ESTROUS AND FERTILITY RESPONSE IN ESTROUS SYNCHRONIZED LWY CROSSBRED PREPUBERTAL GILTS

K. Prabhakar Rao[1], K Veera bramhaiah[2], G Venkata Naidu[3], R V Suresh Kumar[4], D. Rani Prameela[5] and D.Suresh Babu[6]*
Sri Venkateswara Veterinary University
College of Veterinary Science, Tirupati

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Abstract

This study was undertaken to assess estrus and fertility response in LWY Gilts synchronized with Prostaglandin 5 mg, Prostaglandin 7.5 mg, PMSG 400 IU+HCG 200 IU and 5 ml of Normal Saline in LWY crossbred gilts during summer and winter seasons. The mean estrus during winter and summer seasons was 100, 83.33, 83.33 and 66.67 percent and 66.67, 66.67, 66.67 and 50.00 percent, respectively. The difference in the interval between treatment and onset of estrus and the intensity of estrus between seasons and between protocols in each season were significant ($P<0.05$) with the earlier onset of estrus and intensity in gilts synchronized by PMSG 400 IU+HCG 200 IU in both the seasons. The difference in the duration of estrus and litter size between seasons and between protocols in each season were not significant but the duration of estrus was longest in PMSG 400 IU+HCG 200 IU synchronized gilts during winter season and in normal saline synchronized gilts during summer season. While, the intensity of the estrus was highest in PMSG 400 IU+HCG 200 IU and PG 5 mg protocols synchronized gilts in winter season and in PMSG 400 IU+HCG 200 IU protocol during summer season.

Key words: Synchronization of estrus; Estrus response, Season, LWY, Gilts

INTRODUCTION

As per the livestock census (2019), India possesses 9.06 million pigs by representing only 7% of the country's animal protein sources as against 35% of the world's animal protein source. Pig has a great potential to contribute to faster economic return to the farmers, because of certain inherent traits like high fecundity, better-feed conversion efficiency, early maturity and short generation interval. But pig rearing is still unorganized venture with a shortfall of pork in the country (about 0.48 million tonne or a deficit of 48.38%). Present study was undertaken to narrow the gap and double the pork production as per the National Action Plan by scientific pig farming through reproductive technologies.

MATERIALS AND METHODS

A total of 48 (24 winter season and 24 summer season) crossbred gilts were screened for reproductive tract abnormalities by using ultrasound scanner with 5 MHz trans abdominal probe. These gilts in each season were randomly assigned to four equal groups of six gilts namely Prostaglandin 5 mg (Group I), Prostaglandin 7.5 mg (Group II), eCG 400 IU±HCG 200 IU (Group III) and 5 ml of normal saline (Group IV).

During both the seasons, Group I and II gilts were administered with 5 and 7.5 mg of $PGF_{2\alpha}$ (Lutalyse) intramuscularly on day 14 of oestrous cycle, respectively; Group III gilts with 400 IU of PMSG (Folligon) intramuscularly on day 14 of oestrous cycle along with 200 IU of HCG (Chorulon) and Group IV gilts with 5 ml of normal saline intramuscularly on day 14 of oestrous cycle. All the gilts responded to the protocol were bred by natural service.

Among the estrus response parameters, intensity of estrus was measured by using a score card (Ramakrishnan *et al*., 2013) based on behavioural symptoms and physiological changes of gilts. All the inseminated gilts were monitored regularly and those animals which returned to estrus were again bred by natural service. First service, second service and overall conception rates and overall litter size were calculated and the data obtained were analyzed using SPSS 12.0 for windows.

RESULTS AND DISCUSSION

The mean estrus response after synchronization of LWY crossbred gilts with PG 5 mg, PG 7.5 mg, PMSG 400 IU + HCG 200 IU and normal saline was 100 (6/6), 83.33 (6/5), 83.33 (6/4) and 66.67 (6/3) percent, respectively with overall mean estrus response of 83.33 percent during winter season. Same during summer season was 66.67 (6/4), 66.67 (6/4), 66.67 (6/4) and 50.00 (6/3) percent, respectively with overall mean estrus response of 62.50 percent (Table No. 1). The estrus response was higher during winter than summer with the

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*1. Assistant Professor, VGO, CVSc, Garividi; *2. Professor and corresponding author: VGO, CVSc, Tirupati bramhaiahvet@yahoo.com; 3. Dir. of Extension, SVVU, Tirupati; 4. Professor, Sur & Radiology, CVSc, Tirupati; 5. Professor, SLDL, Tirupati and; 6. Professor, LPM, CVSc, Proddatur.*

highest percentage with PG 5 mg protocol during winter and with PG 5.0 mg and 7.5 mg during summer season. The mean intensity of estrus was 2.67 ± 0.21, 2.67 ± 0.21, 2.83 ± 0.17 and 2.67 ± 0.33, respectively with the overall mean of 2.71 ± 0.11 during winter. Same during summer was 2.33 ± 0.21, 2.33 ± 0.21, 2.17 ± 0.17 and 1.83 ± 0.31, respectively with the overall mean of 2.17 ± 0.12 (Table No. 1). The difference in the intensity of estrus between seasons and between groups during each season was significant (P<0.05) but the intensity of the estrus was highest in PMSG 400 IU±HCG 200 IU synchronized gilts during winter but the same was highest in PG 5 mg and PG 7.5 mg groups during summer. It might be due to stimulation of follicular growth leading to higher concentration of oestrogen (Paterson and Martin, 1981) by exogenous gonadotropin (PMSG±HCG) and also decreased estrogen and progesterone ratio leading to enhanced behavioural estrus manifestation (Breen et al. 2006).

All the in LWY crossbred synchronized gilts were bred with selected boar at the specified time as per the protocol. The first service conception rate was 83.33, 83.33, 83.33 and 66.66 percent during winter and the same during summer was 66.66,66.66, 66.66 and 50.00 in LWY crossbred gilts synchronized with PG 5 mg, PG 7.5 mg, PMSG 400 IU±HCG 200 IU and normal saline, respectively indicating higher conception rate during winter but same was least in normal saline administered gilts during both the seasons. While, the second service conception rate was 17.66, 17.66, 17.66 and 33.33 percent, respectively during winter and 33.33, 33.33, 33.33 and 50.00, respectively. The overall first service conception rate was 79.16 and 62.50 percent during winter and summer, respectively. The overall second service conception rate was 20.83 and 37.50 percent during winter and summer, respectively.

In the present study the conception rate in gilts synchronized with prostaglandin is similar to the findings of Guthrie and Polge (1978) who have reported 80 to 85 % of conception rate after synchronization of gilts with prostaglandins. Contrary to the present study findings Konch (2005) noticed 100% conception rate with 5 mg prostaglandins.

While the gilts synchronized with PMSG+HCG had similar observations like Baishya (2005) and Das (2005) who have reported 83.33% of conception rate after synchronization but higher percentage (90%) was noticed by Estienne *et al.* (2001) and Baishnob (2016). The higher conception rates observed with PMSG+HCG might be due to increased follicular development and potentially control the time of ovulation in pigs (without decreasing) or with increasing farrowing rates and litter size by altering under lying physiological mechanism affecting the sensitivity of hypothalamus physiological – ovarian axis to exogenous endocrine responses.

During the seasonal infertility period there will be reduction in farrowing rate (Tummaruk, 2012) with more than 12% pigs detected as pregnant subsequently failing to farrow compared to only a 2% during the rest of the year (Lopes et al., 2013). Main reasons for seasonal infertility during summer might be due to low lactation nutrient intake consequent to elevated temperatures and the longer photoperiods of summer, or both (Prunier et al., 1994) and these would lead to attenuated preovulatory LH surge which in turn show adverse effect on the quality of luteinization of the ovulated follicles (Aherne and Kirkwood, 1985 and Peltoniemi et al., 1997) with a resultant potentially greater sensitivity to environmental inputs. Further, reduced intake during summer would have increased the mobilisation of tissue reserves and circulating leptin concentrations leading to Kiss-1 neurones activation (Smith et al., 2006) for GnRH secretion and controls of reproduction via the consequent LH secretion impacting reproductive functions, including follicle growth and subsequent corpora luteal function.

The mean litter size in LWY crossbred gilts synchronized by PG 5 mg, PG 7.5 mg, PMSG 400 IU±HCG 200 IU and normal saline during winter was 9.50 ± 0.34, 9.00 ± 0.37, 9.50 ± 0.34 and 8.83 ± 0.31, respectively with the overall mean of 9.21 ± 0.17 during winter. While, the same during summer was 8.00 ± 0.58, 8.50 ± 0.62, 10.00 ± 0.58 and 7.83 ± 0.65, respectively with the overall mean of 8.58 ± 0.33. Contrary to the present findings, Noguchi *et al.* (2012) observed more mean litter size (10.0 to 11.4) in gilts synchronized with prostaglandin. While, the litter size in gilts treated with PMSG 400 IU+HCG 200 IU protocol in the present study are akin to the reports of Kadirvel *et al.* (2017) who have reported mean litter size of 9.2 ± 0.3. But the mean litter size of gilts in the present investigation is lower when compared to the observations of Naskar *et al.* (2012); Estienne and Crawford (2014); Kadirvel *et al.* (2014) and Baishnob *et al.* (2018) who have reported mean litter size of 10.37 ± 0.57, 10.1, 10.37 ± 0.57 and 11.66±1.41, respectively in gilts synchronized with PMSG±HCG. At same time Quirino *et al.* (2019) stated that the total number of piglets born will not be altered by synchronization protocols.

The difference in the litter size between seasons and between protocols during each season was not significant (P<0.05) but the litter size was highest in PMSG 400 IU+HCG 200 IU and PG 5 mg synchronized gilts during winter season but the same was highest in PMSG 400 IU+HCG 200 IU protocol during summer. This higher response observed with PMSG+HCG protocol in the present study may be attributed to longer half-life of

PMSG with prolonged period of follicular stimulation and release of a greater number of ova for the apparent increase in litter size in PMSG treated gilts. The contradictory findings reported might be due to an array of factors like high temperatures during summer that reduces the sperm quality in boars (Kunavongkrit et al. 2005) and increases pregnancy loss (Wettemann and Bazer 1985). At the same time lower litter size in synchronized gilts during summer might be due to decreased progesterone secretion by corpora lutea because of seasonally diminished LH secretion during summer which would delay the development of embryos and increase subsequent resorption of embryos or non-visible abortions (Tast et al., 2002).

It is concluded that based on the treatment to onset of estrus duration, duration of estrus, Intensity of estrus, conception rate and litter size observed in the study PMSG 400 IU±HCG 200 IU may be preferred for synchronization and induction of LWY crossbred gilts during both the seasons.

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Table No. 1: Estrus response and conception rate, Interval between treatment and onset of estrus, Duration of estrus, Intensity of estrus and Litter size in LWY gilts after synchronization with different protocols

S. No	Parameters	Protocol (n=6 in each)	Winter	Summer	T test value
1	Estrus response (%)	PG 5 mg	100.00	66.67	
		PG 7.5 mg	83.33	66.67	
		PMSG±HCG	83.33	66.67	
		NS (control)	66.67	50.00	
		Overall (n=24)	83.33	62.50	
2	First Conception rate	Conception rate (%)			
		PG 5 mg	83.33 (5/6)	66.66 (4/6)	
		PG 7.5 mg	83.33 (5/6)	66.66 (4/6)	
		PMSG±HCG	83.33 (5/6)	66.66 (4/6)	-
		NS (control)	66.66 (4/6)	50.00 (3/6)	
		Overall (n=24)	79.16 (19/24)	62.50 (15/24)	
3	Second Conception rate	PG 5 mg	17.66 (1/6)	33.33 (2/6)	
		PG 7.5 mg	17.66 (1/6)	33.33 (2/6)	
		PMSG±HCG	17.66 (1/6)	33.33 (2/6)	
		NS (control)	33.33 (2/6)	50.00 (3/6)	
		Overall (n=24)	20.83 (5/24)	37.50 (9/24)	
4	Treatment to onset of estrus duration (hr)	PG 5 mg	94.67±5.23 ^{aA}	120.00±5.06 ^{bA}	-3.63*
		PG 7.5 mg	131.00±4.22^{aA}	131.00±5.23 ^{aB}	0.00^{NS}
		PMSG±HCG	86.33±4.72 ^{aAB}	107.00±4.22 ^{bAC}	-5.62*
		NS (control)	173.00±3.92 ^{aBC}	206.33±5.71 ^{bCD}	-5.56*
		Overall (n=24)	121.25±7.45 ^{a}	131.17±5.74 ^{b}	
5	Estrus duration (hr)	PG 5 mg	43.00±3.26^{aA}	36.00±6.20^{aA}	0.91^{NS}
		PG 7.5 mg	42.00±5.14 ^{aAB}	33.00±3.38 ^{aA}	1.51^{NS}
		PMSG±HCG	56.00±5.93 ^{aA}	42.00±2.68 ^{aB}	-2.44^{NS}
		NS (control)	50.33±4.63 ^{aABC}	50.67±5.41 ^{aA}	-0.04^{NS}
		Overall (n=24)	44.33±2.02 ^{a}	43.92±3.20 ^{a}	
6	Intensity of estrus	PG 5 mg	2.67±0.21 ^{aA}	2.33±0.21 ^{aA}	1.00^{NS}
		PG 7.5 mg	2.67±0.21 ^{aA}	2.33±0.21 ^{aA}	1.00^{NS}
		PMSG±HCG	2.83±0.17 ^{aA}	2.17±0.17 $^{b A}$	3.16*
		NS (control)	2.67±0.33 ^{aA}	1.83±0.31 ^{bA}	2.71*
		Overall (n=24)	2.71±0.11 ^{a}	2.17±0.12 ^{b}	
7	Litter size	PG 5 mg	9.50±0.34 ^{aA}	8.00±0.58 ^{bA}	3.50*
		PG 7.5 mg	9.00±0.37 ^{aAB}	8.50±0.62 ^{aA}	0.70^{NS}
		PMSG±HCG	9.50±0.34 ^{aB}	10.00±0.58 ^{aA}	-0.59^{NS}
		NS (control)	8.83±0.31 ^{aAB}	7.83±0.65 ^{aA}	1.46^{NS}
		Overall (n=24)	9.21±0.17 ^{a}	8.58±0.33 ^{a}	

Means bearing different superscripts (a,b) within a row differ significantly Pd" 0.05
Means bearing different superscripts (A,B) within a column differ significantly Pd" 0.05

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