

Factors affecting physiological parameters of crossbred calves fed on molasses

S. DUTTA, J. HUSSAIN¹, R. ROYCHOUDHURY², R. BHUYAN³ and J. SAHARIA

Department of Livestock Production and Management

College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati-781022

Received: 19.02.2020; Accepted: 25.12.2021

ABSTRACT

Thirty two crossbred calves (16 each from Holstein Friesian and Jersey crossbred) at one week of age, with equal number of male and female were divided into four groups such as Group-1 (fed no molasses), Group-2 (20gm/ kg calf starter), Group-3 (40gm/ kg calf starter) and Group-4 (60gm/ kg calf starter). Calf starter (CP- 21% and TDN-75%) composed of crushed maize, wheat bran, rice polish, ground nut cake, mustard oil cake, skimmed milk powder, mineral mixture and common salts @ 44, 12, 10, 25, 5, 1, 2 and 1 percent respectively. Antibiotic powder Lixen (Cephalexin oral powder) was mixed with calf starter @ 20gm/ 100 kg of feed. Recording of physiological parameters such as rectal temperature (RT), pulse rate (PR) and respiration rate (RR) was done early morning at 8:30 am at fortnight interval from 7th to 97th day of age. Overall average RR, PR and RT did not differ statistically with respect to breeds and treatment. However, there was significant ($p < 0.01$) difference of overall RT due to sex and age. The overall average RT of female calves was significantly higher (102.26 ± 0.06 °F) than the male calves (101.85 ± 0.06 °F). In respect of age it was significantly lower on 97th day old calves (101.81 ± 0.14 °F). The overall average PR differed significantly ($p < 0.01$) due to age and sex ($p < 0.05$) and RR differed significantly ($p < 0.01$) due to age only. The overall average PR minute was significantly higher in female (83.63 ± 0.24) than the male calves (83.16 ± 0.21). Both PR and RR per minute were observed to be gradually declined with advancement of age with significantly lower average on 97th day of age (80.69 ± 0.48 and 23.47 ± 0.24 , respectively).

Key words: Crossbred calves, Pulse and respiration rate, Rectal temperature

Physiological parameters like rectal temperature (RT), pulse rate (PR) and respiration rate (RR) are the indicators of the health status of an animal. Though the cattle and buffaloes are homeostatic animals, slight variation in RT may occur due to fluctuation in environmental temperature. It was revealed by the report⁵ that in cattle, buffalo, sheep and goat the RT was influenced by the variation in ambient temperature. The RT, RR and PR of young calves and other small animals are generally higher than in the adult animals. In a study¹ it was reported higher heart rate (HR) and RR in the male

than the females calves. The mean RT, RR and PR were significantly higher in young animals than in adult cows and bulls⁶. These parameters are helpful for spotting a sick animal in a herd. Moreover in the prevailing conditions of climate change and global warming, it is likely to cause variation in the physiological parameters of livestock. Therefore, present investigation was carried out to study the basic physiological parameters (RT, RR and PR) of crossbred calves and their variations due to feed, breed, age and sex.

MATERIALS AND METHODS

The crossbred calves (16 Holstein Friesian crossbred and 16 Jersey crossbred) divided into four groups at one week of age, keeping uniformity in sexes and breeds. The group-1, 2, 3 and 4 were fed without molasses, 20 gm, 40 gm and 60 gm

Part of M.V.Sc. thesis

- 1 Corresponding author: Professor, Dept. of LPM, CVSAAU, Khanapara, Assam. Email: drjakir@gmail.com
- 2 Professor & Head, Department of LPM, CVSAAU Khanapara, Assam
- 3 Professor & Head, Department of Animal Nutritional, College of Veterinary Science, AAU, Khanapara, Guwahati-781022;

molasses per kg calf starter, respectively. The calf starter ration (CP 21% and TDN-75%) was constituted with crushed maize, wheat bran, rice polish, ground nut cake, mustard oil cake, skimmed milk powder, mineral mixture and common salts @ 44, 12, 10, 25, 5, 1, 2 and 1 percent, respectively. The antibiotic powder Lixen* (Cephalexin oral powder) was mixed with calf starter ration at the rate of 20 gm per 100 kg of feed. The calf starter ration was provided to the calves @ 1 per cent of body weight allowed to feed *ad lib.* twice daily in a plastic bowl from 8th day of age after freshly mixing with measured quantity of molasses. Green fodder such as Para (*Bracharia mutica*), Napier (*Pennisetum purpureum*) and Guinea (*Panicum maximum*) grasses were fed along with soft paddy straw free of choice as basal diet. Calves were ensured to take optimum quantity (1/10th of body weight) of colostrum twice daily. All the experimental calves were provided whole milk in a pail @ 1/10th of body weight daily in two divided doses till a calf was able to consume 0.5 kg calf starter ration daily. The physiological parameters were recorded in the morning at 8:30 am at fifteen days interval from 7th to 97th day of age as per standard procedure. All the calves were reared under standard management conditions during the period of recording. The data were sorted out as breed, sex, age and group wise for statistical analysis. The statistical analysis was done as per GLM procedure of SAS Enterprise Guide¹⁰.

RESULTS AND DISCUSSION

The average rectal temperature (RT), pulse rate (PR) and respiration rate (RR) in male and female crossbred calves on 7th, 22nd, 37th, 52nd, 67th, 82nd and 97th day of age have been furnished in Table 1. The analysis of variance revealed highly significant ($p < 0.01$) difference in overall RT due to sex and age. The average RT (°F) were 102.23 ± 0.21 , 102.12 ± 0.13 , 102.59 ± 0.17 , 101.79 ± 0.18 , 101.88 ± 0.14 , 102.23 ± 0.18 and 102.07 ± 0.19 in Holstein-Friesian crossbred calves and 102.48 ± 0.17 , 101.72 ± 0.15 , 102.15 ± 0.15 , 101.91 ± 0.15 , 101.93 ± 0.14 , 102.10 ± 0.13 and 101.55 ± 0.19 in Jersey crossbred calves on 7th, 22nd, 37th, 52nd, 67th, 82nd and 97th day of age, respectively. The overall average RT of female calf

was significantly higher than the male calf. In respect of age, it was significantly lowest on 97th day old calves. The previous authors⁴ recorded the RT as 100.36 ± 0.03 to 101.51 ± 0.04 °F in lactating Haryana cows which were lesser than the present findings in young calves. In lactating crossbred Karan Fries cows the morning RT was reported to be 99.9-102.0 °F under sub-tropical climates⁸. As per the report¹¹, the temperature was 100.4° F in 9-15 months old crossbred calves kept in thatch house.

The average PR (per minute) were 85.81 ± 0.38 , 84.13 ± 0.77 , 84.94 ± 0.36 , 83.38 ± 0.35 , 82.75 ± 0.23 , 81.88 ± 0.24 and 80.06 ± 0.21 in Holstein-Friesian crossbred calves and 85.62 ± 0.35 , 85.00 ± 0.37 , 84.56 ± 0.33 , 83.50 ± 0.38 , 82.38 ± 0.29 , 82.25 ± 0.27 and 81.31 ± 0.92 in Jersey crossbred calves on 7th, 22nd, 37th, 52nd, 67th, 82nd and 97th day of age respectively. The overall average PR and RR differed highly significantly ($p < 0.01$) due to age groups. However, only average PR differed significantly ($p < 0.05$) between the sexes. The overall average PR was significantly higher in female than in the male calves. The previous workers⁴ recorded the PR as 51.51 ± 0.56 to 53.63 ± 0.51 per minute in lactating Haryana cows which were lesser than the present findings in young calves. Another author² reported more PR (100-120 per minute) than the present finding in young calves. In his report, it was revealed that normal temperature of cattle was 101.5°F.

The average RR (per minute) were 27.19 ± 0.40 , 29.38 ± 0.30 , 29.00 ± 0.40 , 27.00 ± 0.27 , 25.38 ± 0.26 , 24.75 ± 0.20 and 23.94 ± 0.36 in Holstein-Friesian crossbred calves and 27.56 ± 0.41 , 29.06 ± 0.39 , 28.63 ± 0.30 , 26.25 ± 0.30 , 25.63 ± 0.26 , 24.63 ± 0.26 and 23.00 ± 0.27 in Jersey crossbred calves on 7th, 22nd, 37th, 52nd, 67th, 82nd and 97th day of age, respectively. Though the overall average RR was apparently higher in female calves, but it did not differ statistically. Both the PR and RR were observed to be gradually declined with advancement of age with significantly lowest average on 97th day of age. The previous workers⁴ recorded the RR 10.56 ± 0.09 to 13.71 ± 0.1 per minute in lactating Haryana cows which was less than the present findings in young calves. As per the report of previous¹¹, the RR

was 17.32 per minute in 9-15 months old crossbred calves kept in thatch house. The earlier author² reported the range of RR as 10-30 per minute. The PR observed in the present investigation was less than the report of previous workers², but RR was within the range.

In the present investigation the RT, PR and RR of the calves were within the normal range and there

were no difference between the breeds. Previous authors⁷ studied the comparative physiological response of four genotypes of cattle such as Jersey x (Holstein x Gir), Holstein x (Jersey x Gir) and their inter-se crosses and found that RR and PR showed variation among seasons while breed type affected PR only and had no effect on RR and RT.

Table 1. Average (mean± se) rectal temperature (°f), pulse rate (per minute) and respiration rate (per minute) of crossbred calves

Parameters	Age	Male	Female	Overall (μ)
Rectal temperature (°F)	7 th	101.93 ± 0.18	102.80 ± 0.13	102.36 ± 0.13 ^A
	22 nd	101.78 ± 0.14	102.06 ± 0.15	101.92 ± 0.10 ^{BC}
	37 th	102.23 ± 0.17	102.52 ± 0.16	102.37 ± 0.12 ^A
	52 nd	101.79 ± 0.19	101.91 ± 0.13	101.85 ± 0.11 ^C
	67 th	101.70 ± 0.14	102.10 ± 0.13	101.90 ± 0.10 ^{BC}
	82 nd	102.03 ± 0.13	102.30 ± 0.17	102.17 ± 0.11 ^{AB}
	97 th	101.53 ± 0.19	102.09 ± 0.18	101.81 ± 0.14 ^C
	Overall	101.85 ± 0.06 ^a	102.26 ± 0.06 ^b	-
Pulse rate (per minute)	7 th	85.50 ± 0.40	85.94 ± 0.32	85.72 ± 0.25 ^A
	22 nd	84.63 ± 0.42	84.50 ± 0.76	84.56 ± 0.43 ^B
	37 th	84.50 ± 0.37	85.00 ± 0.32	84.75 ± 0.24 ^B
	52 nd	83.13 ± 0.31	83.75 ± 0.39	83.44 ± 0.25 ^C
	67 th	82.56 ± 0.30	82.56 ± 0.22	82.56 ± 0.18 ^D
	82 nd	81.75 ± 0.23	82.38 ± 0.26	82.06 ± 0.18 ^D
	97 th	80.06 ± 0.23	81.31 ± 0.91	80.69 ± 0.48 ^E
	Overall	83.16 ± 0.21 ^a	83.63 ± 0.24 ^b	-
Respiration rate (per minute)	7 th	30.00 ± 0.45	29.75 ± 0.37	29.88 ± 0.29 ^A
	22 nd	29.13 ± 0.31	29.31 ± 0.38	29.22 ± 0.24 ^B
	37 th	29.00 ± 0.37	28.63 ± 0.34	28.81 ± 0.25 ^B
	52 nd	26.56 ± 0.24	26.69 ± 0.35	26.63 ± 0.21 ^C
	67 th	25.25 ± 0.21	25.75 ± 0.28	25.50 ± 0.18 ^D
	82 nd	24.38 ± 0.22	24.75 ± 0.23	24.56 ± 0.16 ^E
	97 th	23.44 ± 0.30	23.50 ± 0.38	23.47 ± 0.24 ^F
	Overall	26.82 ± 0.25	26.91 ± 0.24	-

Values with different superscripts differ significantly ($p < 0.05$) in a row and Values with A,B,C,D differ across columns

Some authors⁹ mentioned the average RT of calves during morning hours as 100.4°F in pre-monsoon months as compared to 101.1°F in monsoon months. The average RT of the calves during evening hours was found as 101.4°F in pre-monsoon months as compared to 102.2°F in monsoon months. The PR ranged from 55

to 62 per minute in the pre-monsoon months in comparison with 57 to 65 per minute in the monsoon months. The lowest mean RR was recorded as 17.0 ± 0.31 and the highest mean RR was 18.8 ± 0.41 per minute in the pre-monsoon months. The author³ reported average RT and RR

as 39.15 °C and 27.24 per minute in crossbred calves.

CONCLUSION

The rectal temperature, pulse and respiration rate of the crossbred calves were within the normal range and there were no significant difference between the breeds. But average rectal temperature of female crossbred calves was significantly higher than the male crossbred calves and in respect of age it was significantly lowest in 97th day old calves. The average pulse rate was significantly higher in female crossbred calves than the male crossbred calves. Though the overall average respiration rate was apparently higher in female crossbred calves, but it did not differ significantly. Both the pulse and respiration rate were observed to decline with advancement of age with significantly lowest average in 97th day old calf.

REFERENCES

1. Abera, M., Yusuf Mammed, Y., Eshetu, M., Pilla, F. and Wondifraw, Z. 2021. Physiological, biochemical and growth parameters of Fogera cattle calves to heat stress during different seasons in sub-humid part of Ethiopia. *Animals*. **11**(4):1062. <https://doi.org/10.3390/ani11041062>
2. Blood, D. C. and Henderson, J.A. 1968. *Veterinary Medicine*, Third edition. The English Language Book Society and Bailliere, Tindall and Cressell. Part One, General Medicine. Chapter 1:1-23.
3. Kamal, R.; Dutta, T., Patel, B. H. M., Dey, A., Chandran, P. C., Barari, S. K., Chakrabarti, A. and Bhusan, B. 2014. Effect of shade materials on microclimate of crossbred calves during summer, *Veterinary World* **7**(10): 776-783
4. Lal, S.N.; Verma, D.N. and Hussain, K.Q. 1987. Effect of air temperature and humidity on the feed consumption, cardio-respiratory response and milk production in Haryana cows. *Indian Vet. J.* **64**: 115-121.
5. Minett, F.C. and Sen, S. 1945. Study of rectal temperature in water buffaloes, zebu cows, sheep, goat and fowl at different times of the day and in different months in Izatnagar. *Indian J. Vet. Sci.*, **15**:62.
6. Naik, B., Kumar, A., Ravi, A., Bramhaiah, K., and Chakravarthi, V. 2013. Effect of Seasons on Physiological and Hematological Values in Punganur Cattle. *Int. J. Pharma Biol. Sci.* **4**(4):40-49.
7. Nema, R.K., Singh, V.P. and Singh, H.S. 1993. Comparative physiological responses and milk production of four genotypes of cattle under different season. *Indian J. Anim. Prod. Mgmt.*, **9**(1):22-26.
8. Patbandha, T.K., Mohanty, T.K., Baithalu, R.K., Kumaresan, A., Bhakat, M., Golher, D., Lathwal, S.S. and Pathak, R. 2020. Evaluation of rectal temperature during the post-parturient period in crossbred cows reared under the subtropical climate. *Indian J. Anim. Res.*, **54**(1): 110-115.
9. Saikia, T. K., Goswami, J., Sarmah, B. C., Sarmah, B. K., Das, G.C. and Borah, R.S. 2013. Effect of heat exposure on physiological profile in growing swamp buffalo calves under agro-climatic condition of Assam. *Indian J. Anim. Prod. Mgmt.* **29**(3-4): 25-29.
10. SAS Enterprise Guide 2009. SAS Enterprise Guide 4.2, SAS Institute Inc. Cary, NC, USA.
11. Yazdani, A. R. and Gupta, L. R. 2000. Effect of housing and feeding systems of feed utilization and physiological responses in crossbred calves. *Indian J. Dairy Sci.*, **53**(2):88-92.