



Farrowing Induction in Swine with Prostaglandin: Effect on Farrowing Traits and Piglet Performance

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ABSTRACT

The variation of gestation length in sows leads to difficulties performing farrowing supervision in commercial farms. The present experiment was done to evaluate the effectiveness of prostaglandin F₂α (PGF₂α) administration on farrowing induction in swine. The sows (n=50) were randomly divided into two groups. In group-1, sows (n=25) were injected with placebo intramuscularly (one mL sterile water) on 113th day of gestation at 8.00 am in the morning. In group-2 (n=25), cloprostenol sodium (250 mcg) was injected intramuscularly on 113th day of gestation at 8.00 am in the morning. The traits recorded in the study were pregnancy duration, farrowing duration, total number of piglets born per litter (NTB), number of piglets born alive per litter (NBA), number of stillborn piglets per litter, mummified foetuses per litter, birth interval (min), number of piglets alive at day 3 of lactation and piglet mortality (%) till day 3 of lactation. Gestation length was significantly (p<0.05) shorter in Group-2 compared to Group-1. Similarly, the interval from PGF₂α administration to onset of farrowing was significantly (p<0.05) shorter as compared to natural farrowed sows. Farrowing duration was not differ significantly (p>0.05) between two groups. There was no effect of PGF₂α administration on NTB, NBA, stillbirths, mummified fetuses. The numbers of alive piglets at day 3 of lactation were also similar between two groups (p>0.05). The PGF₂α administration also resulted in increased in farrowing on 114th day of pregnancy. In conclusion, PGF₂α administration on 113th day of pregnancy could be an option for controlled farrowing in swine without any adverse effects.

Keywords: Sow, Prostaglandin, Farrowing induction, Farrowing traits, Piglet performance.

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INTRODUCTION

In India, most of the pig population (approximately 46%) is present in North Eastern Region (Singh *et al.*, 2020). This is mainly because of the higher consumption of pork in the region. Pork is the most preferred meat by the tribal people of North East India followed by chicken and fish. In NER India, pigs are raised in backyard production system with low inputs and low outputs (Singh and Mollier, 2020; Singh *et al.*, 2022). Also, the pigs are raised mainly for fattening purpose rather than for breeding because of lack of breeding boars, gap in knowledge about breeding management and constraints during farrowing stage. The reproductive efficiency of pig is measured in terms of numbers of weaned piglets produced per sow in a year (Monteiro *et al.*, 2022). In pigs, good management and timely intervention is very important during farrowing stage to reap the full economic benefits.

In recent years, piglet production per sow per year has gone to 30-35 and two farrowing per sow per year is now the standard benchmark mainly because of improvement in genetics, nutrition, reproduction management and health management (Monteiro *et al.*, 2022). Reproduction management include, synchronization of estrus, artificial insemination, farrowing induction and early weaning (Singh and Mollier, 2020; Singh *et al.*, 2022; Monteiro *et al.*, 2022). The pregnancy duration of sow vary from 114 to 117 days in different herds mainly because of genetics, however, individual variation of gestation length among sows ranges from 106 to 125 days. The piglet's mortality is maximum during farrowing stage (ranges from 20 to 50%) and this leads to discouragement among the pig breeder farmers (Monteiro *et al.*, 2022). Therefore, scientific interventions for management during farrowing are critically required particularly in commercial pig farm. Farrowing supervision is a well-known strategy to enhance piglets survival (Bill *et al.*, 2021; Monteiro *et al.*, 2022). The farrowing induction is a strategy and managerial tools which enable supervised farrowing, cross-fostering of piglets and care of new born piglets. This also enhances labour efficiency, record keeping and improve efficacy of post weaning management and feeding. Farrowing induction enables batch weaning and further synchronization of estrus in weaned sows.

In pigs, farrowing induction is done by oral feeding of altrenogest during late gestation and prostaglandin from 113 to 117 days of gestation. The altrenogest is mainly used to prevent early farrowing and is used for 3-7 days during last gestation period. However, there are reports of high still births while using altrenogest for farrowing induction (Boonraungrod *et al.*, 2018; Taechamaeteekul *et*

al., 2022). Another approach of farrowing induction is by administering prostaglandin F_{2α} (PGF_{2α}) or one of its synthetic analogues (De Rensis *et al.*, 2012). However, some studies reported negative effects while inducing farrowing, including reduced birth weight, increased stillbirth percentage, increased dystocia, increased need for medicating piglets during the suckling period (De Rensis *et al.*, 2012; Boonraungrod *et al.*, 2018; Udomchanya *et al.*, 2019; Taechamaeteekul *et al.*, 2022).

The literature is controversial about deleterious effects of farrowing inductions using different hormones. Also, In Indian condition, there is no study available on use of prostaglandin for farrowing induction in swine and its effect on farrowing parameters and piglet survival. Based on the foregoing observations, therefore, the aim of the current experiment was to evaluate the effectiveness of induction protocols with prostaglandins and its effects on farrowing parameters and neonatal performance.

MATERIALS AND METHODS

The experiment was performed at Pig Research Farm, ICAR Research Complex for NEH Region, Nagaland Centre, Medziphema, Nagaland from October to December 2022. The study was approved by institute animal ethics committee. The climate of the region is sub-tropical with hot humid in summer and pleasant weather in winter (Singh *et al.*, 2021). The sows were of crossbred (Gunghroo x Hampshire) genotype. The animals were housed in individual concrete pen (140 ft²) and provided commercial pig breeder feed twice a day. The sows were offered 2.5 kg of breeder commercial feed per day. The sows used in this study were of 2nd to 5th parity and average body weight was 165.18 ± 4.02 kg. The animals were randomly divided into two groups. In group-1, sows (n=25) were injected with placebo (one mL sterile water) on 113th day of gestation at 8.00 am in the morning. In group-2 (n=25), cloprostenol sodium (250 mcg) was injected intramuscularly on 113th day of gestation at 8.00 am in the morning.

In preparation for farrowing, a wooden slated box covered with jute bag and fitted with infrared bulb was provided in each pen for keeping the piglets during initial 10 days of lactation. The farrowing was monitored carefully without much disturbance to the sow. Birth assistance was provided only when an interval of 30 - 60 min had passed from the birth of previous piglet (Boonraungrod *et al.*, 2018). The birth assistance was provided in the form of stimulation of uterine contraction by palpating dorsal wall of vagina (Ferguson reflex) and manual extraction of

the obstructed piglets. The piglets were weighed and teeth cuttings were done on the first day of life.

The traits observed and recorded during the study were pregnancy length (calculated from the date of first insemination to the date of farrowing), farrowing duration (defined as the time interval between the expulsion of the first and last piglets), total number of piglets born per litter (NTB), number of piglets born alive per litter (NBA), number of stillborn piglets per litter and mummified fetuses per litter. The occurrence of birth assistance was also recorded. Piglet parameters recorded during the study were birth interval (min), number of piglets at day 3 of lactation and piglet mortality (%) till day 3 of lactation.

All statistical analyses were performed using SPSS v. 27. The data were tested for normality one by Shapiro-wilk test and non-normal data were square root transformed. Birth assistance and piglet mortality (%) till day 3 of lactation were compared using Pearson's χ^2 test. Independent Student t-test was performed to study the differences between means of two groups. Quantitative variables were summarized as mean \pm standard error of mean (SEM). Differences were considered statistically significant at 95% confidence level ($p < 0.05$).

RESULTS AND DISCUSSION

The present study reports the use of PGF_{2 α} in pig for farrowing induction and its effect on farrowing traits and piglet performance. The effect of PGF_{2 α} on farrowing induction traits and piglets performance is presented in Table 1. There was no difference in the parity of pigs in natural farrowed and treatment sows. Gestation length was significantly ($p < 0.05$) shorter in Group-2 (114.28 days)

compared to Group-1 (115 days). In a previous study, the gestation length of sows treated with PGF_{2 α} was 1.1 days shorter than the control (Taechamaeteekul *et al.*, 2022). Similarly, the interval from PGF_{2 α} administration to onset of farrowing was significantly ($p < 0.05$) shorter (36.16 h) as compared to natural farrowed sows (64.20 h). In agreement with our result, Taechamaeteekul *et al.* (2022) reported 28 h of interval from PGF2 administration to onset of farrowing. Boonraungrod *et al.* (2018) reported that the farrowing induction using PGF2 α alone increased the number of farrowing by 66% during working hours. This effectively enhances supervision of farrowing and veterinary assistance can be provided if needed. Previous studies revealed that only 50–65% of pigs treated with PGF2 α farrowed during the working hours (De Rensis *et al.*, 2002; Cassar *et al.*, 2005; Taechamaeteekul *et al.*, 2022).

Farrowing duration was not significantly ($p > 0.05$) different between two groups. Boonraungrod *et al.* (2018) reported farrowing duration of 294 min after PGF_{2 α} administration and 289 min in natural farrowed sows. The farrowing duration is influenced by factors including age of the sow, breed, management system, parity, gestation length, number of piglets born, housing condition, body condition of the sow and climate (Oliviero *et al.*, 2010). It was earlier reported that sows bearing large litter had longer farrowing duration which tends to negatively influence the sow health and piglet performance. Prolonged farrowing impairs placenta expulsion and can lead to retained placenta in pigs (Björkman *et al.*, 2017). Therefore, control of farrowing is important in commercial pig farms.

There was no effect of PGF_{2 α} administration on NTB, NBA, stillbirths, mummified fetuses. The numbers of alive piglets at day 3 of lactation were also similar between two groups ($p > 0.05$). Stillbirth of 3.6% and 2.18% was recorded

Table 1: Effect of induction of farrowing with PGF_{2 α} on farrowing traits and piglet performance (Mean \pm SEM)

Parameters	Group-1(n=25)	Group-2(n=25)	p-value
Gestation length	115 \pm 0.17 ^a	114.28 \pm 0.09 ^b	0.01
Parity	2.80 \pm 0.20 ^a	2.6 \pm 0.16 ^a	0.05
Onset of farrowing after treatment (h)	64.20 \pm 2.91 ^a	36.16 \pm 1.81 ^b	0.001
Farrowing duration (min)	238.24 \pm 2.90 ^a	235.96 \pm 3.15 ^a	0.590
Total number of piglets born per litter (NTB)	10.96 \pm 0.38 ^a	10.96 \pm 0.40 ^a	1.0
Number of piglets born alive per litter (NBA)	10.40 \pm 0.35 ^a	10.64 \pm 0.35 ^a	0.627
Stillbirths	0.40 \pm 0.11 ^a	0.24 \pm 0.08 ^a	0.319
Mummified	0.16 \pm 0.09 ^a	0.08 \pm 0.05 ^a	0.554
Number of alive piglets at day 3 of lactation	10 \pm 0.30 ^a	10.32 \pm 0.31 ^a	0.475
Piglets mortality up to day 3 of lactation %	3.84 ^a	3.00 ^a	0.596
Birth assistance %	16 (4/25) ^a	20 (5/25) ^a	0.712
Birth interval	22.36 \pm 0.80	21.77 \pm 0.74	0.593

Means with different superscript in a row differ significantly ($P < 0.05$)

in natural farrowed and PGF_{2α} induced sows, respectively. Piglet mortality up to day 3 of lactation was 3.84% in natural farrowed sows and 3.0% in PGF_{2α} administered sow ($p>0.05$). Taechamaeteekul *et al.* (2022) reported similar findings in sows treated with PGF_{2α}. However, contrary to our results, previous studies reported negative effects associated with farrowing induction, including reduced birth weight, increased stillbirth rate, increased dystocia, increased need for medicating piglets during the suckling period (De Rensis *et al.*, 2012; Boonraungrod *et al.*, 2018; Udomchanya *et al.*, 2019; Taechamaeteekul *et al.*, 2022). Farrowing assistance was required in 16% of natural farrowed sows and 20% in PGF_{2α} administered sows ($p>0.05$). Boonraungrod *et al.* (2018) reported 50% incidence of farrowing assistance in PGF_{2α} administered sow which was higher than reported in the present study. There was no difference in the birth interval between the two groups ($p>0.05$). Birth interval of 17 to 20 min was reported by Boonraungrod *et al.* (2018) in sows administered PGF_{2α}.

In the present study, farrowing was better synchronized in PGF_{2α} administered sows as compared to natural farrowed sows. In natural farrowed sows, 32% sows farrowed on 114 days of gestation, 40% farrowed on 115th day of gestation, 24% farrowed on 116th day of gestation and one sow farrowed on day 117th of gestation (Figure 1). However, in PGF_{2α} administered sows, 72% pigs farrowed on 114th day and 28% farrowed on 115th day of gestation (Figure 2). Furthermore, PGF_{2α} administration reduces the number of pigs that farrow after 115 days gestation. Therefore, this protocol has the potential to improve the number of pigs that can farrow within optimal periods of gestation (i.e. between 114 and 116 days). More synchronized farrowing enable effective farrowing supervision (Boonraungrod *et*

al., 2018; Taechamaeteekul *et al.*, 2022). Therefore, PGF_{2α} administration could be an option for controlled farrowing in sow. Gunvaldsen *et al.* (2007) reported that farrowing induction can increase labour efficiency, minimize week-end farrowing and promote all-in/all-out management. Similarly, Nguyen *et al.* (2011) reported that PGF_{2α} administration resulted in 75% farrowing during working hours. As a result, stillbirths were lower for pigs that had induced farrowing than those that were not induced. In agreement with our findings, Kirkden *et al.* (2013) reported that the farrowing induction by PGF_{2α} increased synchronized farrowing, making it more economical and convenient to provide continual veterinary supervision as well as making cross-fostering management easier and more effective. The optimal gestation length may vary according to sows' breed and genotype of piglets (Bumpenkul and Imboonta, 2021). Therefore, normal gestation length in each breed, genotype and herds should be carefully determined before applying controlled farrowing protocol.

CONCLUSIONS

In conclusion, PGF_{2α} administration results in shortening of gestation length by one day compared to natural farrowed sow. The PGF_{2α} administration also resulted in increased in number of farrowing on day 114 of pregnancy. Also, there was no adverse effect of PGF_{2α} administration on piglet survival, birth assistance, birth interval and farrowing duration. PGF_{2α} administration increased the synchrony of farrowing, making it more economical to provide continual supervision as well as making cross-fostering management easier and more effective. Therefore, PGF_{2α} administration on day 113 of gestation could be an

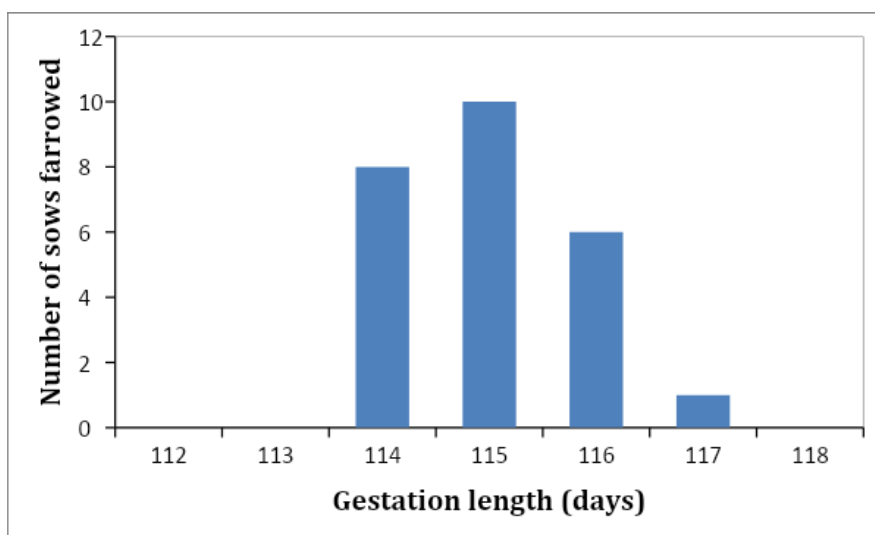


Fig. 1: Distribution of gestation length in sows that farrowed naturally

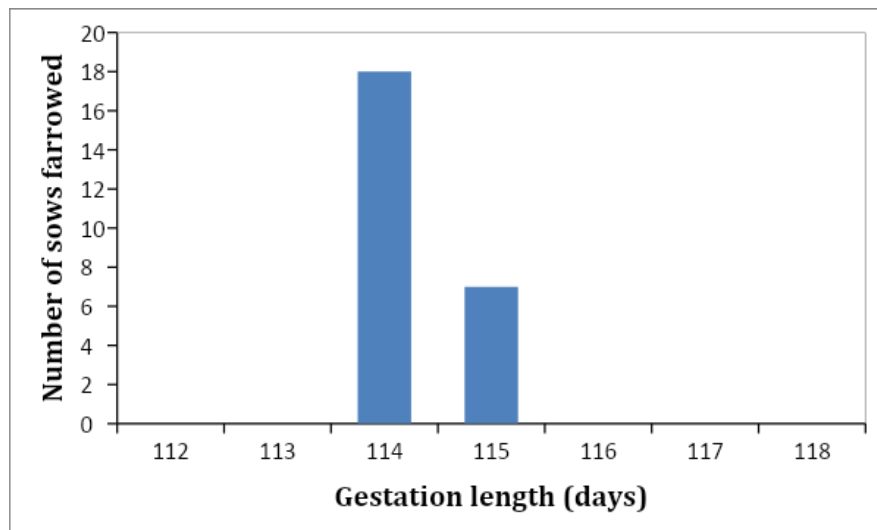


Fig. 2: Distribution of gestation length in sows induced with PGF_{2α} injection on day 113 of gestation

option for controlled farrowing in sow. However, normal gestation length in each breed, genotype and herds should be carefully determined before applying controlled farrowing protocol.

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CONFLICT OF INTEREST

The authors declare no conflict of interest in the conduct of this experiment.

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