

Short Communication

Preliminary studies on synchronization of estrus with double injection of prostenol in dwarf does (*Capra hircus*) and role of macro minerals in estrus

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A study was conducted to examine the efficacy of prostenol for synchronizing estrus in dwarf goats (*Capra hircus*) and role of concentration of macro minerals during estrus phase. A lot of goats (n=8) were selected from the flock maintained at Nuclear Institute for Agriculture and Biology (NIAB) Farm, Faisalabad on the basis of their post-partum period >2 months. Goats (n=5) were given 2 prostenol (an analogue of prostaglandin F₂α (PGF₂α) injections of 125 µg/animal), 12 days apart while 3 goats were kept as control. The does responded double injection at an interval of 15 days, because of immaturity of follicles. A teaser buck was introduced in the herd for estrus detection and visual symptoms were also observed. Blood sampling was carried out during estrus phase for sodium, potassium and phosphorus determination. Estrus was observed after 48 to 96 h with a mean time of onset of estrus at 72 ± 33 PGF₂α injection. Estrus was observed in all treated goats (100% response) while no estrus was exhibited by any animal of the control group, because they were not injected by injection (PGF₂α). Regarding macro-minerals, potassium in estrus was found to be higher (10.83 ± 1.89 ppm) in treated animals as compared to that of the control animals, while sodium and phosphorus levels were found to be the same in treated as well as control groups. It was concluded that double injection of prostenol (125 µg/animal) was efficient in synchronizing estrus in goats and potassium might have some important role during estrus phase in goats.

Key words: Estrus synchronization, goats, prostaglandins, macro-minerals.

INTRODUCTION

Prostaglandins F₂α (PGF₂α) and their analogues have been used successfully to synchronize estrus in buffaloes, goats and sheep. The double injection regimen aims at achieving higher rates of estrus synchronization at the 2nd PGF₂α injection without the need to detect the estrus status of the animals before the first injection. Prosteno which is the cheaper analogue of PGF₂α, works well in goats and gives best results in goats.

Minerals are very important in animal feed and are

classified as micro and macro elements (Abdelhameed, 2000). Phosphorus deficiency is associated with decreased reproductive performance in dairy cows. Inactive ovaries (anestrus, delayed sexual maturity and low conception rates) have been reported when phosphorus intakes are low (Smith et al., 1979). Sabir (2005) mentioned that, deficiency of potassium leads to infertility, weak muscles and bones and hormonal defects which appeared in extra secretion of adrenal gland, loss

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of appetite, botulism. Akinsoyino (1986) reported that hypokalemia and hyperkalemia lead to delayed growth, poor production, and respiratory arrest, heart failure, kidney failure and finally death occur (Siribaddana, 2011) respectively.

Deficiencies, excesses or malabsorption of minerals contribute to several diseases of maternal, fetal, hormonal dysfunction and exert negative effect on the reproductive efficiency and it was reported that a mineral deficiency can cause infertility, abortion and still birth (Apgar et al., 1992).

There is no single study describing the role of macro-minerals at estrus phase of estrus cycle after synchronizing goats with PGF2 α . Therefore, the present study was designed to investigate the role of different concentrations of sodium, potassium and phosphorus in estrus to observe the efficiency of double injection regimens of prostenol with an interval of 12 days for estrus synchronization in the goats.

MATERIALS AND METHODS

A herd of eight female goats (Teddy \times Beetal), weighing 30 to 35 kg reared at Livestock Farm, Nuclear Institute for Agriculture and Biology (NIAB), Faisalabad, Pakistan were selected on the basis of their post-partum period >2 months. Does were divided into 2 groups. Group 1 does (n=5) were (n=5) given two injections (i/m) of 250 μ g (PGF2 α)/animal (Selmore, Pharmaceutical Industries, Lahore) with twelve days apart and group 2 (control group, n=3) were given no treatment. The blood sampling was carried out on days 0 and 12th when PGF2 α were given and on estrus day. Estrus and duration of the estrus were determined by continuous observation. The teaser buck was introduced into the herd for estrus detection. Blood samples were analyzed for sodium, potassium and phosphorus by following procedures.

Samples collection

Blood samples (5 ml) were collected from the jugular vein with a syringe and blood was immediately transferred to the tube. The blood samples were allowed to clot for 4 h at room temperature and then centrifuged at 2500 rpm for 20 min, and then serum was frozen at -20°C. Hemolytic free serum samples were harvested into clean polypropylene vessels and were frozen at -20°C for serum mineral analysis.

Sample preparation

Two milliliters serum sample was placed in a 50 ml centrifuge tube, and 1 ml of 1 N HCL was added. They were mixed and allowed to stand for 10 min. 8 ml of 10% trichloroacetic acid (TCA) was also added. The mixture was mixed very well and allowed to stand for 30 min. At 2000 rpm centrifugation, supernatant was collected and the precipitate was washed with 3 ml TCA. It was then centrifuged again and the supernatant fluids were combined.

Sample analysis

The sodium and potassium in digested samples were read on Flame photometer (FP, Jenway, PFP-7, England). Phosphorus

Table 1. Estrus synchronization rate in dwarf does with double injection of PGF2 α (Prostenol).

Parameter	Control (n=3)	Treated (n=5)
Synchronization rate (%)	0 (0/3)	100% (5/5)
Time of onset of estrus	-	72 \pm 33
Estrus duration	-	37.3 \pm 2.33

determination was done by Spectrophotometer (Cecil, CE-1021, England). Foslam et al., (1975) respectively.

Statistical analysis

The mean (\pm standard error (SE)) values of sodium, potassium and phosphorus of treated and control groups were compared.

RESULTS AND DISCUSSION

Estrus synchronization

The results of estrus synchronization are presented in Table 1. All the treated does presented in estrus. The animals showed vaginal discharge, bleating, redness of vagina, flehman posture, stands to be mounted and finally copulation. The animals were observed in estrus for 30 to 40 h with a mean duration of 37.3 \pm 2.33 h. Overall, 100% estrus response was found in all treated does. No estrus behavior was found in control group, because they were not injected with injection of PGF2 α .

These results are comparable with the results reported by Nuti et al. (1992). The authors reported that mean time from injection (PGF2 α) to behavioral estrus was 46 to 48 h with 95 to 100% does estrus response. Beck et al. (1993) reported that estrus response and timing of estrus in goats treated with prostenol (125 μ g) on days 6 and 12 of the estrus cycle was 100%.

Sodium, potassium and phosphorus

A mean (\pm SE) value for sodium on days 0, 12 and at estrus is presented in Table 2. It was found out that there is no difference of sodium and phosphorus concentration levels in treated and control groups on 0, 12th and on estrus days. Mean (\pm SE) value for potassium on days 0, 12 and estrus are presented in Table 2. Higher values of potassium in treated does than that of the control group were found on estrus day.

Sodium and chloride are critical in the electrolyte balance. In addition, sodium affects the absorption of sugar and proteins from the digestive tract. Salt deficiencies can affect the efficiency of digestion and indirectly the reproductive performance of cows. Potassium functions in acid-base balance, osmotic pressure and the amount of water retained in the body. High levels of

Table 2. Serum concentrations of sodium, potassium and phosphorous in dwarf does affected by PGF2 α injection.

Mineral Day	Sodium			Potassium			Phosphorus		
	0	12 th	Estrus	0	12 th	Estrus	0	12 th	Estrus
Treated (n=5)	42.4 \pm 4.33	45.8 \pm 10.82	46.2 \pm 1.29	8.4 \pm 1.29	8.15 \pm 1.61	11 \pm 1.83	11.89 \pm 135.34	580 \pm 154.82	525 \pm 22.93
Control (n=3)	35.33 \pm 12.50	42.33 \pm 7.76	45.33 \pm 7.37*	7.08 \pm 2.80	8.15 \pm 1.61	8.66 \pm 2.08*	243 \pm 92.26	293 \pm 52.43	525.33 \pm 14.18*

Values (Mean \pm SD) with difference in the columns. Concentration showed in ppm. *Animals showed no estrus response.

potassium may inhibit magnesium absorption and cause metabolic problems, especially in grazing systems. Other studies also report lower fertility in cows fed high levels of potassium or diets in which the potassium-sodium ratio was too wide (Rivera, 2011).

Mean (\pm SE) value of phosphorus is presented in Table 2. No difference in phosphorus levels was observed on days 0, 12 and estrus day.

Phosphorus deficiency leads to decreased growth, unthriftiness, decreased milk production, poor conception, lower fertility and calving percentage (Bredon and Dugmore, 2005). Phosphorus is commonly referred to as the "fertility" mineral. Inactive ovaries, delayed sexual maturity and low creatinine have been attributed to low phosphorus intake (Lopez et al., 2004). In ruminants, majority of phosphorus is excreted through the feces (69% of the total) with approximately 30% being excreted through the milk and only about 1% being excreted through the urine (Phillips, 2000).

Conclusions

Prostenol, a synthetic cheaper product of PGF2 α is the best hormone for estrus synchronization in goats and had given 100% estrus response. Role of macro-minerals, especially potassium, might have some role in behavioral estrus. Further study should be conducted to identify the exact role of potassium during estrus phase of the estrus cycle.

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