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Effect of Feeding and Housing Systems on T_3, T_4 and Cortisol Concentration of Kankrej Cows During Different Seasons

Chauhan HD, Patel HA, Makwana RB, Srivastava AK, Prajapati KB, Suthar BN, Latif A, Ashok P Patel, Pawar MM, Bhagwat SR

Department of Livestock Production & Management, College of Veterinary Science and Animal Husbandry, Sardarkrushinagar Dantiwada Agricultural University Sardarkrushinagar, Dist: Banaskantha, GUJARAT

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Abstract

Eighteen lactating Kankrej cows were subjected to three housing systems viz., RCC shed (T_1), Thatched roof (T_2) and Tree shelter (T_3). Serum concentration of T_3 (Tri-iodothyronine), T_4 (Thyroxin) and Cortisol hormones was estimated once in a season for one year. The overall average serum concentration (ng/ml) of Tri-iodo thyronine (T_3) recorded under T_1, T_2 and T_3 was 0.96 ±0.01, 0.89 ±0.02 and 0.90 ±0.02 respectively. The difference due to treatments, seasons and their interaction was non-significant. The overall average serum concentration (ng/ml) of Thyroxin (T_4) recorded under T_1, T_2 and T_3 was 25.17 ±0.9, 26.41 ±1.0 and 26.39 ±0.8, respectively. It was significantly ($P < 0.05$) higher in winter (37.30 ±1.0) as compared to monsoon (27.03 ±1.0) and summer (13.65 ±0.70), while difference due to treatments was non-significant. The average serum concentration (ng/ml) of Cortisol recorded under T_1, T_2 and T_3 was 11.41 ±0.5, 12.57 ±0.5 and 12.11 ±0.6 respectively. The difference due to treatment was non-significant.

Keywords: Hormone; Cattle; Stress.

Corresponding author: Dr. S.R. Bhagwat, Professor & Head, Dept. of Animal Nutrition, College of Veterinary Science and Animal Husbandry, SDAU, Sardarkrushinagar – 385 506, Gujarat. Email: shekhar.bhagwat@gmail.com

Introduction

Milk and milk products are widely accepted source of animal protein. Milk plays a major role in economic significance in cattle and buffaloes. India has emerged as leading milk producing country in the world (FAO, 2002). Milk harvesting is an art and science as well as it is the most important aspects on a dairy farm management (Bhagat *et al.*, 1992). Full co-operation of the milch animal is required for harvesting clean and maximum milk. In flush season higher milk production is seen while reverse trend is observed in lean season. Thus, the present experiment was conducted to find out effect of season on different milking attributes in Kankrej cows.

Material and Methods

Eighteen lactating Kankrej cows of almost same stage of lactation, level of production and body weight were selected for present study. These cows were divided into three groups of six animals each. Each group was randomly allotted to one of the three treatments viz., RCC shed (T_1), Thatched roof (T_2) and Tree shelter (T_3). The experiment was conducted for one year covering all the three seasons. Individual feed and water consumption was recorded by providing measured quantity of roughages, concentrate and water to each cow at fortnightly interval every month. Individual serum hormone concentration was analysed for T_3(Tri-iodo thyronine), T_4 (Thyroxine) and Cortisol hormones once in a season for one year by using ready made kit supplied by Jainam biomedicals. The collected data were analyzed by standard statistical methods (Snedecor and Cochran, 1994).

Results and Discussion

Feed intake

The overall average daily feed intake (kg/animal/day) recorded in T_1, T_2 and T_3 were 12.41±0.17, 11.65± 0.19and 10.64±0.14, respectively and was significantly (Pd"0.05) higher in T_1, T_2 and T_3.

Water intake

The overall average water intake recorded under T_1, T_2 and T_3 were 40.0±0.23, 36.28±0.17 and 36.10±0.26 litre / animal / day, respectively and the differences were statistically significant.

Table 1: Mean sum of squares of different hormones in Kankrej cows

Source	d.f.	Tri-iodothyronine (T-3)	Thyroxin (T-4)	Cortisol
Treatment (T)	2	0.004	11.81	0.292
Season (S)	2	0.001	51.75*	1.803
T x S	4	0.002	6.066	1.892
Error	45	0.01	16.172	0.975

* Significant ($P < 0.05$).

Tri-iodothyronine (T-3)

The overall average serum concentration (ng/ml) of hormone T-3 recorded under T_1 (RCC shed), T_2 (Thatched roof shed) and T_3

Table 2: Mean sum of squares of different hormones in Kankrej cows

Straw type	Quantity			End use & Total		
	(000 tonnes)	Fodder	Manure	Burnt	Sold	Miscelaneous
Rice straw	09.852	06.5	00.9	81.4	04.8	05.8
Wheat straw	18.972	42.6	00.2	48.2	08.1	01.0

* Significant (P < 0.05)

(Under tree) was 0.96 ± 0.01, 0.89 ± 0.02 and 0.90 ± 0.02, respectively. In summer season, the average serum concentration (ng/ml) of T-3 for T_1 was 0.86 ± 0.01. The corresponding value for T_2 and T_3 was 0.82 ± 0.03 and 0.79 ± 0.02, respectively. In monsoon season, average serum concentration of Tri-iodothyronine for T_1 was 0.91 ± 0.01. The corresponding values for T_2 and T_3 were 0.89 ± 0.02 and 0.93 ± 0.01, respectively. In winter season, average serum concentration of Tri-iodothyronine for T_1, T_2 & T_3 were 1.1 ± 0.02., 0.96 ± 0.01 and 0.97 ± 0.04, respectively.

The analysis of variance (Table 4.3.2) revealed that there were non-significant differences between treatments, seasons and their interaction. These findings are corroborated with findings of Vazhapilly *et al*. (1990), while Yousef *et al*. (1997) and Kataktalware (2004) found significant effect due to different shelters. This might be due to those experiments were carried out at different places and in other breeds.

Thyroxin (T-4)

The overall average Thyroxin concentration (ng/ml) in T_1 (RCC shed), T_2 (Thatched roof shed) and T_3 (Under tree) was 25.17 ± 0.9, 26.41 ± 1.0 and 26.39 ± 0.8, respectively.

In summer season, the average serum T-4 concentration (ng/ml) for T_1 was 11.15 ± 0.6. The corresponding values for T_2 and T_3 were 16.45 ± 0.90 and 13.34 ± 0.80, respectively. In monsoon season, the average serum T-4 concentration for T_1, T_2 and T_3 was 27.43 ± 1.2, 25.36 ± 0.80 and 28.30 ± 0.90, respectively. In winter season, the average serum T-4 concentration for T_1, T_2 and T_3 was 38.22 ± 0.90, 36.93 ± 1.30 and 37.43 ± 0.80, respectively.

Analysis of variance showed non-significant difference in serum T-4 concentration. However, the difference due to season was significant (Table 4.3.2). It was significantly (P < 0.05) higher in winter (37.53 ± 1.00) followed by monsoon (27.03 ± 1.00) and summer (13.65 ± 0.70). In winter, it was higher due to increase metabolism, required for heat generation in the body.

Chickamune *et al*. (1986) and Vazhapilly *et al*. (1990) also observed effects of climatic changes on concentrations of thyroid hormones. These results differ with the results reported by Muller and Both (1995).They found similar levels of T-4 in unsheltered, sheltered dry lot and barned cows.

Cortisol

The level of Cortisol in serum has been used as stress indicator.

The overall cortisol concentration (ng/ml) for T_1 (RCC shed) was 1.41 ± 0.5. The corresponding values for T_2 (Thatched roof shed) and T_3 (Under tree) were 12.57 ± 0.5 and 12.11 ± 0.6, respectively. In summer season, the average serum Cortisol concentration (ng/ml) for T_1, T_2 and T_3 was 10.50 ± 0.40, 11.89 ± 0.20 and 10.60 ± 0.60, respectively.

In monsoon season, the average serum Cortisol concentration for T_1, T_2 and T_3 was 11.84 ± 0.80, 12.73 ± 0.50 and 12.81 ± 0.70, respectively, while corresponding values in winter season for T_1, T_2 and T_3 were 11.89 ± 0.20, 13.10 ± 0.90 and 12.51 ± 0.40, respectively.

Conclusion

It can be concluded that all three housing systems provided sufficient shelter against weather stress as far as hormone levels are concerned during experimental period.

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References

1. Chickamune T, Kanai Y, and Shimizu H. Comparison of the effects of seasonal-climatic changes on thermoregulatory responses and plasma concentrations of thyroid hormones in swamp buffaloes and cattle. *Japanese J Zootech Sci.* 1986; 57(9): 778-784.
2. Kataktalware MA. Studies on production performance, behaviour and physiological parameters of crossbred dairy cattle under different shelter management systems. *Ph.D. Thesis*, NDRI, Karnal. (1986).
3. Snedecor GW, and Cochran WG. *Statistical Methods*. 8th Edn. New Delhi: Oxford and IBH Publ Co Pvt Ltd; 1994.
4. Vazhapilly, Frazzi E, Lombardelli R, Maianti MG, and Cappa V. Effect of microclimate on the physiological and metabolical responses of dairy cows and on milk quality. *Dairy Sci Abstr.* 1990; 55: 48.
5. Yousef HM, Habeeb AA, and El-Kousey H. Body weight gain and some physiological changes in Friesian calves protected with wood or reinforced concrete sheds during hot summer season of Egypt. *Egyptian J Anim Prod.* 1997; 34(2): 89-101.