Research Article

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COMPARATIVE STUDIES ON CERTAIN HORMONAL AND BIOCHEMICAL PROFILES OF NORMAL CYCLIC AND ANOESTRUS SURTI BUFFALOES

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ABSTRACT

A comparative study on hormonal and biochemical profiles was carried out on twenty four (24) lactating Surti buffaloes, divided into two groups viz. normal cyclic (n=12) and anoestrus (n=12) groups, maintained at Livestock Research Station, Navsari Agricultural University, Navsari, Gujarat. The body condition score was non-significantly differed between normal cyclic and anoestrus Surti buffaloes. The mean serum T_3 (Tri-iodothyronine) and T_4 (Thyroxine) levels were found significantly ($p<0.05$) higher in normal cyclic than the anoestrus group whereas, mean serum cortisol levels differed non-significantly between the groups of Surti buffaloes. The mean serum total cholesterol level was found significantly ($p<0.05$) higher as 88.8±1.51 vs. 82.4±2.55 mg/dl in normal cyclic as compared to anoestrus buffaloes. Significantly lower levels of T_3 and T_4 in anoestrus buffaloes indicating hypothyroidism which results into the reduced responsiveness of ovary to pituitary gonadotropins and producing anoestrus condition in buffaloes.

Key word: Anoestrus, Normal cyclic, Surti buffalo, Thyroxine, Tri-iodothyronine

Buffalo is the premier dairy animal in the developing countries of Asia and the mainstay of the Indian dairy industry, contributing over 60 percent of the total milk production (Mondal *et al*., 2010). Due to its eminent position among the milk producing animals, buffalo is considered as black diamond but their poor reproductive efficiency affect economy of the farmers in terms of milk yield, net calf crop and therefore additional cost of rearing. Among various reproductive disorders in buffaloes, anoestrus is the most important cause of poor reproductive performance (Devkota *et al.,* 2012). Body condition score (BCS) is often strongly correlated with individual fitness including survival and reproductive potential. Buffaloes with poor BCS had inactive ovaries and postpartum anoestrus periods (Jainudeen and Wahab, 1987). The low levels of T_3 and T_4 are related with delayed puberty and reproductive disorders hence, the levels of thyroid hormones are important in the reproductive activity of the animals (Chandrasekhar *et al.,* 1985). Moreover, thermal stress increased the cortisol level, which caused a change in the endocrine secretion resulting in anoestrus (Singhal and Mudgal, 1984). Normal levels of biochemical constituents are of utmost importance for maintaining the functional integrity of the reproductive system (Niazi *et al*., 2003). Serum cholesterol acts as precursor of steroid hormones and its level can indicate circulatory adequacy of these hormones responsible for normal oestrus (Ramkrishna, 1997). Increased urea concentration leads to impaired fertility as higher plasma urea concentrations interfere with normal inductive actions of progesterone on the microenvironment of the uterus thereby causing sub-optimal conditions for the support of embryo development (Butler, 2000). However, little information was available regarding levels of T_3, T_4 and cortisol hormones particularly in Surti buffaloes hence, the present research work was proposed.

MATERIALS AND METHODS

The study was undertaken on twenty four (24) lactating Surti buffaloes, comprising of 12 normal cyclic and 12 anoestrus Surti buffaloes, maintained at Livestock Research Station, Navsari Agricultural University, Navsari, Gujarat. The climate of the region is sub-humid tropical with heavy rainfall. The average minimum and maximum ambient temperatures of the zone ranged from 14.0° to 27.9°C and 30.0° to 35.9°C and relative humidity ranged from 81 to 93 per cent in the morning and 38 to 79 per cent in the evening, respectively, during the period of study.

Selection of normal cyclic and anoestrus buffaloes was carried out on the basis of history and repeated per-rectal examinations. The buffaloes having history of regular estrus cycle and either follicle or CL on ovary during per-rectal palpation were considered as normal cyclic while, the buffaloes that did not show any sign of estrus since last three months and having no palpable structure over ovary were considered as anoestrus.

All the selected animals were fed green fodder, hay and compounded concentrate, as per the standard feeding schedule followed on the farm and had free access to drinking water. The animals were appropriately vaccinated against foot and mouth disease and haemorrhagic septicemia. As a routine, all animals were dewormed before and after monsoon.

Approximately 10 ml of blood was collected once from all the animals aseptically by jugular vein puncture with the help of vaccutainers and serum was separated by centrifugation at 3000 rpm for 5 minutes and stored at -20°C in deep freezer until analysis.

BCS was recorded as scale 1 to 5 in all the animals, using the method described for buffaloes (Vanessa *et al.,* 2009). In this method, BCS was recorded by visual

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Table 1:-

BCS, serum hormonal and biochemical profiles of normal cyclic and anoestrus Surti Buffaloes (Mean ± SE)

Parameters		Groups			
		Normal Cyclic (n=12)	Anoestrus (n=12)	't' -Value	'P' -Value
BCS		3.7 ± 0.04^{x}	3.6 ± 0.04^{x}	1.22	0.23
Hormonal Profile (ng/ml)	T3	3.4 ± 0.14^{x}	2.8 ± 0.23^{y}	2.32	0.03
	T4	63.7 ± 1.60^{x}	48.4 ± 4.11^{y}	3.48	0.00
	Cortisol	7.0 ± 0.22^{x}	$7.3\pm0.0.19^{x}$	1.04	0.31
Biochemical Profile (mg/dl)	Total Cholesterol	88.8 ± 1.51^{x}	82.4 ± 2.55^{y}	2.15	0.04
	BUN	31.8 ± 2.06^{x}	32.5 ± 1.65^{x}	0.24	0.81
	Creatinine	1.5 ± 0.03^{x}	1.4 ± 0.05^{x}	1.69	0.11

Means bearing different superscripts within a row (between the groups) differ significantly ($p<0.05$ & $p<0.01$).

inspection of the animal's coat and manual palpation of four areas of the body where buffalo store fat: ribs, spine, hips and base of the tail. Each body part, including the coat, was given a score between 1 and 5, with a higher score reflecting a thicker, shinier coat or greater fatness. The average of sum of all five scores was then used as a composite measure of overall body condition. Serum T_3, T_4 and cortisol concentrations were measured by standard ELISA (Enzyme Linked Immuno Sorbent Assay) technique and procedure described by assay kits, NovaTec Immundiagnostica GmbH Technologie & Waldpark, Germany. Serum biochemical parameters (Total Cholesterol, BUN and Creatinine) were analyzed using commercial kits of Randox laboratories limited, United Kingdom as per the procedure described by kit, in semiautomatic serum biochemical analyzer of Merck. The test of significance for different parameters between normal cyclic and anoestrus group were made by Standard Student's paired 't' test.

RESULTS AND DISCUSSION

The mean values of BCS in normal cyclic and anoestrus Surti buffaloes are presented in Table 1 and did not differ statistically ($P>0.05$) between the groups though obtained value was found apparently higher in normal cyclic as compared to anoestrus Surti buffaloes.

The concentrations of serum T_3 and T_4 found were significantly higher ($p<0.05$) in normal cyclic as compared to anoestrus Surti buffaloes whereas, serum cortisol concentration did not differ statistically ($p>0.05$) between the groups (Table 1).

The level of serum total cholesterol was found significantly higher ($p<0.05$) in normal cyclic as compared to anoestrus buffaloes whereas, the mean levels of serum BUN and creatinine did not differ statistically ($p>0.05$) between the groups (Table 1).

The BCS values found non-significant between normal cyclic and anoestrus Surti buffaloes might be due to the standard management practices and healthcare strategies followed at the well-organized farm of Surti buffalo. The findings of present study were supported by the similar findings reported by Bohara and Devkota (2009), who observed significantly ($p<0.01$) higher mean level of BCS in cyclic as compared to non-cyclic Murrah cross buffaloes. In addition to this, Jainudeen and Wahab (1987) reported the buffaloes with poor BCS had inactive ovaries and postpartum anoestrus periods. Likewise, Ahmed *et al.* (2011) also reported that, buffaloes with ovarian inactivity had poor mean values of body condition score as 2.1±0.11 vs. 2.9±0.28 compared to cyclic buffaloes. While, On the contrary, Hegazy *et al.* (1994) reported almost similar mean interval 75.0 days and 73.8 days from parturition to first detected estrus in animals with average and poor body condition score, respectively.

Significantly lower levels of T_3 and T_4 in anoestrus than that of normal cyclic Surti buffaloes, indicating hypothyroidism that results into the reduced responsiveness of ovary to pituitary gonadotropins producing anoestrus condition in buffaloes. The mean serum levels of T_3 and T_4 observed in present study are in close agreement with the findings of Raja Kumar *et al.* (2010), who also reported significantly ($p<0.05$) higher level of T_3 and T_4 as 2.9±1.26 vs. 2.2±0.912 ng/ml and 5.9±1.614 vs.5.5±1.208 µg/dl, respectively in normal cyclic as compared to anoestrous buffaloes. Similarly, Sarvaiya *et al.* (1992) also reported significantly ($p<0.05$) higher mean levels of T_3 and T_4 in cyclic than that of anoestrus Surti buffalo heifers. Moreover, the results of present study are also well supported by the statement of Ahmed and Ezzo (1998), who stated that, hypothyroidism was associated with cessation of behavioral signs of estrus in buffalo. Singhal and Mudgal (1984) reported high level of serum corticoids in anoestrus buffaloes exposed to thermal stress during summer that leads to an altered gonadotropin secretion, which ultimately triggers the state of anoestrus. Similarly, Ahmed *et al.* (2013) reported that cortisol may play an important role in the regulation of oestrus cycle and maintenance of CL. In the present study non-significant ($p>0.05$) but higher mean levels of cortisol in anoestrus buffaloes than that of normal cyclic buffaloes might be due to stress.

In present study, significantly higher mean serum total cholesterol level in normal cyclic Surti buffaloes could be an indicator of enhanced steroid secretion and normal cyclicity. Similarly, many research workers reported higher level of mean serum total cholesterol in normal cyclic as compared anoestrus buffaloes (Kabir *et al.,* 2001; Ghuman *et al.,* 2011; Ali and Shukla, 2012 and Jayachandran *et al.,* 2013) which strongly supports the findings of present study. Whereas, contrary to the present findings, Yadav *et al.* (2006) reported, significantly higher ($p<0.05$) level of mean serum total cholesterol as 72.0±5.115 vs. 69.9±6.895 mg/dl in acyclic as compared to cyclic Murrah buffaloes. Further, Hedaoo *et al.* (2008) reported significantly ($p<0.05$) higher level of mean serum

BUN as 21.1±1.70 vs. 10.7±1.40 mg/dl in non-cycling as compared to cycling buffaloes whereas, Balamurugan *et al*. (2015) reported significantly ($p<0.05$) higher mean serum values of BUN as 30.2±0.81 vs. 15.6±0.72 mg/dl in regular cyclic as compared to anoestrus Murrah buffaloes. Moreover, the present findings of non-significant difference in mean serum creatinine level are well supported in between non-cycling and cycling buffaloes by Ghuman *et al*. (2011). Similarly, Balamurugan *et al*. (2015) reported, non-significantly higher mean value of creatinine as 0.84±0.67 vs. 0.80±0.32 mg/dl in regular cyclic than that of anoestrus Murrah buffaloes.

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REFERENCES

Ahmed, A.E., Ismail, M.N., Aref, M.S., El Abedin, A.Z. and Kassab, A.Y. (2013). Cortisol and postpartum luteal function in cattle. *Iranian J. Appl. Anim. Sci.* **3(3)**: 465-470.

Ahmed, W.M., and Ezzo, O.H. (1998). Peripartum changes of plasma thyroxin (T_4) and triiodothyronine (T_3) levels in buffalo-cows with emphasis on postpartum ovarian inactivity. *Alexandria J. Vet. Sci.* **14**: 177-186.

Ahmed, W.M., Hanafi, E.M., Soliman, N.M. and Ali, A.H. (2011). Ovitone as a novel treatment for ovarian inactivity in Egyptian buffaloes. *World Appl. Sci. J.* **14(9)**: 1258-1264.

Ali, R. and Shukla, S.P. (2012). Haemato-biochemical changes in post-partum anoestrus buffaloes during low breeding season. *Researcher*. **4(9)**: 55-58.

Balamurugan, T.C., Krupakaran, P.R., Pandiyan, G.D.V., Arunkumar, S. and Perumal. P. (2015). Comparative studies on serum biochemical profiling at various stages of reproduction in Murrah buffaloes. *J. Cell Tissue Res.* **15(1)**: 4823-4826.

Bohara, T.P. and Devkota. B. (2009). Assessment of some of the serum biochemical profile and ovarian status of cyclic and non-cyclic anestrous buffaloes of Shivanagar VDC and IAAS livestock farm of Chitwan, Nepal. *J. Inst. Agric. Anim. Sci.* **30**: 199-205.

Butler, W.R. (2000). Nutritional interactions with reproductive performance in dairy cattle. *Anim. Reprod. Sci.* **2**: 449-457.

Chandrasekhar, Y., Holland, M.K., D'Occhio, M.J. and Setchell, B.P. (1985). Spermatogenesis, seminal characteristics and reproductive hormone levels in mature rams with induced hypothyroidism and hyperthyroidism. *J. Endocrinol.* **105(1)**: 39-46.

Devkota, B., Bohara, T.P. and Yamagishi, N. (2012). Seasonal variation of anestrus conditions in buffaloes (*Bubalus bubalis*) in Southern Nepal. *Asian J. Anim. Vet. Adv.* **7**: 910–914.

Ghuman, S.P.S., Singh, J., Honparkhe, M., Ahuja, C.S., Dhami, D.S., Nazir, G. and Gandotra, V.K. (2011). Differential fertility in dairy buffalo: role of thyroid and blood plasma biochemical milieu. *Iranian J. Appl. Anim. Sci.* **1(2)**: 105-109.

Hedaoo, M.K., Khllare, K.P., Meshram, M.D., Sahatpure, S.K. and Patil, M.G. (2008). Comparative studies of certain biochemical constituents of normal cyclic and anoestrus Surti buffaloes. *Vet. Wld.* **1(4)**: 105-106.

Hegazy, M.A., Essawy, S.A., Teleb, H.M., El-Wishy, A.A. and Youssef, A.H. (1994). Effect of body condition score on reproductive performance of buffaloes. Proceedings of 4th World Buffalo Congress, Sao Paulo, Brazil, 27-30 June, **3**: 630-631.

Jainudeen, M.R. and Wahab, S. (1987). Postpartum anoestrus in dairy buffalo. Proc. Int. Symp. Milk Buffalo Reprod. Islamabad. pp. 69-77.

Jayachandran, S., Nanjappan, K., Muralidharan, J., Selvaraj, P. and Manoharan, A. (2013). Blood biochemical and mineral status in cyclic and postpartum anoestrus buffaloes. *Int. J. Food, Agric. Vet. Sci.* **3(1)**: 93-97.

Kabir, K.K., Varshney, J.P., Rawal, C.V.S. and Ansari, M.R. (2001). Studies on serum progesterone and certain blood biochemical indices in cyclic and acyclic Non-descript rural buffaloes. *Indian Vet. J.* **78(12)**: 1116-1118.

Mondal, S., Suresh, K.P. and Nandi, S. (2010). Endocrine profiles of oestrous cycle in buffalo: a meta-analysis. *Asian-Aust. J. Anim. Sci.* **23(2)**: 169-174.

Niazi, A.A., Khalid, J., Sattar, A. and Haq, A.U. (2003). Comparative studies on plasma profile of calcium, inorganic phosphorus and magnesium in repeat breeder and non cyclic Holstein Friesian and Jersey cows. *Pakistan J. Biol. Sci.* **6**: 1139-1141.

Raja Kumar, P., Lakshmana Swamy, P., Aswani Kumar, K. and Somasekhara Rao, K. (2010). Studies on the thyroid profile (T_3, T_4 and TSH) in estrous, cyclic and anoestrous buffaloes. *Buffalo Bull.* **29(2)**: 115-128.

Ramkrishna, K.V. (1997). Comparative studies on certain bio-chemical constituents of anoestrus cross-bred Jersey rural cows. *Indian J. Anim. Reprod.* **18(1)**: 33-35.

Sarvaiya, N.P., Pathak, M.M. and Patel, A.V. (1992). Study on circulating thyroid hormones in pubertal Surti buffalo heifers (cycling and non-cycling). *Int. J. Anim. Sci.* **7(2)**: 211-213.

Singhal, K.K. and Mudgal, V.D. (1984). Macro and micro-elements of feed, fodder and agro-industrial by product. *Indian J. Anim. Sci.* **54**: 685-691.

Vanessa, O.E., Anna, E.J. and Michael, P.O. (2009). A reliable body condition scoring technique for estimating condition in African buffalo. *Afr. J. Ecol.* **47**: 476–481.

Yadav, K.V.S., Ansari, M.R. and Kumaresan, A. (2006). Profile of macro, microelement, total protein and cholesterol in serum of cyclic and acyclic Murrah buffaloes. *Indian J. Vet. Res.* **15**: 10-13.