-Spilsbury *et. al.,* 2007). Parentally piglets receive nutrients via the umbilical cord and glucose is the most important source of energy. The transaction from fetal nutrition to perinatal nutrition is substantial, and colostrum plays a vital role in easing this transaction (Roy *et. al.*,2014).

Soyabean is a tropical legume and soyabeans meal contains 47% crude protein, 5.6% fat. 5.6% fibre, 0.85% calcium, 0.68% phosphorus, 2.42% metabolizable energy, 2.8% lysine, and 1.30% methionine and cystine (Esonu, 2006). Soya bean meal is balanced for all amino acids except lysine and methionine and also low in vitamin and minerals especially calcium, carotene, and vitamin D (Miller, 1991). Soya bean meal and cornmake excellent combination for all ages of swine provided these are mixed in proportions and the mixture must be sublimated with vitamins and minerals (Miller, 1991).

## MATERIALS AND METHODS

### Materials

The materials are newly farrowed piglets, soya bean powder (made from roasted soya bean), glucose powder, grinded maize starch,5ml syringe, feeding bottle, weighing balance (scale balances), thermometer, sterile swabs, agar plates, refrigerator, microscope, glass slides, scissors, scalpel, blade, formalin 10%, alcohol, identification marker, staining reagent, housing, electric lamp and camera.

### Methods

The studies were spread over a period of about 8- weeks .The animals used in survey were a hard of crosses between large white landrace. In the herd under study, seven piglets obtained from a sow that died after farrowing were available for monitoring from birth to 8 weeks. These piglets were raised in a weaning pen with a concrete floor, which was cleaned routinely every day and were then placed on soya milk which has the following component:

One cup (20 cl ) of soya bean powder per 300cl of water.

Two fear level teas spoonful of glucose per one feeding bottle.

The soya bean milk was then fed to the piglet with the aid of 5ml syringe initially until after 4 days it was fed to the piglet ad libitum.

The weight and rectal temperature of each piglet were taken at different ages with the aid of scale balance and clinical thermometer respectively. The rectal temperature of various piglets was recorded regularly.

When the piglets were six days old they were given iron injection (1ml per piglet). Electric lamp was provided to generate heat for the piglets to keep them warm.

The various weights of the piglets and also their rectal temperature were constantly taken from five days until when the piglets were 8weeks (2 month old).

Blood samples were collected for haematology when the piglets were eight weeks old.

## STUDY AREA

The study was carried out in 8 weeks and was conducted at a private farm at Barika- Ibadan near University of Ibadan main campus (in the rain forest of Nigeria) and the laboratory work was done in the Department of Veterinary Medicine Laboratory, University of Ibadan. Ibadan covers an area of 70 square Km and lies on the longitude 7.23° N, 3.5° E (Dada, 2010)

## RESULTS AND DISCUSSION

It was clinically observed that there was vigorous shivering of piglet No 1, 2 and 3 on day 5. One showed signs of convulsion, coma, rapid respiration, general body weakness and died overnight. The average rectal temperature throughout the experiment was 38.7$^{o}$C. One of the piglets developed a swollen lesion around the hock, antibiotics was then given generally. As from 11$^{th}$ to 13$^{th}$ day shivering had highly reduced but the piglets tend to come together in one corner when there was cold (especially in the morning). As from second week (14$^{th}$ day) there was no more shivering (plate 1). Two piglets died before weaning age of six weeks. One of the two piglets died when the sow was still alive and the second piglets died when they were three days old.

As from birth to the first week the weight gain/growth was not as fast as normal piglet. This was probably due to the poor stage of development of the digestive system and also enzyme secretion couple with inability to take in as much volume of soya milk at that time. At this stage the weight gain was 0.04 kg per day.

From the first week to the third week the weight gain was very rapid per day. This was due to the increase in the soya milk in take per day proper development of the digestive system and increase enzyme secretion.

This means there was increase in absorption. This is showed on table 1 and also indicating average 0.07 kg day. From the third day to the first week the daily weight gain was very low (lowest). This means lowest from the third week to the weaning age. This was shown to be 0.02kg / day. It was probably due to the deficiency in sulphur amino acids such as methionine and cysteine, which affected their growth rate at that age. Also at this age there was addition of pap (grinded maize starch). There was different rate of weight gained. The higher the birth weight the more rapid the weight per day.

Result from the farm (at Barika) was compared with those obtained from various farms in the temperate and tropics with litter fed with natural milk(Prasad 2011 A, Prasad 2011 B, and Prasad 2011 C)

**Table 1 : Weight of piglets from five days to eight weeks old**

| Piglet Number | Weight at five days | Weight at 1st week | Weight at 3rd week | Weight at 8th week |
|---|---|---|---|---|
| 1 | 1.3 kg | 1.4 kg | 2.1 kg | 2.6 kg |
| 2 | 1.4 kg | 1.5kg | 2.2 kg | 3.0 kg |
| 3 | 1.4 kg | 1.5 kg | 2.6 kg | 3.7 kg |
| 4 | 1.5 kg | 1.55 k | 2.5 kg | 2.8 kg |
| 5 | 1.55 kg | 1.6 kg | 2.6 kg | 3.7 kg |
| 6 | 1.7 kg | 1.8 kg | 3.2Kg | 4.0 kg |
| Mean Weight | 1.48 | 1.56 | 2.53 | 3.30 |
| | ±0.14 | ±0.14 | ±0.39 | ±0.57 |
| Sum | 8.850 | 9.350 | 15.20 | 19.80 |

The mean birth weight is 1.48kg which increases as the age of the animal increases. (Table 1)
Average weight at five days = 1. 48 kg
Average weight at one week = 1.56 kg
Average weight gain in two days is 1.56 kg - 1. 48 kg = .08 kg
Average weight gain per day is $\frac{0.97}{14}$ =07 kg / day
From the tenth day, they were all very active and drank more soya milk than before (i .e the first week).

They were able to drink up to 6.300cl of soya milk with the aid of feeding bottle. The average weight gain from first week to third week is as follows (table 1).
Average weight at first week = 1.56 kg
Average weight at third week = 2. 53 kg
Average weight gain is 2.53 - 1.56 = 0.97 kg
Average weight gain per day $\frac{0.97}{14}$ = 07 kg / day
Similarly the average weight gain from the third week (21days) to the eight- week (56 days) is a follows
Average weight at third week =2.53 kg
Average weight at eight week = 3.3 kg
Average weight gained = 3.3 - 2. 53 = 0.77 kg
Eight weeks (56 days) minus three weeks = Five weeks (35 days)
Average weight gained per day for 35 days $= \frac{0.77\text{kg}}{35\text{day}}$=0.22 kg / day

**Plate 1: Piglets at 2 weeks of age when they were no more shivering**

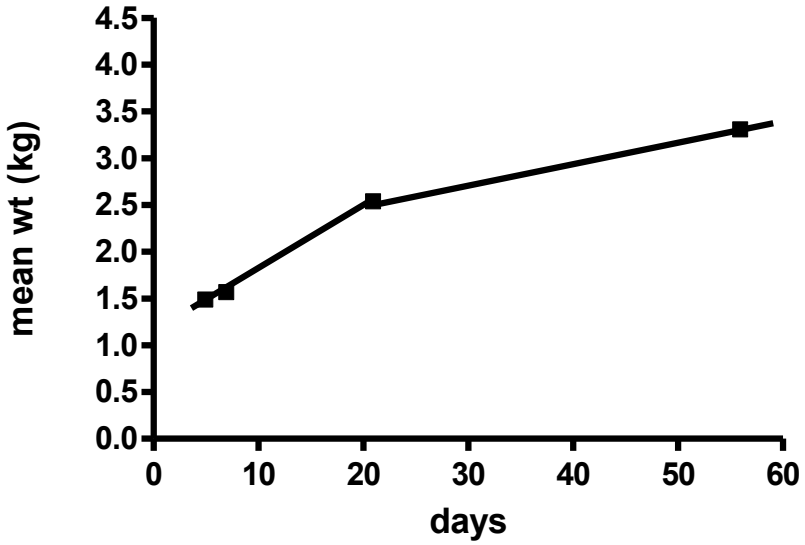


**Figure 1: Showing changes in average body weight according to age in days**

**Table 2: Haematology of the piglets at 8 weeks old**

| Pig no | PCV | HB | RBC | WBC | Lym | Neut | Eos | Mon | Bas |
|---|---|---|---|---|---|---|---|---|---|
| 1 | - | - | - | - | - | - | - | - | - |
| 2 | 32 | 7.6 | 8.3 | 6.5 | 45 | 50 | 3 | 1 | 0 |
| 3 | 25 | 7.3 | 12.1 | 7.34 | 55 | 45 | 0 | 0 | 0 |
| 4 | 45 | 11.0 | 8.95 | 7.56 | 70 | 27 | 1 | 2 | 0 |
| 5 | 42 | 13.3 | 9.0 | 7.10 | 60 | 38 | 1 | 1 | 0 |
| 6 | - | - | - | - | - | - | - | - | - |
| Mean | 35.509.80 ±9.20 | 9.597.1357.50 ±2.87 | ±1.71 +0.46 | 40.00 ±10.41 | 1.25 ±9.97 | 1.00 ±1.26 | 0.0 ±0.82 | 0.0 | |
| Sum | 144.0 | 39.20 | 38.35 | 28.50 | 230.0 | 160.0 | 5.000 | 4.000 | 0.0 |

**The haematology of piglets 1 and 6 could not be carried out because the collected from them got coagulated**

**Table 3: Haemogram of normal swine red cells and white cells cont**

| | Standard value |
|---|---|
| PCV(%) | 32-50 |
| HB(g/dL) | 10.0-16.0 |
| RBC($x10^6$/ul) | 5.0-80 |
| WBC($x10^3$/ul) | 11.0-22.0 |
| Lym | 4.5 – 13.0 |
| Neo | 0 – 0.8 |
| Eos | 0.05 – 2.0 |
| Mon | 0.25 – 2.0 |
| Bas | 0 – 0.4 |

Data obtained from Studdert *et al.,*2012.

Key:
PCV----------Packed cell volume (%) HB----------Haemoglobin (g/dL)
RBC---------- Red blood cell count(x$10^6$/ul) WBC--------- White blood cell count (x$10^3$/ul)
Lym---------- Lymphocyte Eos----------Eosinophils
Neo----------Neutrophils Mon----------Monocyte

**Table 4 Performance of litter compare with value of other sources with litter fed with natural milk**

| Parameter | Present B-Ibadan | Prasad 2011 A | Prasad 2011 B | Prasad 2011 C | Eusebio 1980 |
|---|---|---|---|---|---|
| Mean litter Size- at birth | +8.00 | 7.79 | 8.71 | 9.53 | 11 |
| Mean piglet weight (Kg) at birth | 1.48 | 0.9 | 1.34 | 1.23 | 0.76 |
| Mean piglet weight (Kg) at 56 days | 3.3 | 4.02 | 7.01 | 6.65 | 4.5 |
| Still birth % | - | 7.68 | 7.84 | 3.87 | 9.09 |
| Mortality % | 25 | | | | 40 |
| Average daily gains | 0.04 | 0.073 | 0.108 | 0.102 | 0.067 |

Prasad 2011 A, B and C means indigenous breed called Desi, Middle white Yorkshire and Crossbred respectively
Present B-Ibadan means present Barica –Ibadan farm

Table 4 shows the performance litter compare with reference value. The average litter size of 8.00 in Barika pig in Ibadan was comparable to 7.79%, 8.7, 9.53, and 11.0 for desi middle white yorkshire and crossbred, respectively. The litter size at birth was lower than the mean litter size was a little lower than other units except one. This may be due to the fact that was the first time of farrowing and may be also due to variation in climatic conditions of the studied area, feeding and management practices.

The average mortality of 25% in this study was lower than 40% reported by Eusebio (1980).The average daily gains of 0.04% was higher than 0.073 and 0.067 reported in Prasad 2011 in indigenous Desi breed and Eusebio (1980) but lower 0.108 and 0.102 reported in middle white Yorkshire and its crossbred respectively as reported by Prasad (2011).

Table 1 shows the weight of piglets from five days to eight weeks old. There was a linear increase in the growth trend observed in the study which implies that as the animal increased in age, a linear increased was observed in growth rate, The weight at eight weeks (3.3Kg) was comparable to the report of Prasad (2011). The litter size at 56 days was lower the mean litter size of other units. There was no stillbirth. The mortality was high because of the small litter size since the two lost among eight means 25%.

## CONCLUSION

Based on the studies, it is evident that starvation is one of the major causes of piglet mortality especially when there is death of dam (sow that farrowed) during or after the first few days or week before weaning age. Other similar conditions that result into milk scarcity include abnormally large number of piglet farrowed in the same litter by the same dam, lactation failure, insufficient milk production by the sow, mastitis and agalactia. Soya bean milk can be used as replacer to enhance survival of piglets. Attempt to reduce these significant losses require an effort of nutritional, technical and biological expertise because one pig saved during the first week of life means one more pig is weaned. Few people are aware of alternative to milk when there is no foster dam after the death of sow. The use of soya milk only for the survival of these piglet until weaning age of eight weeks have shown that soya bean milk is a very good and reliable alternative to the milk of dam. Although when compared with other farms where piglets relied on normal milk of the dam, performance is poorer, but it is more economical to use soymilk if the survival of piglet and cost is taken into consideration. The skin conditions of the piglets were normal. The viability of the piglets is alright when there is constant and enough supply of the soymilk ad libitum before the weaning age of eight weeks.

When haematology of the piglets was compared with normal piglets, it shows that the mean of the packed cell volume (PCV) fell within the normal range .The mean of the red blood cells count (RBC) was higher than that of normal piglets. The means of the haemoglobin concentration (HB) and white blood cell count (WBC) were lower than that of normal piglets. The reasons for high RBC may be due dehydration when the blood sample was collected, this means the piglets low water level. Low level of haemoglobin concentration (HB) was due to incomplete haemoglobin of red blood cells before they were release from the bone marrow into circulation but the differences is still acceptable. In other to reduce baby pig mortality during nursing using soya ban milk so as to increase the level of swine productivity, the following recommendation will be of help: We should ensure that the piglets get colostrum the first day of life. Those that cannot get the colostrum from the sow such as in case of agalactia artificial colostrum should be provided. The week piglets either resulting from low birth weight or prolonged parturition should be given glucose saline intraperitoneally .Soymilk is highly recommended as an alternative to normal milk (of the dam) especially when piglet survival and economic aspect is considered. Pig farmers should be informed of a cheap alternative through veterinary extension services about the survival of piglets after the death of the dam and when there is no foster mother.

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