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Estrogen and Progesterone hormone levels in Punganur Cattle

B.R.Naik., A.V.N.Siva Kumar*, K.V.Bramhaiah, A.Ravi and V.Praveen Chakravarthi
College of Veterinary Science., Tirupati –A.P

Abstract: *The present study was conducted at Livestock Research Station, Palamaner, Chittoor district, Andhra Pradesh to estimate female reproductive hormone values in Punganur cattle. The blood samples were collected from the twelve Punganur cows on 0, 3, 6, 9, 12, 15, 18 and 21 days of estrous cycle. The serum was separated from the blood samples and was transferred into sterile eppendorf tubes, labeled and stored in deep freeze (-20 ^{o}C) until hormonal assay for progesterone and estrogen was carried out. The estrogen level (ng/ml) in Punganur cows during estrus cycle was significantly higher (P<0.01) on '0' day (20.24) and decreased upto 15th days (12.36) and thereafter gradually increased to a level of 22.58 on day '00'.The mean progesterone level (ng/ml) in Punganur cows during estrus cycle increased significantly (P<0.01) upto 15th day of estrus cycle and gradually decreased thereafter with the values ranging from 0.43 ('0' day) to 10.66 (15th day) and from 8.64 (18th day) to 0.34 (day 00).*

Key words*: Punganur cow, estrus cycle and hormones*

Indian subcontinent has a variety of indigenous breeds of cattle (*Bos indicus*) with wide genetic diversity. Most of these breeds are undergoing genetic degradation due to indiscriminate cross breeding and irregular mating among the breeds situated in each other's vicinity. As a result several indigenous breeds with many desirable traits are threatened with extinction while others are in the process of getting replaced completely by certain high producing crossbred animals. Punganur is one such breed of Indigenous cattle at the verge of extinction (Ramesha, 2001). Punganur, is the Worlds shortest, humped cattle with long tail with switch touching the ground, white and light grey in color with a broad forehead and short horns. The average height is 60-100 centimeters and weight 115-200 kgs. Indian breeds of cattle like Kankrej, Hariana, Gir, Deoni, Ongole, Redkhandari, Malvi, and Rathi (Mithuji *et al*., 1966 and Deshpande *et al*., 1987) reproductive hormone levels are available, where as Punganur cattle are poorly characterized both in terms of physiology and reproductively. Therefore there is a need to establish reproductive hormone levels to help conservation and propagation of these breed. Accordingly the present study was undertaken to establish the base line values of reproductive hormone levels in Punganur cattle.

I. Materials And Methods

The present investigation was conducted at Livestock Research Station (LRS), Palamaner, Chittoor district, Andhra Pradesh, India. The institute is located at an altitude of 2550 feet above mean sea level, at the longitude of 78° and Latitude 13.15° and mean environmental temperature, relative humidity and vapor pressure ranged between 12-40° C, 59-85% and 7-17 mm Hg, respectively.

A total of twelve (12) Punganur cows in estrus were selected from the Livestock Research Station. Estrus period in animals was detected by using teaser animal, the symptoms exhibited by the animals like vulval discharge, frequent urination, bellowing and also through rectal palpitation. All animals were maintained under uniform managemental and husbandry conditions. They were housed in well-ventilated asbestos roofed shed with cemented anti-slippery floor. The animals fed with concentrate mixture consisted of maize 40%, wheat bran 37%, ground nut cake 20%, mineral mixture 2% and common salt 1% on dry matter basis and fresh greens and bhoosa were given *ad libitum*. The animals were provided with clean drinking water *ad libitum* twice a day at about 9.30 AM and 3.30 PM. The blood samples were collected from the jugular vein on 0, 3, 6, 9, 12, 15, 18 and 21 days of estrous cycle. The serum was separated from the blood and was transferred into sterile eppendorf tubes, labeled and stored in deep freeze (-20 ^{o}C) until hormonal assay for progesterone and estrogen was carried out. Estrogen and Progestrone hormone levels were estimated by ELISA method. The data was analyzed as per the Snedecor and Cohron., 1980.

II. Results And Discussion

Plasma estrogen and progesterone levels change continuously during estrous cycle and these changes bring about changes in the hypothalamo-pituitary-ovarian relationship that is the basis for endocrine regulation of reproductive cycles in mammalian females (Pineda and Dooley, 2003). The progesterone and estrogen concentrations during estrous cycle of Punganur cows are presented in Table 1 and Figure 1.

The overall mean concentration of estrogen in the Punganur cows during estrous cycle on the day of estrus (day 0) and the day 3, 6, 9, 12, 15, 18, 19, 20 of estrous cycle and subsequent estrus (day 00) were 20.24±1.17, 11.26±1.17, 14.25±1.17, 10.53±1.17, 15.24±1.17, 12.36±1.17, 17.83±1.17, 20.28±1.17, 21.47±1.17 and 22.25±1.17 pg/ml, respectively. Similar to the concentration of estrogen in the present study, Shukla *et al.*, (2000) in crossbred cows, Lemon *et al.*, (1974) in exotic cows, Gupta *et al.,* (1998), Coe and Aldrich (1985), Jimenez (1988) and Selvaraju *et al.,* (2002) also recorded same concentrations at different days of estrous cycle. But higher concentration of estrogen on different days of estrous cycle than the present finding were recorded by Mehrotra *et al.,* (2005) in Holstein Friesian x Hariana cattle, Mutha Rao *et al.,* (2005) in Ongole cows, Harpreet Singh *et al.,* (2006) in Sahiwal crossbred heifers. While, the estrogen concentrations in the present study were higher than the reports of Agarwal *et al.,* (1989) in cows, Purohit *et al.,* (2000) and Venkatesan *et al.*, (2005) in indigenous cows, Ecthernkamp and Hansel (1973), Christensen *et al.*, (1974), Corah *et al.,* (1974) and Glencross and Pope (1981) in exotic cows who recorded lower concentrations of estrogen on different days of estrous cycle compared to the concentration of estrogen in Punganur cattle. These inconsistencies in the concentration of estrogen hormone might be due to the differences in the sampling frequency, seasons and climate at the time of sampling and age and physiological stage (Lactating or not) of the animals (Alvarez *et al*., 2000).

The estrogen concentration showed a significant ($P<0.01$) decrease from day '0' to day 3 of estrous cycle which might be due to the ovulation and subsequent development of luteal tissue under the influence of luteinizing hormone (Hafez, 2008 and Noakes *et al*.,2001). Later, the concentration of estrogen from day 3 to day 6 showed a significant ($P<0.05$) increase but the concentration of estrogen did not reach the peak levels which indicated the development of first dominant follicle (Alvarez *et al*., 2000). Immediately after day '6' the concentration of estrogen decreased significantly indicating atresia of dominant follicle developed during first follicular wave (Hafez, 2008 and Noakes *et al*., 2001). Later, the concentration from day 9 onwards estrogen showed an increasing trend up to subsequent estrus day '00' at which time the concentration of estrogen was at peak level which might be due to the development of preovulatory follicle (Alveraz *et al*., 2000 and Hafez, 2008).

The overall mean concentration of progesterone in the Punganur cows during estrous cycle on the day of estrus (day 0) and day 3, 6, 9, 12, 15, 18, 19, 20 of estrous cycle and subsequent estrus day 0 were 0.43±0.89, 1.89±0.89, 5.39±0.89, 6.24±0.89, 9.72±0.89, 10.67±0.89, 8.64±0.89, 5.22±0.89, 1.67±0.89 and 0.34±0.89 mg per ml, respectively. The concentration of progesterone in the present study gained support from the findings of Mutha Rao *et al.,* (2005), Harpreet Singh *et al.*, (2006), Echterkamp and Hansel (1973) who also recorded similar concentrations of progesterone at different days of estrous cycle. But the concentrations of progesterone reported by Rabiee *et al.,* (2002) at day '0' and Hamit *et al.,* (2005) at different days of estrous cycle were higher than the present findings. While, progesterone concentrations in the present study were higher than the reports of Shukla *et al.,* (2000), Mandal and Prakash (2003), Mehrotra *et al.,* (2005), Venkatesan *et al.*, (2005), Christensen *et al.*, (1974), Dutta *et al.,* (1989) and Selvaraju *et al.,* (2002) who recorded lower concentrations of progesterone on different days of estrous cycle as compared to the concentration of progesterone in Punganur cattle.

The progesterone concentration showed significant increase from day '0' to day 15. Later, from day 18 onwards, the progesterone concentration showed a significant decreasing trend and finally came down to the lowest concentration. This constant rise in the concentration up to day 18 might be due to the functional activity of corpus luteum and the decreasing trend from day 18 might be due to the initiation of luteolysis (Hafez, 2008).

Further, this study also recorded the lowest progesterone concentrations on the day of estrus and this gained support from the findings of all the authors who also recorded either similar or higher or lower concentrations on the other days of estrous cycle than the present study. These inconsistencies in the concentration of progesterone hormone might be due to the differences in the sampling frequency, seasons and climate at the time of sampling, age and physiological stage (lactating or non lactating) of the animals (Alvarez *et al*., 2000).

It is concluded from the study that the estrogen concentration showed a significant decrease from day '0' to day 10 with a significant rise on day 15 later there was an increase trend from day 15 to subsequent estrus day '00'. Whereas the concentration of progesterone increased significantly from day '0' to day 15, thereafter it decreased and the decrease was significant upto day 19 and insignificant from day 20 to subsequent estrus day '00'. Hence the trend of estrogen and progesterone hormones showed during estrous cycle of Punganur cow indicates the normal cyclicity of these breed like any other Indian cattle breed.

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Table 1:Estrogen and progesterone concentrations during estrous cycle of Punganur cows (ng/ml)

Days	Estrogen	Progesterone
0	20.24 ± 0.01^{ab}	0.43 ± 0.01^{d}
3	11.26 ± 0.37^{ef}	1.83 ± 0.37^{d}
6	14.25 ± 0.57^{de}	5.39 ± 0.57^{c}
9	10.53 ± 0.82^{f}	6.24 ± 0.84^{bc}
12	15.23 ± 1.54^{cd}	9.71 ± 0.78^{a}
15	12.36 ± 1.16^{def}	10.66 ± 2.24^{a}
18	17.83 ± 0.81^{bc}	8.64 ± 0.86^{ab}
19	20.28 ± 1.79^{ab}	5.21 ± 0.49^{c}
20	21.47 ± 1.38^{a}	1.67 ± 0.28^{d}
Day 00	22.58 ± 1.78^{a}	0.34 ± 0.01^{d}

Values with different superscripts in a column are significantly different ($P<0.01$)

ANOVA (Estrogen)

Source	Degrees of freedom	Mean squares	F calculated	Significance
Between days	9	138.824	14.412	**
Error	60	9.632		
Total (SS)	69	827.364		

S.Ed. = 1.658 CD (0.05) = 3.3178

ANOVA (Progesterone)

Source	Degrees of freedom	Mean squares	F calculated	Significance
Between days	9	103.463	18.876	**
Error	60	5.481		
Total (SS)	69	1260.050		

S.Ed. = 0.1.251 CD (0.05) = 2.5028

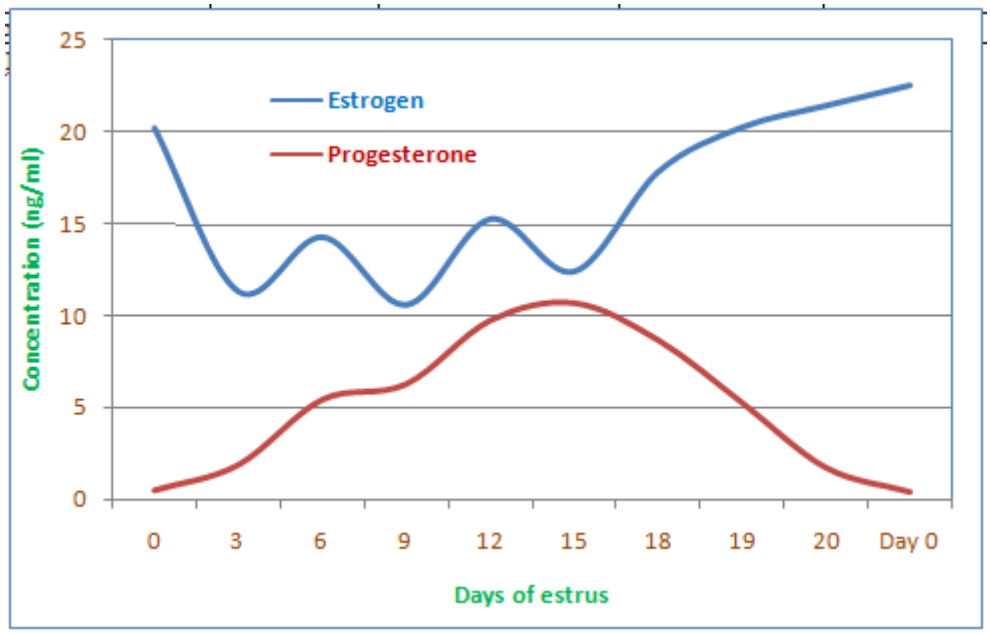

Fig. 1: Esterogen and progesterone concentrations (ng/ml) during estrous cycle of Punganur cow