

# **Effect of Heat Stress on the Productive and Reproductive Performances of Crossbred Dairy Cattle at Chattogram**



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Roll No. 0118/06

Registration No. 493

Session: 2018-2019

**A thesis submitted in partial fulfillment of the requirements for the degree of  
Master of Science in Dairy Science**

**Department of Dairy and Poultry Science  
Faculty of Veterinary Medicine  
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**DECEMBER 2019**



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**This is to certify that we have examined the above Master's thesis and have found that is complete and satisfactory in all respects, and that all revisions required by the thesis examination committee have been made**

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Avijit Dhar  
December 2019

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*Dedicated to*

**AHAD BHAI**

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## ACKNOWLEDGEMENT

The author wishes to acknowledge the immeasurable grace and profound kindness of the creator and the supreme ruler of the universe Almighty “**GOD**” who empowers the author to complete the research work successfully.

At first the author would like to express his deep sense of respect and gratitude to **Professor Goutam Kumar Debnath**, Department of Dairy and Poultry Science, CVASU to have him as research supervisor. The author conveys his sincere gratitude to him for his guidance, suggestions, constant inspiration and constructive criticism for the successful completion of this research.

The author feels proud in expressing his deep sense of thanks **Dr. A. K. M. Humayun Kober**, Professor and Head, Department of Dairy and Poultry Science, CVASU for providing his guidance, valuable suggestions and constant inspiration to complete this research work.

The author humbly thanks to **Professor Dr. M. A. Hossain (Rony)**, Department of Dairy and Poultry Science, CVASU for providing his guidance and support to complete this research work. The author would like to thank all the other teachers and staffs of Department of Dairy and Poultry Science of CVASU, without their support and assistance this research work would be quite impossible to finish.

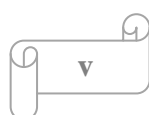
The author humbly expressing his thanks to **MD. Mannan, MD. Sujon, MD. Selim** helping hands of selected dairy farms and all of farm staffs and owners for their cordial and continuous support during this work. Without their helping hand and providing day and night assistance this research work would be quite impossible to finish.

The author would like to express his deep sense of gratitude and thanks to Honorable Vice Chancellor **Professor Dr. Goutam Buddha Das**, CVASU. The author privileges to acknowledge **CASR**, CVASU and **NST** for providing necessary research funds and other resources for this research work.

The author feels proud in expressing his deep sense of thanks to his parents, family members, seniors, juniors and well-wishers for their inspiration to finish this research.

The Author

December, 2019



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## LIST OF ABBREVIATIONS

| Abbreviations | Elaborations   |
|---------------|--|
| %             | Percentage   |
| °C            | Degree Celsius                                       |
| °F            | Degree Fahrenheit                                    |
| <             | Less than  |
| >             | Greater than   |
| 0.1N          | 0.1 Normal   |
| ACTH          | Adrenocorticotrophic Hormone                         |
| ANOVA         | Analysis of variance                                 |
| BBS           | Bangladesh Bureau of Statistics                      |
| DMI           | Dry matter Intake                                    |
| CBW           | Calf birth weight                                    |
| CMA           | Chattogram Metropolitan Area                         |
| CP            | Crude protein  |
| CR            | Conception rate                                      |
| CVASU         | Chattogram Veterinary and Animal Sciences University |
| DLS           | Department of Livestock Services                     |
| <i>et al.</i> | And his associates                                   |
| etc.          | Etcetera   |
| FSH           | Follicle stimulating hormone                         |
| GDP           | Gross Domestic Product                               |
| HF            | Holstein Friesian                                    |
| hrs           | Hours  |

|        |                            |
|--------|----------------------------|
| kg     | Kilogram                   |
| L      | Local-bred                 |
| LH     | Luteinizing hormone        |
| mg     | Milligram                  |
| ml     | Milliliter                 |
| RT     | Rectal Temperature         |
| S      | Sahiwal                    |
| sq. km | Square Kilometer           |
| THI    | Temperature Humidity Index |

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## ABSTRACT

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Cattle among the other livestock species found in Bangladesh are the most versatile component in consideration to existing integrated agricultural farming system. Chattogram is one of the most dairy developed districts of Bangladesh in the aspect of commercial dairy farming. The present study intended to determine the effect of heat stress on productive and reproductive performances of the dairy cattle of Chattogram at different farming conditions. In context of this objective, three commercial dairy farms (denoted as farm A, B, C) from Chattogram were selected considering differences in housing conditions and availability of crossbred genotypes. From the selected farms 27 cows (3 from each genotype of same lactation, from each farm) of different genotypes, grouped as  $G_1$  (HF50% $\times$ L25%),  $G_2$  (HF75% $\times$ L25%),  $G_3$  (HF50% $\times$ S50%) were picked to determine the productive performances. Along with these all dairy cows of mentioned genotypes from selected farms (n=173) were observed during the experimental period for determining the reproductive performances. During the experimental period from December, 2018 to June, 2019 the highest average temperature humidity index (THI) were  $66.22\pm 5.55$ ,  $69.82\pm 5.83$ ,  $72.80\pm 5.42$ ,  $76.43\pm 2.89$ ,  $78.93\pm 1.75$ ,  $80.29\pm 2.06$  and  $83.58\pm 2.77$  in December, January, February, March, April, May and June, respectively obtained from Farm C compared to farm A and B. The differences of THI between three farms were significant ( $p<0.05$ ). The highest rectal temperature (RT) was  $39.36\pm 0.05^\circ\text{C}$  observed in genotype  $G_2$  during June and the lowest was  $38.5\pm 0.11^\circ\text{C}$  observed in genotype  $G_1$  during December. The differences of RT in three groups were significant ( $p<0.05$ ). Highest average milk yield was  $18.88\pm 0.58$  L/day/cow in case of genotype  $G_2$  during January and the lowest was  $9.11\pm 0.12$  L/day/cow in genotype  $G_1$  during June. The differences of milk production among different genotypes in different months were significant ( $p<0.05$ ). In case of milk composition (Fat, protein) highest average percentage were obtained during cooler month and the lowest during month with low THI. As compared to  $G_1$  and  $G_3$  genotypes milk production and composition of  $G_2$  genotype had more negative impact by increased THI. For all genotypes group, the highest conception rate (62.5, 61.53 and 57.14% in  $G_1$ ,  $G_2$  and  $G_3$  genotype, respectively) was recorded in the month of December whereas the lowest rate (50, 30, and 42.12 in  $G_1$ ,  $G_2$  and  $G_3$  genotype, respectively) was observed in the month of June. The mean days open in selected groups were higher during cooler months and lower during hotter months of the trial. The highest CBW was  $35.75\pm 1.06$  kg during January in genotype  $G_2$  and which was declined upto 17.5% during May when THI exceeds thermoneutral zone. Incidence of abortion, dystocia and retained placenta were higher 66.66%, 40% and 42.85%, respectively during the month with high THI due to heat stress condition of the pregnant cows. From the result it can be concluded that housing system plays an important role in THI of the stanchion barn, that increased THI clearly affect the productive and reproductive performances of crossbred dairy cows. Cows with higher temperate blood percentage in the study are more prone to heat stress.

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**Key Words:** Heat stress, Crossbred, Temperature-humidity index, Production, Reproduction.