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Estimating optimal operation time of korral kools on dairy cows in a desert environment

Abstract

Developing management strategies for Korral Kools will help producers provide cooling in the housing area while minimizing the operational cost of the Korral Kools system. Two experiments were conducted at a dairy in Saudi Arabia to evaluate operational time of Korral Kools for multiparous and primiparous dairy cows. For multiparous cows, running time per day of Korral Kools should be continuous, but for primiparous cows, no difference in performance was detected between 21 and 24 hours. However, producers need to be careful when reducing daily operation time of Korral Kools for primiparous cows because elevated core body temperatures were observed in both treatments.; Dairy Day, 2008, Kansas State University, Manhattan, KS, 2008; Dairy Research, 2008 is known as Dairy Day, 2008

Keywords

Dairy Day, 2008; Kansas Agricultural Experiment Station contribution; no. 09-134-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 1002; Dairy; Operation time; Korral Kools; Desert enviroment

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Estimating Optimal Operation Time of Korral Kools on Dairy Cows in a Desert Environment

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Summary

Developing management strategies for Korral Kools will help producers provide cooling in the housing area while minimizing the operational cost of the Korral Kools system. Two experiments were conducted at a dairy in Saudi Arabia to evaluate operational time of Korral Kools for multiparous and primiparous dairy cows. For multiparous cows, running time per day of Korral Kools should be continuous, but for primiparous cows, no difference in performance was detected between 21 and 24 hours. However, producers need to be careful when reducing daily operation time of Korral Kools for primiparous cows because elevated core body temperatures were observed in both treatments.

Introduction

An efficient indicator for assessing the physiological response to heat stress is elevated core body temperatures (**CBT**). The average normal CBT is 101.5 °F for dairy cows. Producers use the Korral Kools (**KK**) cooling system to increase wind speed and decrease the temperature of the air surrounding the cow. Two experiments were conducted at a dairy in Saudi Arabia to determine daily operational time of KK for multiparous and primiparous dairy cows.

Experimental Procedures

Experiment 1

Korral Kools systems were operated for 18 (18 h), 21 (21 h), and 24 (24 h) hours per day while CBT of 63 multiparous (average milk production = 97 ± 37 lb/day and 120 ± 85 days in milk) Holstein dairy cows were monitored. All treatments started at 0600 hours, and systems were turned off at 0000 and 0300 hours for the 18 h and 21 h treatments, respectively. The animals were housed in 7 different pens that were randomly assigned to the treatment sequence in a 3 × 3 Latin square design.

Experiment 2

Twenty-one multiparous (average milk production = 79 ± 37 lb/day and 144 ± 56 days in milk) and 21 primiparous cows (average milk production = 79 ± 35 lb/day and 94 ± 38 days in milk) were housed in 6 different pens. Pens were randomly assigned to a sequence of 2 treatments, 21 (21 h) or 24 (24 h) hours per day, in a switchback design. All treatments started at 0600 hours, and KK were turned off at 0300 hours for the 21 h treatment.

In both experiments, CBT measurements were obtained at 5-minute intervals by using data loggers (HOBO U12, Onset Computer Corporation, Bourne, MA) attached to intravaginal inserts. Each experiment lasted 6 days, with 3 periods of 2 days each. Cows had 1 day to acclimate to each treatment, and the second day was used to determine CBT.

Results and Discussion

Experiment 1

During the experiment, average ambient temperature was 99°F and average relative humidity was 24% (Figure 1). Cows had lower ($P < 0.05$) average CBT in the 24 h treatment than in the 18 h and 21 h treatments (102.15°F, 102.35°F, and 102.27°F, respectively, Figure 2). A significant treatment × time interaction ($P < 0.001$) was detected, with greatest treatment effects occurring at 0600 hours. Temperature means at 0600 hours were 102.99°F, 102.86°F, and 101.99°F for 18 h, 21 h, and 24 h treatments, respectively (Figure 3). These results demonstrate that reducing running time of KK cooling systems for 3 or more hours per day may lead to an increased CBT.

Experiment 2

During the experiment, average ambient temperature was 96°F and average relative humidity was 49% (Figure 4). A significant parity × treatment interaction was observed; multiparous cows on the 24 h treatment had a lower ($P = 0.008$) average CBT than multiparous cows on the 21 h treatment (102.63°F vs. 103.02°F, respectively), but treatment had no effect on average CBT of primiparous cows (103.11°F vs. 103.34°F for 21 h and 24 h, respectively). A treatment × time interaction ($P < 0.001$) was detected, with greatest treatment effects occurring at 0500 hours. Treatment means at this time were 103.24°F, 102.62°F, 103.81°F, and 102.28°F for 21 h primiparous, 24 h primiparous, 21 h multiparous, and 24 h multiparous cows, respectively (Figure 6). These results demonstrate that multiparous and primiparous cows respond differently when running time of KK cooling systems decreases from 24 to 21 hours.

Conclusions

On the basis of these results, we conclude that for multiparous dairy cows in desert climate conditions, it is advisable to operate the KK system continuously to decrease heat stress, whereas KK operating time could potentially be reduced from 24 to 21 hours for primiparous cows. Reducing operation time should be done carefully, however, because CBT was elevated in all treatments.

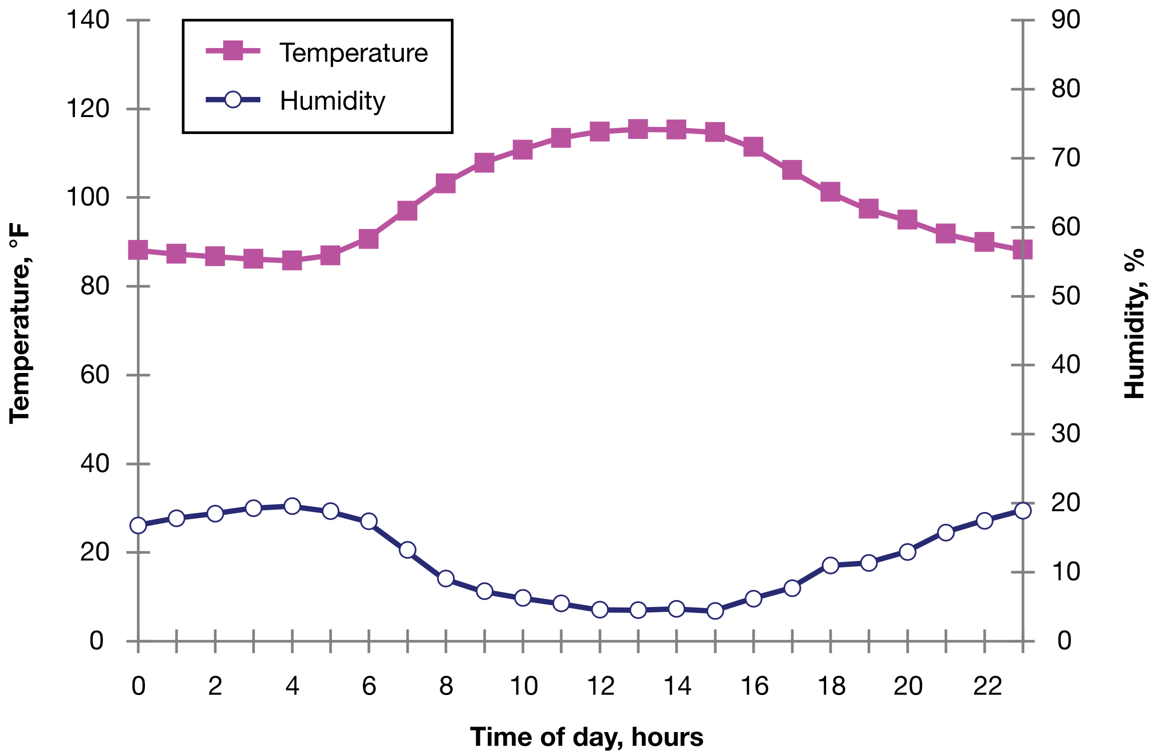

Figure 1. Average ambient temperature and relative humidity (Exp. 1).

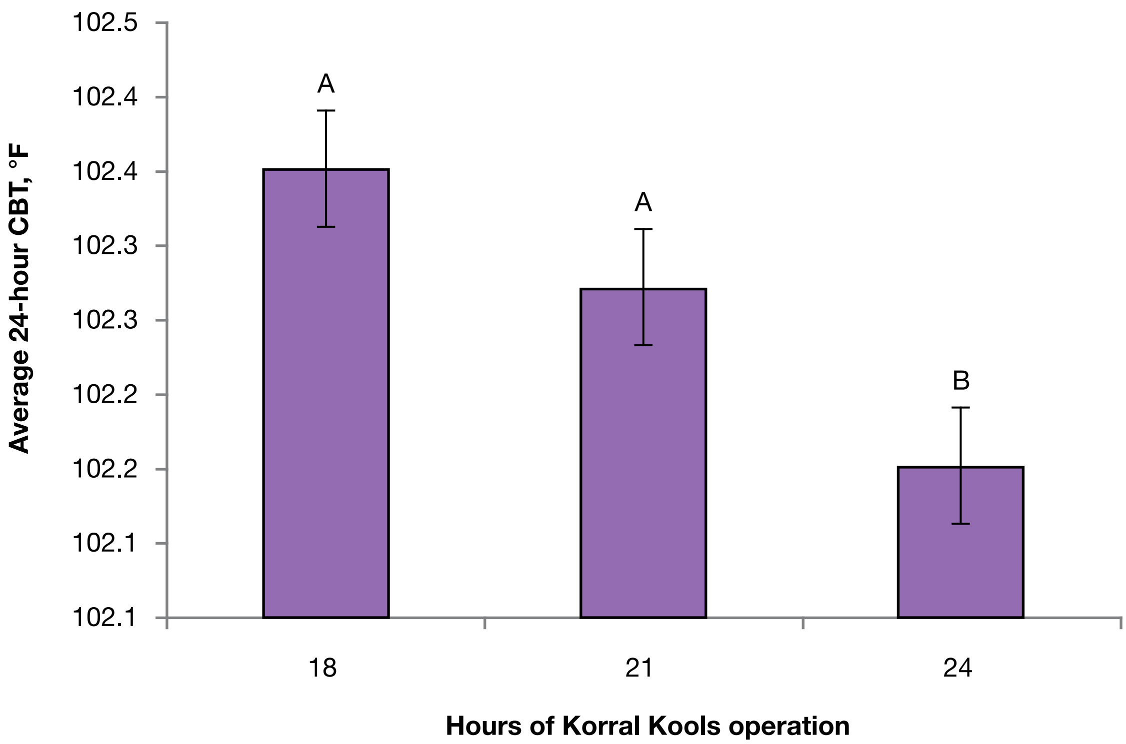

Figure 2. Average core body temperature (CBT) of multiparous cows with Korral Kools operated for 18, 21, and 24 hours per day (Exp. 1). [A-B]Values with different letters differ ($P < 0.05$).

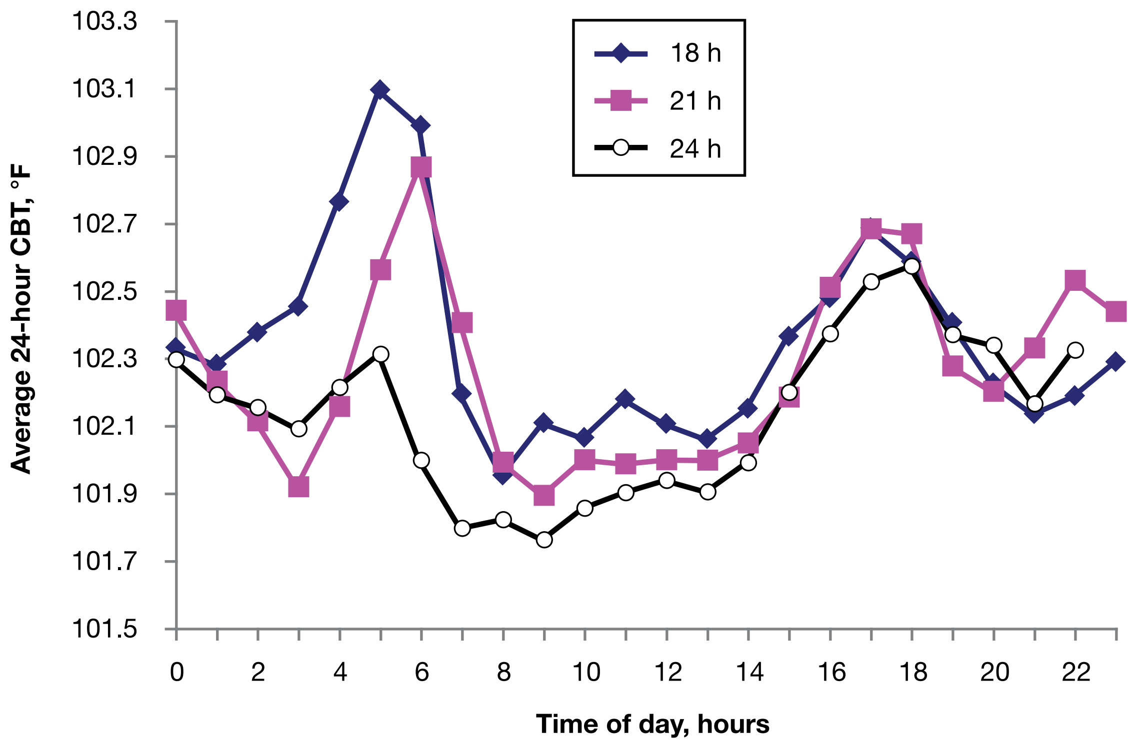

Figure 3. Running core body temperature (CBT) of multiparous cows with Korral Kools operated for 18, 21, and 24 hours per day. Treatment × time interaction ($P < 0.001$; Exp. 1).

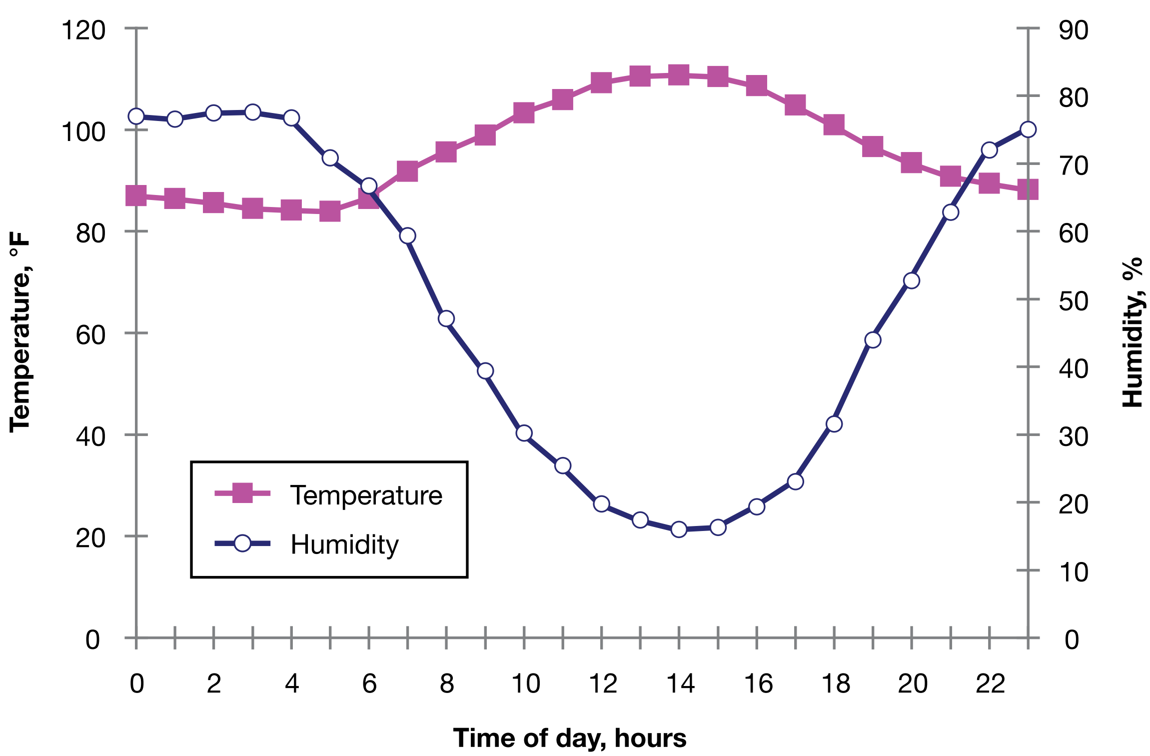

Figure 4. Average ambient temperature and relative humidity (Exp. 2).

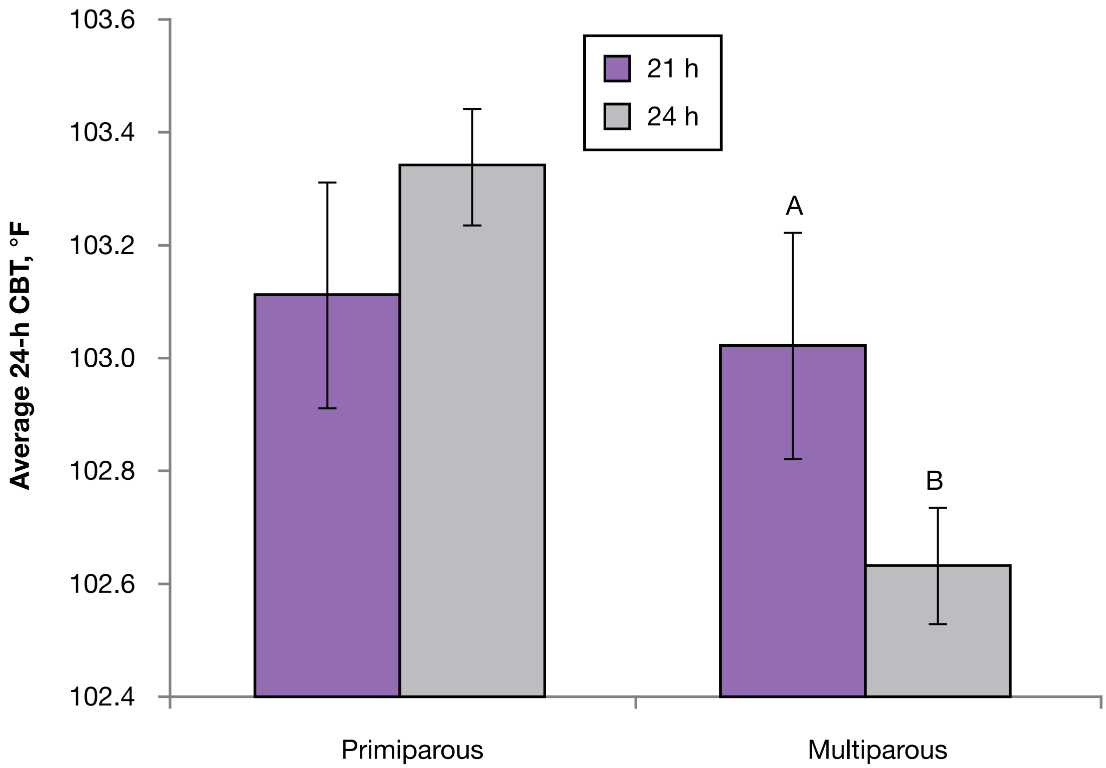

Figure 5. Average core body temperature (CBT) of multiparous and primiparous cows with Korral Kools operated for 21 and 24 hours per day (Exp. 2). [A-B]Values with different letters differ ($P = 0.008$).

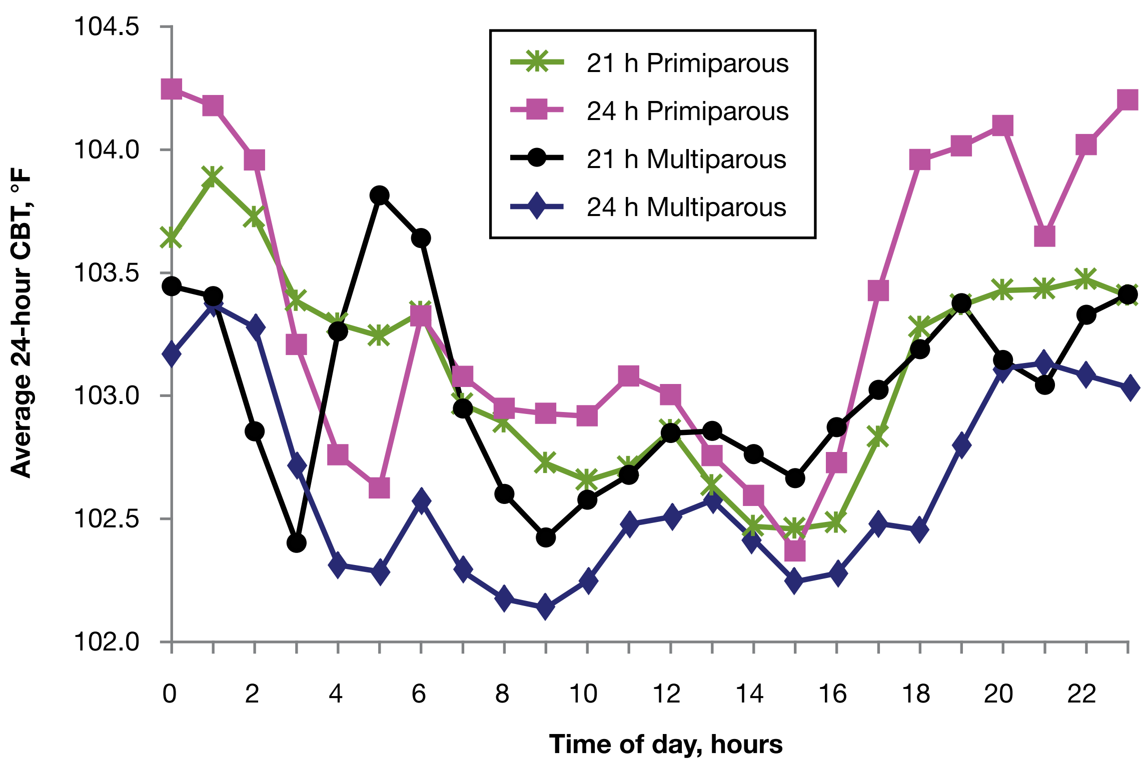

Figure 6. Running core body temperature (CBT) of primiparous and multiparous cows with KK operated for 21 and 24 hours per day. Treatment × time interaction ($P < 0.001$; Exp. 2).