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Introduction

Climate change has a deleterious impact on livestock production system. Animals possess a number of phenotypic and genotypic characteristics that contribute to their adaptation to harsh environmental conditions (Figure 1). However minimal studies that assess the molecular response of dairy cows reared by small scale farmers have been reported

Aim: to monitor the molecular responses of lactating crossbred cows in Bengaluru, India, in relation to seasonal transition and the temperature humidity index (THI)

Methodology

- Study was conducted in the rising megacity, Bengaluru, India
- 40 lactating crossbred dairy cows were selected



Fig. 1 Crossbred cattle in Bengaluru, India

- The research period comprised the transitioning season of
 - late summer (June)
 - early monsoon (July)
- Gene expression in bovine peripheral blood mononuclear cells (PBMCs) was assessed at two points
- Selective genes were considered:
 - Heat stress and adaptation: *heat shock factor-1 (HSF1)*, *heat shock protein 70 (HSP70)* and *HSP90*
 - Production: *growth hormone (GH)*, *growth hormone receptor (GHR)*, *insulin-like growth factor-1 (IGF-1)* and *leptin (LEP)*
 - Inflammatory/ immune response: *interleukin 18 (IL18)*, *interferon gamma (IFN γ)*, *IFN β* and *tumor necrosis factor alpha (TNF α)*.

Results

The THI significantly influenced the relative expression profile of *HSP70*, *IL18*, *IFN γ* , *IFN β* , *TNF α* and *GH* genes in crossbred cows (Fig.2).

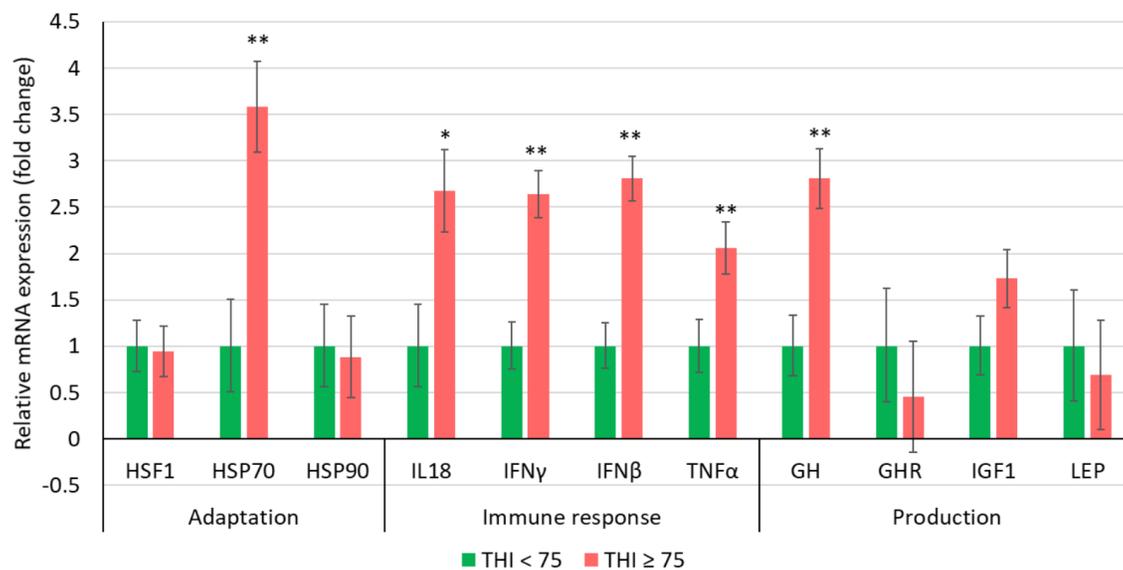


Fig.2 Relative mRNA expression (the vertical lines indicate standard errors) of selective genes in PBMCs of dairy cows within two THI classes (* $p < 0.05$; ** $p < 0.01$)

Though the relative expression profiles of the adaptation-related genes, i.e., *HSF1*, *HSP70* and *HSP90*, revealed altered expression levels, differences between seasons were non-significant ($p > 0.05$) (Fig.3). Among the immune response-related genes, the relative expression profiles of *IL18*, *IFN γ* and *IFN β* were significantly ($p < 0.01$) altered due to seasonal transition. Among the production-related genes, the relative expression of *GH* ($p < 0.01$) and *IGF1* ($p < 0.01$) was significantly up-regulated during late summer when compared to early monsoon.

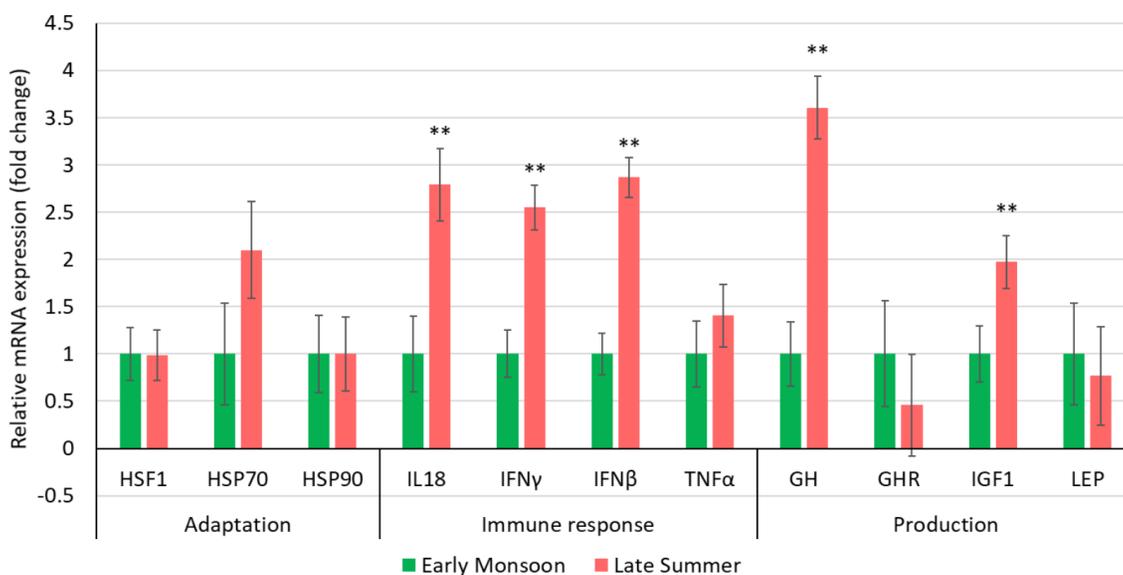


Fig.3 . Relative mRNA expression (the vertical lines indicate standard errors) of selective genes in PBMCs of dairy cows in two transitioning seasons (** $p < 0.01$).

Conclusion

The results revealed the significant influence of climatic stressors in activating both adaptation and immune response related transcripts in dairy cows. The study points towards the fact that these targeted genes could serve as biomarkers for quantifying climatic stressors in dairy cattle in tropical Savanna regions