



Variation and Correlation of Plasma Cortisol and THI in Mithun Calves During Different Seasons and at Different Altitudes

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Abstract – Mithuns are animals of high hills and are quite adaptable in that range. Plasma cortisol concentrations have been used as physiological markers of stress. A comparative study on variation and correlation with plasma cortisol and THI during different season and at different altitudes in Mithun calves was carried out at Medziphema farm (300 MSL) and Porba farm (2100 MSL) Nagaland, India. The mithuns of either sex were selected and fed in confined condition. Plasma cortisol level was 4.08, 3.21, 2.89 and 2.70 ng/ml respectively when THI values were 73.74, 61.91, 67.66 and 53.41 respectively at Medziphema and Porba farm during summer and winter season. Positive correlation of 0.158 and 0.253 was obtained between cortisol and THI at Porba farm during winter season. It was concluded that there is a significant variation and correlation between cortisol level and THI at different altitude and during different seasons.

Keywords – Mithun, Altitude, THI, Plasma Cortisol.

I. INTRODUCTION

Mithuns are animals of high hills and are quite adaptable in that range. Plasma cortisol concentrations have been used as physiological markers of stress. The minimum, mean and maximum THI of 64, 72 and 76 respectively was reported by Igono *et al.* (1992) in cattle. Wise *et al.* (1988) found that the serum cortisol concentration were higher in heat stress cows compared to cows maintained under cooling. Aggarwal *et al.* (2010) found that the plasma cortisol concentration was higher ($P < 0.01$) and varied from 4.80 vs. 2.60 ng/ml in Murrah buffaloes when they were kept in water showers in comparison to water pond buffaloes.

II. MATERIALS AND METHOD

Six Mithun calves were selected irrespective of sex and strains at National Research Centre on Mithun, Jharnapani (300 MSL) and at Porba farm (2,100 MSL). The animals were kept in confined condition during pre - monsoon season (March - June) and winter (Nov- Feb). THI for a particular day was calculated according to the following formula $THI = 0.72 (W+D) + 40.6$ as suggested by Kadzere *et al.* (2002), where W stood for wet bulb temperature ($^{\circ}C$) and D for dry bulb temperature ($^{\circ}C$). The blood samples were collected at weekly intervals during the whole experiment from the jugular vein into properly labelled test tubes containing heparin solution (20 I.U

heparin per ml) in the morning at 6.30 am before feeding. Immediately after sampling, the blood was centrifuged at 3000 rpm for 15-20 minutes; the plasma was separated and was stored frozen in cryovials at $- 20^{\circ} C$ for further analysis of Plasma cortisol. Cortisol was analysed using Cortisol assay design technology (Kit). All the statistical analyses have been performed using the SPSS (1999) software package, version 10.0.1 and all data were presented as mean \pm SE.

III. SUMMARY AND CONCLUSION

The values of plasma cortisol (ng/ml) in different seasons (Pre - monsoon and winter) at different altitudes (Medziphema: 300 m MSL and Porba 2100 m MSL) is presented in Table 1. It was found that plasma cortisol was significantly higher at both the altitude during pre monsoon season as compared to winter season. These findings were in close agreement with the findings of Alvarez and Johnson (1973) who reported that the acute environmental heat exposure can cause a transient increase in circulating gluco - corticoid that may subsequently decrease even though body temperature remains elevated during chronic heat exposure. Massip *et al.* (1974) reported that the mean values of cortisol in adult cattle was 5.1 ng/ml. Increase in plasma cortisol with increase in THI was reported by Bouraoui (2002) and Aggarwal *et al.* (2010) in cows and Murrah buffaloes. The elevated level of cortisol in the present study may be attributed to increase in THI levels during pre-monsoon and winter season at lower altitude when compared pre-monsoon and winter season at higher altitude.

The value for correlation between THI and plasma cortisol level in different season and at different altitudes is presented in Table 2. A positive and significant correlation between THI and cortisol was found during winter season at higher altitude. Bouraoui (2002) found that the THI was positively correlated to cortisol (0.31) in cows.

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Table 1: Variation in plasma concentration of cortisol (ng/ml) and THI in different seasons at different altitudes

Particulars	Season	
	Pre -monsoon	Winter
Plasma cortisol (ng/ml)		
Medziphema (300 msl)	4.08 ^a ± 0.14**	3.21 ^b ± 0.12*
Porba (2100 msl)	2.89 ± 0.10**	2.70 ± 0.13*
THI		
Medziphema	73.74 ^a ± 0.12**	61.91 ^b ± 0.34**
Porba	67.66 ^a ± 0.35**	53.41 ^b ± 0.48**

** ($P < 0.01$); * ($P < 0.05$); ^{a,b} ($P < 0.01$)

Table 2: Correlations between THI and plasma cortisol level in different season and at different altitudes

Particular	Pearson Correlation coefficient (r)
Season	
Pre - monsoon	0.024
Winter	0.158*
Farm	
Medziphema	0.011
Porba	0.253**
Overall	0.099

** ($P < 0.01$); * ($P < 0.05$)

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