

PHYSIOLOGICAL LEVELS OF TRIIODOTHYRONINE, THYROXINE AND CORTISOL IN GROWING SWAMP BUFFALO CALVES

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ABSTRACT

Ten numbers of growing swamp buffalo calves were selected irrespective of sex and divided into two groups comprising 5 animals in each. About 5 ml of blood was collected from each of the experimental animal both in the morning and in the afternoon at 15 days intervals during the period between March and August. Hormone T₃, T₄ and cortisol were estimated from serum by Radio-Immuno Assay . The mean values of Triiodothyronine, Thyroxine and Cortisol ranged from 1.00 ± 0.28 to 1.08 ± 0.30, 44.20 ± 1.20 to 46.30 ± 1.20 and 60.26 ± 1.36 to 62.75 ± 1.07 nmol/l respectively. Present study revealed that serum T₃ were below normal in both the groups. Serum T₄ levels were found within the normal value. However, serum cortisol levels were found to be higher than the normal value in both the groups during pre-monsoon and monsoon periods.

Keywords : Swamp buffalo calves, serum, Triiodothyronine (T₃), Thyroxine (T₄), Cortisol, premonsoon and monsoon.

The biological activity and productivity of an animal depends not only on the flow of energy, food and water within the system, but also on its adaptability to the environment. Environmental stress exerts profound effects on various hormonal and biochemical characteristics of blood^{3, 4}. Among the endocrine glands, adrenal and thyroid glands respond quickly to bring about the necessary physiological adjustments in the body to the changing environmental conditions. Thyroid hormones (T₃ and T₄) by their role on cellular energy, nitrogen, mineral and water metabolism are related to the adaptation of mammals to their

environment. Environment influences thyroid activity by affecting the hypothalamo-hypophyso-thyroid axis^{6,7}. The influence of various factors such as age, season and reproductive status upon blood parameters are important to determine the physiological status of animals in order to undertake preventive prophylactic measures for health disorders to increase productivity^{1, 2,5}, particularly in adverse climatic conditions. Buffalo is a very important species so far milk production is concerned. However, there is paucity of sufficient literature in relation to the season and age related variation on thyroid hormone and biochemical parameters in swamp buffalo calves under agro-climatic condition of Assam where the mercury level generally ranged between 36°C and 39°C with relative humidity 80 and 85 per cent during pre-monsoon (March-May) and monsoon (June-August) periods. Therefore, the present work

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was designed to evaluate the effect of season on thyroid and adrenal function in growing swamp buffalo calves.

MATERIALS AND METHODS

The study was conducted at the ICAR sponsored "Network Project on Swamp Buffalo", College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati-22 in two different seasons *ie.* pre-monsoon (March-May) and monsoon (June-August). Ten (10) swamp buffalo calves were selected irrespective of sex and divided into two groups comprising of 5 calves in each. Experimental buffalo calves were reared under semi-intensive system. About 5 ml of blood was collected from each animal twice daily, morning and afternoon at 15 days interval from the month of March to August. The Serum samples were separated and stored at -20°C until estimation. The level of thermal stress related blood hormones such as triiodothyronine (T_3), thyroxine (T_4) and cortisol hormones were estimated by Radioimmunoassay (RIA) using RIA kits supplied by Immunotech, France. The tracer I-125 was used in the estimation technique which involved competition between free and isotope tagged hormones for binding to the limited antibody sites and subsequently quantification was made through calibration curve. The estimation was done in 6 well Automatic gamma counter, Startec, West Germany. The intra and inter assay coefficient of variation were 6.3% and 7.7 % for Triiodothyronine, 6.2 % and 8.6 % for thyroxine and 5.8 % and 9.2 % for cortisol. Statistical analysis was carried out by using ANOVA¹³.

RESULTS AND DISCUSSION

Triiodothyronine (nmol/l)

The mean values of Triiodothyronine (T_3) concentration at different months in group I and group II are presented in Table 1. The mean values of Triiodothyronine ranged from 1.00 ± 0.28 to 1.08 ± 0.30 nmol/l and 1.02 ± 0.22 to 1.04 ± 0.32 nmol/l in Group I and Group II

respectively. The recorded mean values for T_3 ranged between 1.00 and 1.08 nmol/l. The highest T_3 value was observed during the month of March and lowest during the month of June. Analysis of variance showed that there was significant difference ($P < 0.05$) between different months. These observations were in agreement with other workers^{8,11}. The exposure of animal to high environmental temperature depresses the functional activity of thyroid gland, thereby causing a relatively lower concentration of thyroid hormones in summer. During winter, oxidative metabolism and heat production increase under the influence of T_3 and T_4 , so their concentration in blood rises in winter while decline during summer, enables the animals to compensate for the higher environmental temperature¹².

Thyroxine (nmol/l)

The mean values of Thyroxine ranged from 44.70 ± 1.20 to 46.30 ± 1.20 and 44.20 ± 1.20 to 45.32 ± 1.80 nmol/l in Group I and Group II respectively (Table 1). The recorded mean values for T_4 ranged between 44.20 to 46.30 nmol/l in both the groups. The highest T_4 value was found in group I during the month of May. Similar observations were made by other workers^{8,9,10}. Analysis of variance showed that there was no significant difference between different months and between the two groups.

Cortisol (nmol/l)

The mean values of Cortisol ranged from 60.26 ± 1.36 to 61.50 ± 1.76 nmol/l and 60.30 ± 0.71 to 62.75 ± 1.07 nmol/l in Group I and Group II respectively (Table 1). The recorded mean values for cortisol ranged from 60.26 to 62.75 nmol/l which was above the normal value. The higher level of cortisol might be due to the stress condition to the animals as a result of high environmental temperature which was in close agreement with the data recorded by other workers¹¹. Analysis of variance showed that there was no significant difference between different months and between the two groups.

Table 1: Mean \pm SE of Triiodothyronine (T₃), Thyroxine (T₄) and Cortisol (nmol/l) in growing swamp buffalo calves during Pre-monsoon and Monsoon under agro-climatic condition of Assam

Month	T ₃ (nmol/l) (Mean \pm SE)		T ₄ (nmol/l) (Mean \pm SE)		Cortisol (nmol/l) (Mean \pm SE)	
	Group I	Group II	Group I	Group II	Group I	Group II
March	1.08 \pm 0.30 ^b	1.04 \pm 0.32 ^b	45.42 \pm 1.20	45.32 \pm 1.80	60.32 \pm 1.91	60.30 \pm 0.71
April	1.03 \pm 0.31 ^a	1.02 \pm 0.30 ^a	45.32 \pm 1.20	44.30 \pm 1.20	60.26 \pm 1.36	62.75 \pm 1.07
May	1.02 \pm 0.32 ^a	1.04 \pm 0.34 ^b	46.30 \pm 1.20	45.25 \pm 1.20	60.45 \pm 1.30	60.45 \pm 1.30
June	1.00 \pm 0.28 ^b	1.03 \pm 0.23 ^a	45.30 \pm 1.80	45.30 \pm 1.30	61.50 \pm 1.76	60.45 \pm 1.25
July	1.03 \pm 0.30 ^a	1.02 \pm 0.22 ^a	44.70 \pm 1.20	45.30 \pm 1.35	60.34 \pm 1.91	62.36 \pm 1.49
August	1.02 \pm 0.20 ^a	1.03 \pm 0.30 ^a	45.50 \pm 1.30	44.20 \pm 1.20	60.32 \pm 0.97	61.37 \pm 1.33

Means showing different superscripts in a column within the group differ significantly (P<0.05).

CONCLUSION

The study of hormonal profiles revealed that the mean values for serum T₃ were found below normal in both the groups. Serum T₄ levels were found within the normal range. However, serum cortisol levels were found to increase than normal

value in both the groups during both pre-monsoon and monsoon periods.

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