Effect of Genotype and Temperature-Humidity Index (THI) on Milk Yield of Ankole and its Crossbreds in Rwanda

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Introduction

- Efforts to modernize the Rwanda's traditional dairy sector have involved massive introduction of exotic high performance dairy cattle since 2006
- Systematic crossbreeding of indigenous and resilient Ankole cattle with exotic breeds, is believed to confer environmental resilience and adaptation to crossbred herds, but associated with a potential risk of genetic erosion of Ankole breed
- It remains uncertain whether crossbreds have resilience to parasites and climate stress, owing to limitations of data recording and access
- Regular monitoring of heat stress indicators and animal performance over seasons may allow alternative possibilities to adjust the management and improve adaptability of dairy farms.

Objectives

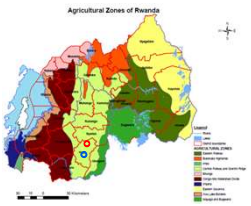
To assess the environmental effect on milk yield (**MY**) in Ankole (**AA**) and its crossbreds (with Holstein Friesian-**AF**, Jersey-**AJ** and Sahiwal-**AS**) by:

- Using measures of local relative humidity (RH) and ambient temperature (AT) to create a temperature-humidity index (THI)
- Evaluating the effect of heat stress (THI) on MY for the four breed groups.

Material

Research stations

- Central plateau, Central Agro-ecological Zone:
  - **Songa**
  - **Rubona**
  - Both in midaltitude zone (1400-1500 m.a.s.l),
- Animals raised on natural pastures. Only mineral licks ad lib
- 188 cows (AA 74, AF 40, AJ 36, AS 28)
- 61984 daily MY rec.
- THI = (1.8×AT×32) -(0.55-0.0055×RH)× (1.8×AT-26)



Statistical analysis

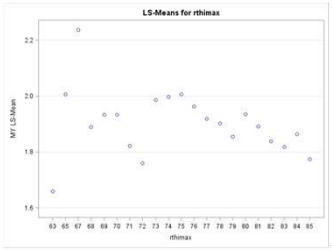
MY = μ + breed group + parity + season + b (THI-*thr*) + e where *thr* is threshold of start of heat stress

Results

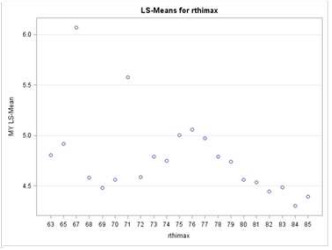
- The effect of genotype (breed group) on daily milk yield was highly significant (p< 0.0001)
- Results indicated an overall negative effect of THI values above the threshold on MY (p<0.0001), with an aggregate decline of 0.12 kg/day/THI.

Breed group	DMY LSMeans	Standard Error	THI threshold	MY change per unit of THI
AA	2.32[a]	0.10	75	-0.02
AF	4.05[c]	0.11	76	-0.08
AJ	3.30[b]	0.18	76	-0.12
AS	3.45[b]	0.21	77	-0.12

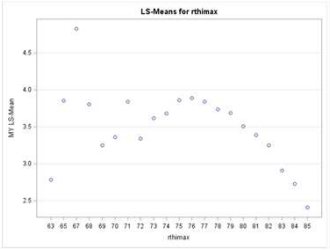
- Ankole breed showed a lower MY decline (-0.02 kg/day/THI) after the THI threshold of 75, suggesting its ability to resist heat stress with relatively milder effect on its daily milk yield.



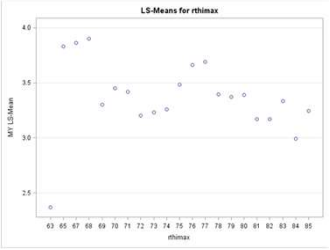
Ankole MY LSMeans as a function of THI



Ankole-Friesian crossbred MY LSMeans as a function of THI



Ankole-Jersey crossbred MY LSMeans as a function of THI



Ankole-Sahiwal crossbred MY LSMeans as a function of THI

Conclusions

- Purebred Ankole had a lower decrease in milk yield than crossbred with increasing THI above the threshold.
- However, crossbreds still had higher yield at high THI than Ankole.
- Monitoring heat stress indicators and animal performances over seasons may offer alternative possibilities to adjust the management and improve adaptability of dairy farms in tropical conditions
- Extended studies are recommended to explore potential existence of complex heterosis effects and Genotype by Environment interaction (GxE), to inform further breeding schemes
- Perspectives of long-term selection schemes for adaptability traits may be prospected, in a way to predict adapted breeding schemes for resilient and sustainable dairy farming in the country.

Courtesy picture of Ankole cows

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