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DAIRY NEWSLETTER

COOPERATIVE EXTENSION
The University of Arizona
New Mexico State University

NOVEMBER 2004

THIS MONTH'S ARTICLE:

Evaluation of Advanced Dairy Systems Shade Tracker (ADS-ST) Fans and Korral Kool (KK) Coolers on a Commercial Dairy in Arizona

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J. F. Smith[2], M. J. Brouk[2], and L. H. Baumgard[1]
The University of Arizona[1], Tucson, AZ., Kansas State University[2], Manhattan, KS

(Reprinted from the Arizona Dairy Production Conference,
November 4, 2004, Tempe, Arizona)

Dairy Day is Coming Soon!

The Annual University of Arizona Dairy Day will be held on Friday, March 4, 2005. The Golf Tournament will take place on Saturday, March 5. See inside for more information.

Arizona Dairy Day

Friday, March 4, 2005

Arizona State Fairgrounds Agriculture Building
1826 West McDowell Road
Phoenix, Arizona

Booths will be available to vendors at the following prices:

10 ft. X 10 ft.	$425
10 ft. X 20 ft.	$475
20 ft. X 20 ft.	$525
20 ft. X 30 ft.	$575
Tractors, Feed trucks or other equipment:	Inside - $200 each Outside - $100 each

Larger spaces are available upon request
One table and two chairs furnished with each space
Power, water, additional table(s) and chair(s) are available if necessary

For more information or to request space for your company,
contact Laura Rittenbah at (520) 626-9382 or via email at ljr22@ag.arizona.edu

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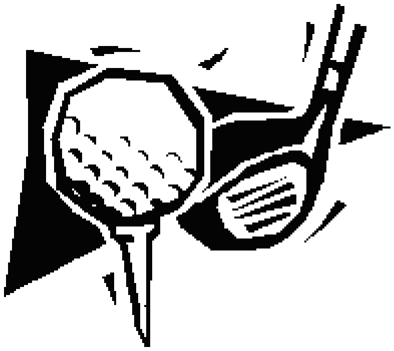
Dairy Day Golf Tournament Registration



Saturday, March 5, 2005

Club West Golf Course
16400 South 14th Avenue
Phoenix, AZ

Entry Fee:	$85.00 per person
Shotgun Start:	7:30 a.m.
Contact Person:	Matthew VanBaale
	PO Box 210038, Tucson, AZ 85721
	(520) 621-1923 or (520) 349-3532
	vanbaale@ag.arizona.edu

✂- -

Registration form. Please detach and return to address above.

☐ **Individual** ☐ **Team**

Name(s)____

Organization____________________________________

Address____

City/State/ZIP__________________________________

Phone____

Team Members:

____

____

____

Number of players _________

x $85.00

Total amount due **$**_________

Please make check payable to Matthew VanBaale

Individuals will be assigned to a team.

Dairy Day Golf Tournament
Hole Sponsorship

Sponsorship is greatly appreciated and will be $200 per hole.

Sponsorship includes:

1. Sign with your company name (If received by February 26th, 2004)

2. One Free individual registration
(If you would like to give golf balls, towels, pencils, etc., contact
Matt VanBaale at 520-349-3532 or vanbaale@ag.arizona.edu)

- -

Return by February 26, 2004

Organization____

Address____

City/State/ZIP____

Contact Person____

Phone____

Article to give away____

Name of Individual for Free Registration_________________________

Please make check for $200.00 payable to:

Matthew VanBaale
University of Arizona, Dept. Animal Sciences
PO Box 210038
Tucson, AZ 85721

Evaluation of Advanced Dairy Systems Shade Tracker (ADS-ST) Fans and Korral Kool (KK) Coolers on a Commercial Dairy in Arizona

M. J. VanBaale[1], D. Ledwith[1], R. Burgos[1], R. J. Collier[1], D. V. Armstrong[1],
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The University of Arizona[1], Tucson, AZ., Kansas State University[2], Manhattan, KS

TAKE HOME MESSAGES:

1. **Average milk yield was similar for cows in ADS-ST or KK (91.2 vs. 93.0 lbs/d) pens.**
2. **1st lactation heifers in the KK pen tended to produce more milk (83.4 vs. 81.0 lbs/d).**
3. **The initial investment for the ADS-ST was less ($58,500 vs. $118,067).**
   a. **ADS-ST = $234/cow vs. $472/cow for the KK coolers.**
4. **ADS-ST used less electricity, water and had lower daily costs ($27.30 vs. $33.36).**
   a. **Variable cost for ADS-ST = $0.11 vs. $0.15/cow/day for the KK coolers.**
   b. **Variable cost for ADS-ST = $0.10 vs. $0.14/cwt for the KK coolers.**

INTRODUCTION

Evaporative cooling systems have proven beneficial for animal productivity in areas of low humidity such as Arizona (Armstrong, 1994). The two predominant cooling systems utilized on Arizona dairies are fans with sprayers/misters (**SF**) and Korral Kool (**KK**, Mesa, AZ) coolers. Both systems are mounted on shade structures and suspended below the roof. Recently, SF systems, such as those produced by Advanced Dairy Systems-Shade Tracker (**ADS-ST**, Chandler, AZ), have been equipped with a variable speed water injection into the air stream and the fans have variable ranges of motion (270) allowing for cooling under or around shade structures as the suns position changes during the day. The KK system cools the air around the cow by injecting micron-sized water droplets into fresh air moving down the cooler (Ryan et al., 1992; Armstrong, 1994). Unlike the ADS-ST system (marketed without curtains) the KK system utilizes a curtain suspended from the western edge of the shade (running N and S) to prevent exposure to solar radiation during late afternoon. A previous study, (Annen et al., 2004) evaluated and compared earlier models of the ADS-ST and KK systems on a university dairy. Annen et al., (2004) reported that milk yield was not affected by cooling system. The KK system reduced heat stress compared to ADS-ST and operation costs for both systems were similar. They concluded that the maintenance and lifespan of two systems and their impact on reproductive performance needs to be evaluated to determine which system is most economical.

The newly designed ADS-ST and KK cooling systems have never before been simultaneously tested against each other in a controlled "on-farm" setting. Therefore objectives of the current study were: 1) to evaluate the effects of ADS-ST compared to KK coolers on milk yield, milk composition, body condition score (**BCS**), body weight (**BW**), respiration rate (**RR**), body surface temperature (**ST**), and typical reproduction and animal health parameters of lactating dairy cows: 2) to compare core (vaginal) body temperature (**CBT**) of a sub set of multiparous cows (6/treatment) housed under ADS-ST or KK conditions.

MATERIALS AND METHODS

Animals

All procedures involving animals were approved by the University of Arizona Animal Care and Use Committee. The cooling trial was conducted from 06/03/04 to 09/30/04 and the CBT trial was conducted from 08/24/04 to 08/28/04 at Stotz Dairy, Buckeye, Arizona. Four hundred multiparous and 100 primiparous, bST-supplemented, Holstein cows housed in a dry lot facility (with shade over the feed manger) were randomly assigned to one of two treatments, ADS-ST or KK cooling systems. All cows were housed in open dry-lot pens (530 sq. ft/cow) with shades (48 sq ft /cow) in the center of each pen oriented North-South. Shade dimensions were 400 ft long by 30 ft wide by 13 ft high. Prior to the study, ADS-ST and KK treatments were balanced for parity (3.2 and.

3.1), stage of lactation (81.0 and. 81.4 DIM) and milk yield (106.9 and. 107.2 lbs/day). Data from thirteen animals were omitted from the ADS-ST treatment: 7 were sold during the study (4 for mastitis, 2 for cancer and 1 for lameness) and 6 were removed because time spent in the hospital disqualified them from analysis (< 9 weeks of valid data). Data from twenty animals were omitted from the KK treatment: 10 were sold during the study (6 for digestive, 2 for lameness, 1 for mastitis and 1 for an injury), 7 died during the study (3 from pneumonia, 2 from an injury, 1 from cancer and 1 from mastitis) and 3 were removed because time spent in the hospital disqualified them from analysis (< 9 weeks of valid data). As a consequence, 188 multiparous and 99 primiparous cows on the ADS-ST treatment and 180 multiparous and 100 primiparous cows on the KK treatment were included in the analysis. All animals had ad libitum access to feed and water and a total mixed ration (TMR) balanced to meet or exceed nutrient requirements (NRC, 2001) of all animals on the experiment was fed three times daily at 0500, 1200 and 2000 h to both ADS-ST and KK pens (Table 1). One mixed load of feed from the same wagon was split between the two pens. Cows were milked back to back three times daily at 0400, 1200 and 2000 h and cows from both treatments were cooled identically while in the wash and holding pen prior to milking.

A core (vaginal) body temperature trial using a subset of 12 multiparous cows (6/treatment) from the same study which were balanced for milk yield, stage of lactation and parity was conducted over a four day period. The study was a "switch back" design, and monitored and evaluated cows CBT every minute of every hour 24 hours/ day. Vaginal temperatures were recorded using temperature data loggers (HOBO® U12 Stainless Temp Data Logger (Part @ U12-015) from Onset Computer Corporation, Bourne, MA). These devices were attached to a plastic intravaginal drug delivery device (CIDR) and inserted into the vagina on 08/24/04 at approximately 1300 h. Cows were allowed 18 h to acclimate to the devices. Beginning at 0700 on 08/25 and again every morning for 4 days cows were switched from ADS-ST to KK or from KK to ADS-ST and CBT was measured every minute. The data presented in this paper consists of 18 out of 24 hours for the 4 day study. Milking times (0400 to 0600; 1200 to 1400 and 2000 to 2200) were omitted from the analysis to prevent time spent out of pen effects on CBT. During the four day trial period, RR and ST were taken from each cow at 1200, 2000 and 0400 h to compare the differences between actual CBT, RR and ST.

Evaporative cooling systems

The ADS-ST group was cooled with 20 oscillating fans and misters placed 20 ft apart below the eastern edge of the shade roof based upon manufacturer's guidelines. This system was computer driven and used photo-electric cells to enable the fans to "track" and cool the shaded areas throughout the day and to enable continuous adjustment of water flow through the misters based on ambient temperature and humidity. Fan oscillation radius was 270°, each fan was 36 inches in diameter and driven by a 2.0 Hp motor and oscillations and the shade tracker function were powered by a 0.5 Hp gear motor. The water pump for the misters was a 10.0 Hp variable frequency drive pump. Depending on the temperature and humidity, 0.25 to 1.25 gal/min of water were pumped through the misters, but droplet size was not altered. This system was designed to provide both improved sensible heat loss by cooling the microenvironment around the cow and increase body surface water evaporation (Table 2).

The KK cooled pen consisted of 17 coolers placed 20 ft apart in the center of the shade roof based upon manufacturer's guidelines. Each KK cooler was 60 inches in diameter and driven by a 3.0 Hp motor. Two 5.0 Hp water pump motors were used to facilitate water flow to the coolers. This system cools by pulling fresh outside air down through the coolers while injecting the airstream with micron-sized water droplets to cool cow environment and increase body surface water evaporation directly from the surface of the cow. This system is also computer operated and is programmed to increase cooling as ambient temperature increases. The KK system can operate based on the actual environment ambient temperature or on a max-cool setting to cool for one degree above the ambient temperature per max-cool setting (Table 2).

Ambient temperature (AT), RR, ST, BCS and BW

Throughout both trials, daily and hourly environmental data were obtained from the Arizona Meteorological Network (**AZMET**) weather station located ~ 1 mile from the experimental site (Figures 1, 2). Figure 3 shows the average THI by week for the experimental period (06/03/04 to 09/30/04) and an average of the past 6 summers collected over the same time period. Interestingly, the THI average for the past 6 years (1998 to 2003) was higher ($P < 0.05$) compared to THI over the same time period (06/03/04 to 09/30/04) of the 2004 trial reported in this paper. Thus, on average this study was conducted under cooler conditions than is typical for this area. Surface temperature and RR, from 40 multiparous and 10 primiparous (20%) cows were taken randomly from 5 zones within pen, every Thursday at 1200 and 2000 h. Surface temperature and RR during the CBT trial were taken at 0400, 1200 and 2000 h for each of the sub set of 12 multiparous cows (6/treatment) used in the 4 day CBT trial. All ST measurements were taken with a Raynger®MX™ model RayMX4PU infrared temperature gun (Raytek C., Santa Cruz, CA). The ST measurement was taken from the left side of the cow in the thurl region just cranial of the pin bone. Measurements were taken with the gun ~4 to 6 ft away from the surface of the cow. Respiration rate was determined by counting flank movements over a 10 second interval and multiplying by 6 to establish breaths per minute. Cows were scored for body condition at freshening and at 28 d intervals and BW was collected from 20 multiparous and 20 primiparous cows monthly.

Milk yield, milk composition, dry matter intake (DMI), Reproduction and Herd Health

Daily milk weights were measured electronically by Boumatic computer software (Madison, WI) for each cow's milking throughout the 17 week study. Monthly milk composition analysis and SCC was conducted at Arizona DHIA Tempe, AZ. Pen DMI was monitored daily and recorded using PROFEED2000® (Tempe, AZ) feed management software. Milk yield was recorded at each milking and transferred to daily milk yield data and then collapsed into weekly averages for statistical analyses. In order to have a weekly mean, an animal must have greater than four daily milk weights for the week. Otherwise, the weekly means were considered to be missing data. Reproductive measurements and herd health information normally monitored at Stotz dairy were collected and evaluated. The reproductive measurements were: 1) % pregnant within 65 days of the voluntary waiting period (VWP), 2) % cows open within 65 d VWP, 3) cows not yet diagnosed as pregnant; 4) average DIM at pregnancy. The herd health measurements were classified as cows that went to the hospital for: 1) mastitis, 2) digestive disorders, 3) respiratory, 4) lame/injury, 5) reproductive and 6) other.

Statistics

Data were analyzed using PROC MIXED procedures of SAS (SAS Institute, Inc, Cary, NC). Previous 305 day mature equivalent milk yields were included as a covariate in the analysis for multiparous cows. Dependent variables tested were milk yield, milk fat, protein, SCC and ST, RR, CBT, BCS, BW, water and electrical usage. Independent variables included treatment, parity, time and respective interactions. The level of significance was set at $P < 0.05$ for all main effects and interactions.

RESULTS

Average daily milk production did not differ ($P = 0.15$) for multiparous cows housed in ADS-ST or KK (91.2 vs. 93.0, lbs/d Figure 4) pens. However, average daily milk yield for primiparous cows housed in the KK pen (83.4 lbs/d) tended ($P = 0.09$) to be higher than the ADS-ST pen (81.0 lbs/d; Figure 4). Weekly DMI were similar between the two pens (Figure 5) and there was no difference ($P = 0.45$) in BW change between multiparous cows (-3 vs. + 12 pounds) in the ADS-ST or KK pens respectively. However, primiparous cows housed in ADS-ST pens gained less BW (19 vs. 88 lbs, $P < 0.01$) than those housed in KK pens (Table 3). Multiparous cows housed in ADS-ST pens had a higher RR (60.5 vs. 58.3 breathes/minute, $P < 0.01$) compared to multiparous cows in KK cooled pens. However, RR (59.3 vs. 58.6 breathes/minute) in primiparous cows housed in ADS-ST or KK pens were not different ($P = 0.15$). There was no difference in body surface temperature for multiparous (90.0 vs. 89.8 F; $P = 0.35$) or primiparous (90.1 vs. 90.2 F; $P = 0.81$) cows housed in ADS-ST or KK pens, respectively (Table 3).

Milk fat percentage, SCC and BCS were not different between treatments ($P > 0.05$) regardless of parity. Although protein percentage was not different between multiparous cows housed in ADS-ST or KK (2.86 vs.

2.86%) pens, primiparous cows in the ADS-ST pen had higher ($P = 0.02$) percentages of protein compared to those housed in the KK pen (2.84 vs. 2.77%; Table 3). The percentage of cows pregnant within 65 days of their VWP for ADS-ST and KK was 40.3 and 44.3% and average DIM at pregnant was 122 for ADS-ST and 129 for the KK pen respectively. Approximately 3.0% of cows had not been checked for pregnancy by the end of the study (Table 4). One hundred seventeen cows (47%) from the ADS-ST and 113 (45%) from the KK treatment visited the hospital during the 17 week study. Mastitis was the number one reason for going to the hospital for both ADS-ST (88/117) and KK (72/113) cows. Of the remaining ADS-ST cows that went to the hospital, 15, 6, 5, 2 and 1 went for lame/ injury, digestive, respiratory, cancer or reproductive disorders respectively. Of the remaining KK cows that went to the hospital, 15, 14 and 12 went for digestive, respiratory and lame/injury disorders respectively (Table 5). Fourteen animals housed in the ADS-ST pen left the herd during the 17 week study. Twelve were sold, 6 were lame, 4 had mastitis and 1 had cancer. Two animals died, both were downers (Table 5). Twenty animals housed in the KK pen left the herd during the 17 week study. Twelve were sold, 6 for digestive reasons, 5 were lame and 1 had mastitis. Eight animals died, 3 from pneumonia, 3 were downers, 1 from mastitis and 1 had cancer (Table 5).

The average outside ambient temperature during the four day CBT trial was 81.8 F (ranging from 68 to 94) and the THI averaged 85 (ranging from 70 to 97). Although it was not extremely hot, the THI was only below 72 for 4 hours per day, indicating at least 20 h/day of mild to moderate heat stress (Figure 6). There was no difference ($P = 0.47$) in mean core (vaginal) body temperature between the 2 groups (6/treatment) of multiparous cows used in the switch back design trial between 08/24/04 and 08/28/04 (Figure 6). During the time spent in the ADS-ST or KK pens cows had an average CBT of 102.2 and 102.1 F. The mean RR (61.4 vs. 62.5 breathes/ minute) and ST (91.0 vs. 90.3 F) of cows in the ADS-ST and KK pens were not different ($P = 0.83$ and $P = 0.20$; Table 6). However, there was an effect of time; both groups had the highest ($P = 0.02$) RR at 1200 h (66.7) followed by 2000 h (63.4) and then 0400 h (50.2 breathes/minute). Surface temperatures were also highest ($P = 0.02$) at 1200 h (91.6) followed by 2000 h (90.5) and then 0400 h (89.8 F; Table 7). Specifically, the ADS-ST and KK pen of cows had mean RR over the 3 time periods collected of 67.6 vs. 65.9, 61.9 vs. 64.8, and 50.6 vs. 50.0 breathes/minute at 1200, 2000 and 0400 h respectively. Surface temperature for the ADS-ST and KK pen of cows over the 3 time periods collected were 92.3 vs. 90.5, 90.7 vs. 89.6, and 90.9 vs. 90.5 F at 1200, 2000 and 0400 h respectively (Table 7).

The initial investment for the ADS-Shade Tracked system used in this study was $58,500 ($234/cow) compared to $118,067 ($472/cow; [which included $90/cow for curtains]) for the Korral Kool system. The ADS-ST cooling system used less ($P < 0.01$) electricity (526 vs. 723 kwh/day) and water (76.9 vs. 80.6 gallons/day) than the KK coolers. The daily cost of electricity ($0.0446/Kw hour) for the ADS-ST and KK system was $23.42 vs. $32.33 respectively. The daily cost of water ($0.05/gallon) for the ADS-ST and KK was $3.84 vs. $4.03 respectively. The variable cost of the ADS-ST system was $27.30 and the KK system was $33.36/day. The cost per cow for the ADS-ST and KK systems was $0.11 and $0.15 respectively, and per hundred pounds of milk the costs were $0.10 and $0.14 for ADS-ST and KK coolers (Table 8). Lifespan, depreciation or amortization factors were not measured in this experiment.

SUMMARY

Average daily milk production for multiparous cows housed in ADS-ST compared to KK did not differ. However, milk yield for primiparous cows housed in the KK pen tended to be higher compared to primiparous cows housed in the ADS-ST pen. Weekly DMI were similar between the two pens. Multiparous cows housed in ADS-ST pens had a higher RR compared to multiparous cows in KK cooled pens, however, RR in primiparous cows housed in ADS-ST or KK pens and body surface temperature for multiparous and primiparous were similar. Reproductive, herd health and reasons for leaving the herds did not appear to be different between groups. There was no difference in mean CBT, RR or ST between the 2 groups of multiparous cows used in the switch back design trial. However, there was an effect of time; both groups had the highest RR and ST at 1200 followed by 2000 and then 0400 h. The initial investment for the ADS-Shade Tracker system used in this study was lower compared to the Korral Kool system. The ADS-ST cooling system used less electricity and water than the KK coolers and variable costs per cow and per hundred pounds of milk for ADS-ST was lower than the KK coolers.

AKNOWLEDGMENTS

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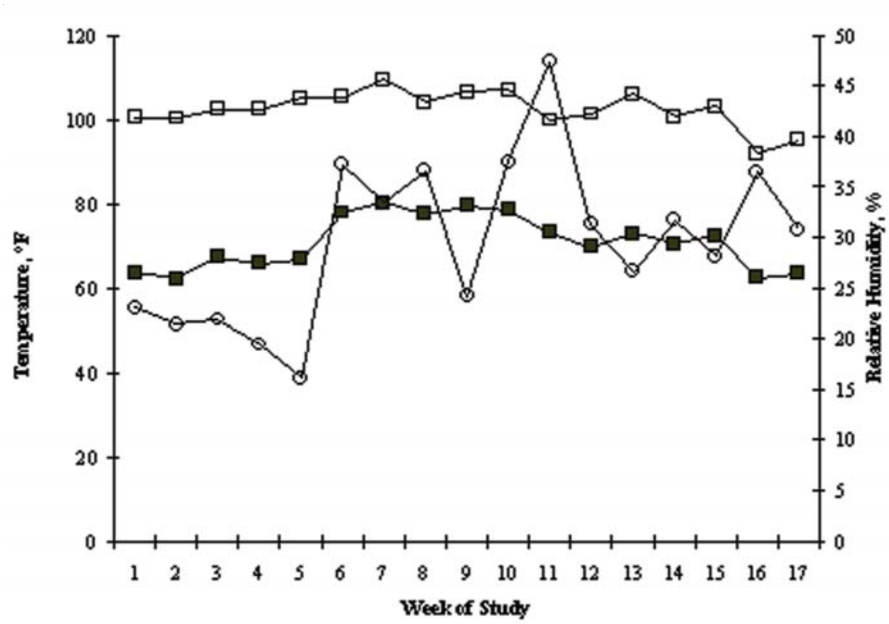

Figure 1. Temporal pattern of environmental conditions for the duration of the study. Temperature and humidity data used to calculated the temperature-humidity indexes were obtained from the Arizona Meteorological Network weather station approximately 1 mile from the experimental site.

Key: □ = Maximum Ambient Temperature, ■ = Minimum Ambient Temperature, ○ = Average Daily Relative Humidity

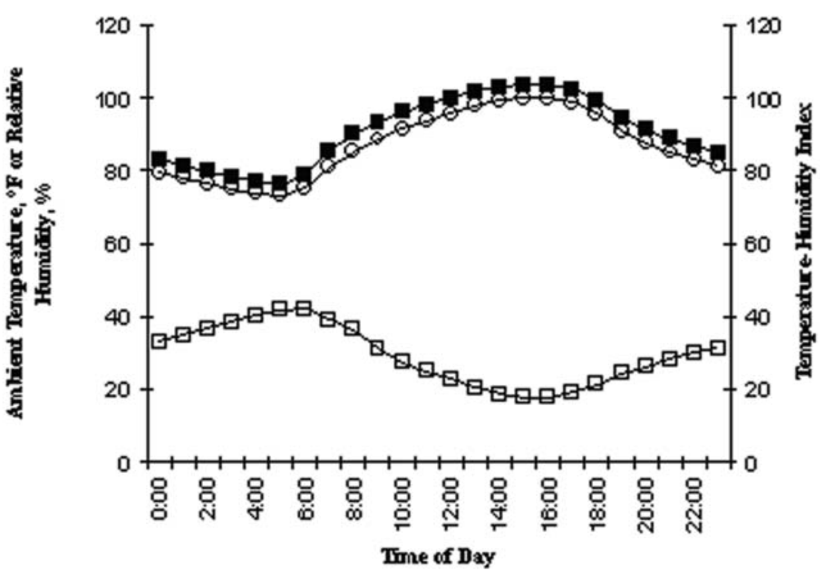

Figure 2 Average diurnal patterns for ambient temperature, relative humidity, and temperature-humidity index during the experimental period of June 3, 2004 to September 30, 2004. Temperature and humidity data used to calculate the temperature-humidity indexes were obtained from the Arizona Meteorological Network weather station approximately 1 mile from the experimental site.

Key: ○ = Ambient Temperature, □ = Relative Humidity, ■ = Temperature Humidity Index.

—— Line represents 72 THI.

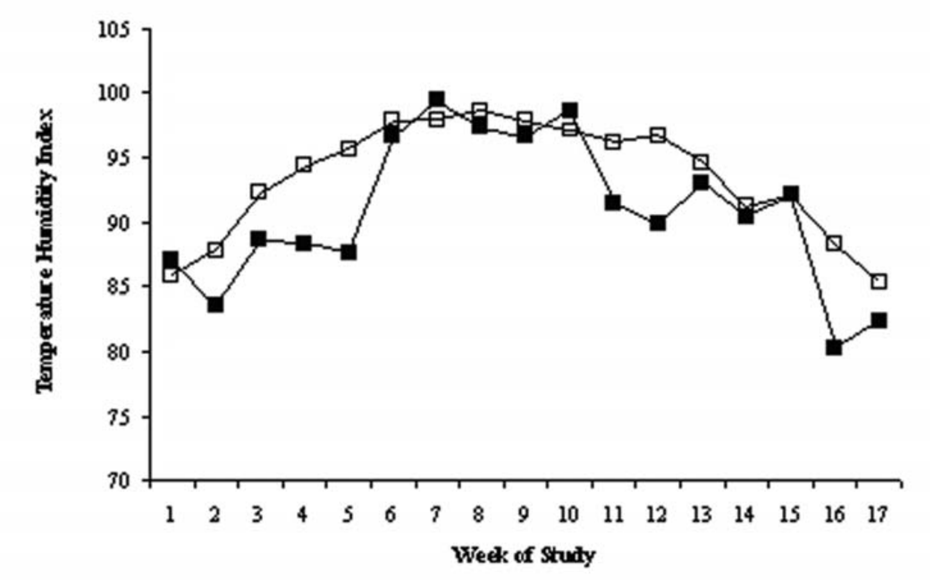

Figure 3 Average diurnal patterns temperature-humidity index during the experimental period (06/03/04 to 09/30/04) and the average temperature for the same time period from 1998 to 2003. Temperature and humidity data used to calculated the temperature-humidity indexes were obtained from the Arizona Meteorological Network weather station approximately 1 mile from the experimental site.

Key: □ = Temperature Humidity Index 1998-2003, ■ = Temperature Humidity Index 2004.

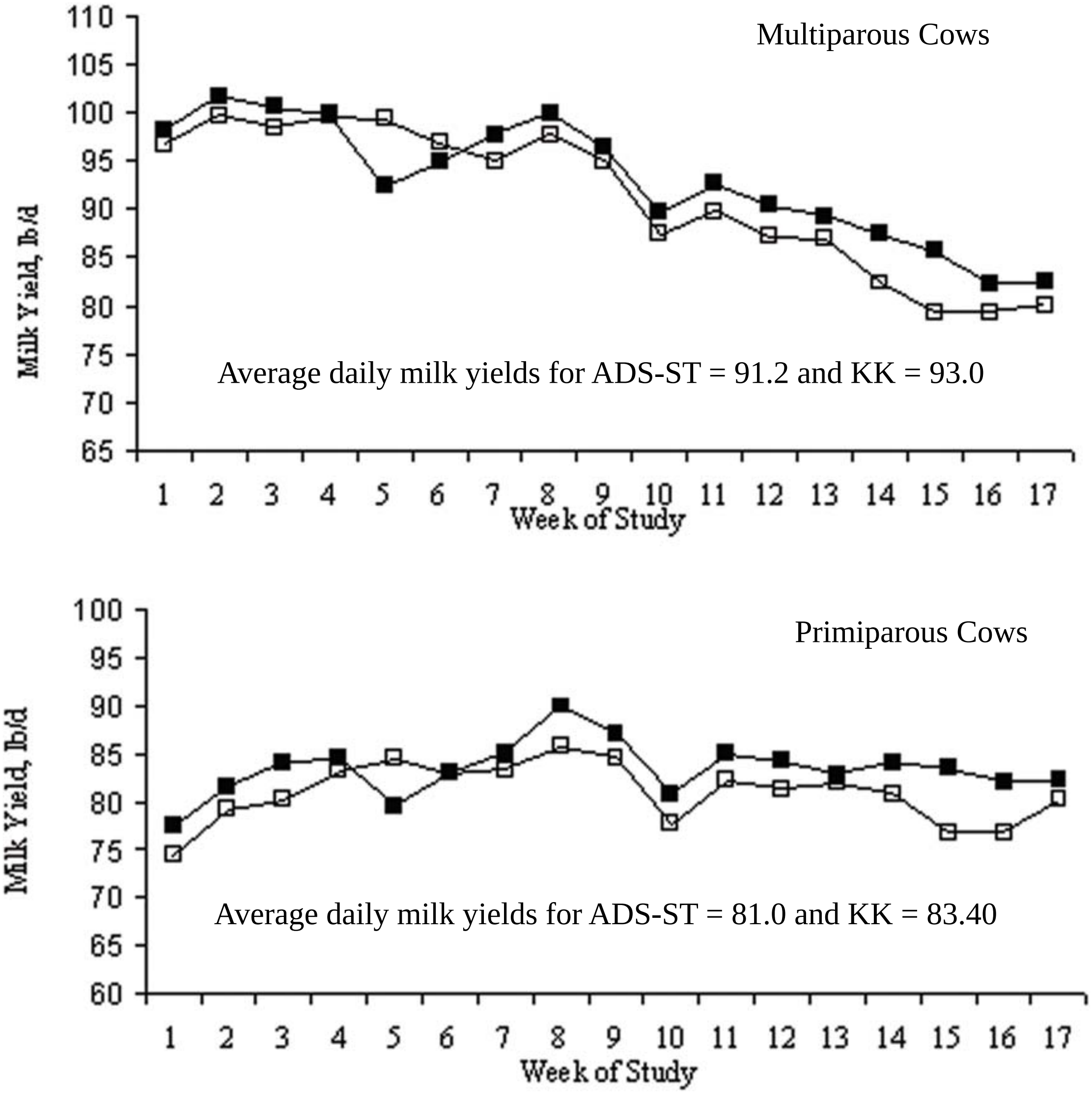

Figure 4. Temporal pattern of milk yield in primiparous and multiparous cows cooled with ADS-ST or KK.

Key: □ = ADS-ST, ■ = KK

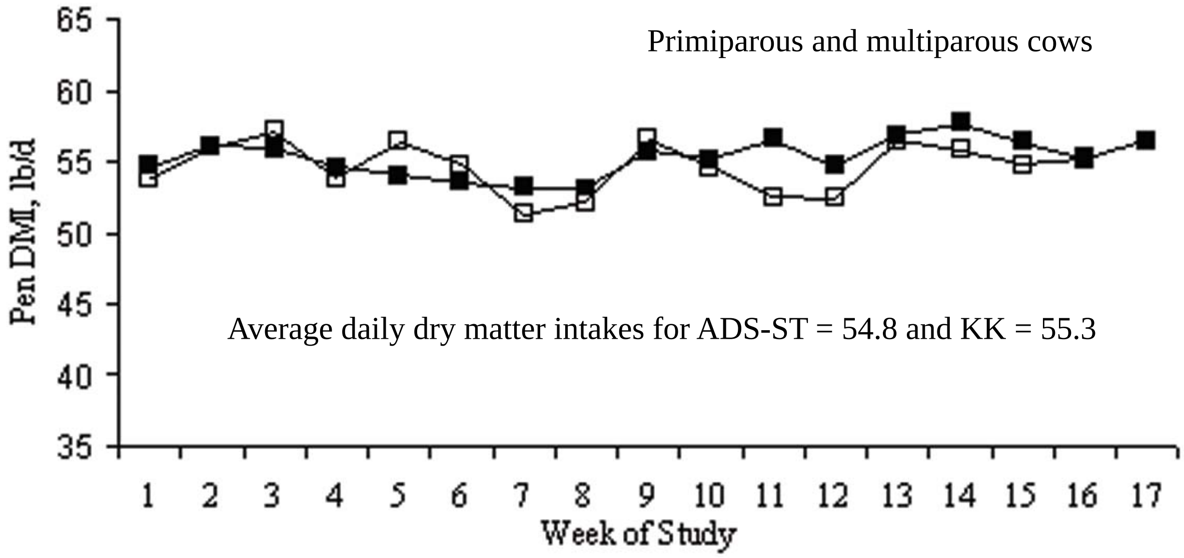

Figure 5. Temporal pattern of dry matter intake in cows cooled with ADS-ST or KK.

Key: □ = ADS-ST, ■ = KK

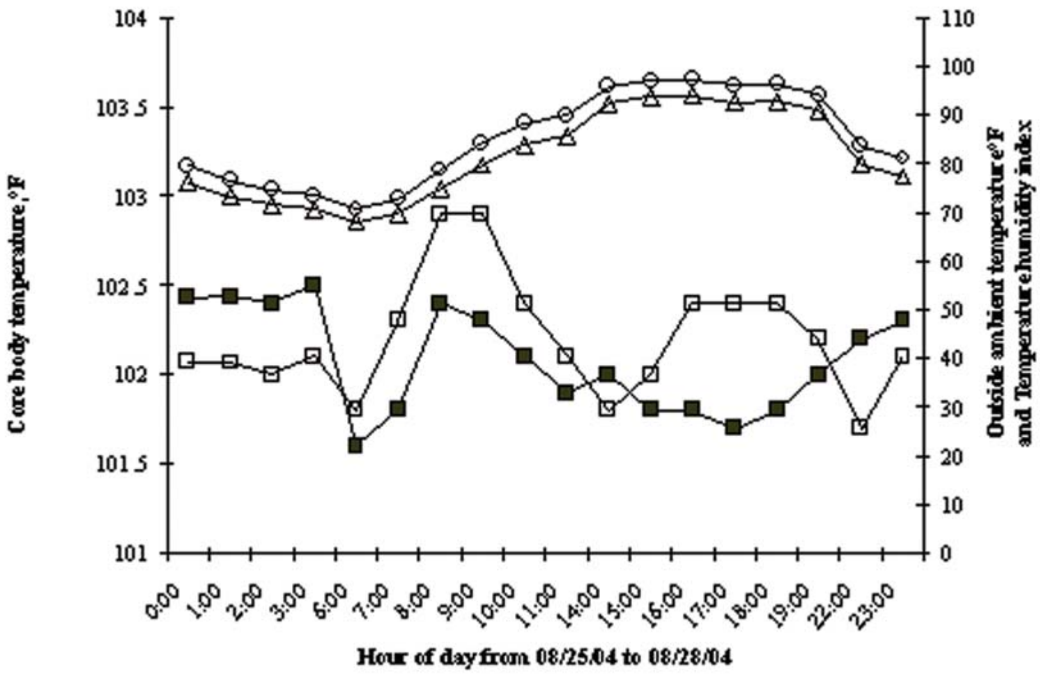

Figure 6. Vaginal body temperature of cows cooled with ADS-ST or KK, outside ambient temperature, and THI (minus milking times) during the CBT trial from 08/25/04 to 08/28/04. Temperature data were obtained from the Arizona Meteorological Network weather station approximately 1 mile from the experimental site.

Key: □ = ADS-ST, ■ = KK, △ = Outside ambient temperature, ○ = Temperature humidity index

Table 1. Composition of the total mixed ration fed during the experimental period.[1]

Ingredient	% DM
Alfalfa Hay	25.0
Alfalfa Greenchop	14.8
Soybean Meal	3.3
Corn Silage	12.2
Molasses	2.8
Tallow	0.9
EnerG II	2.0
Whole Cottonseed	4.8
Barley	31.5
Protein mineral buffer vitamin premix	2.7
Nutrition Composition	
Dry Matter, %	53.9
Crude Protein, %	16.6
RUP, % of Crude Protein	30.1
NEL, Mcal/lb	0.9
NDF, %	27.3
ADF, %	17.6
Fat, %	5.8
NFC, %	40.5

[1]Vitamin and mineral mix formulated to meet or exceed NRC, 2001 requirements.

Table 2. System parameters for each of the evaporative cooling systems

Variable	ADS-ST	KK
Size of Fan (inches)	36.0	60.0
Fan Motor (Hp)	2.0[1]	3.0
Water Pump Motor (Hp)	10.0[2]	5.0[3]
Gear Motor[1] (Hp)	0.5	N/A
Mean On/Off Temperature (°F)	80.0/80.0	82.0/80.0
Mean Cooler Settings	Automatic adjustment by the system based on temperature and humidity	Automatic adjustment by the system based on temperature and humidity

ADS-ST = Advanced Dairy Systems Shade Tracker Cooling System, KK = Korral Kool Cooling System, [1]Programmed to run at 70% capacity, [2]Variable frequency drive pump ranges from 1.5 to 7.5 Hp, [3]The control module contains two 5.0 Hp motors that pump water to the coolers.

Table 3. Summary of the milk yield, percentage of milk fat and protein, SCC, ST, RR, BCS, and BW change in primiparous and multiparous cows cooled with ADS-ST or KK evaporative cooling systems.

	Primiparous				Multiparous			
Item	ADS-ST	KK	SEM	P	ADS-ST	KK	SEM	P
Milk yield, lb/d	81.0	83.4	1.4	0.09	91.2	93.0	1.3	0.15
Milk fat, %	3.59	3.71	0.09	0.19	3.64	3.65	0.05	0.84
Milk protein, %	2.84	2.77	0.03	0.02	2.86	2.86	0.02	0.99
Somatic Cells X 1,000	211	215	80	0.95	570	448	80	0.13
ST, ºF	90.1	90.2	0.2	0.81	90.0	89.9	0.1	0.35
RR, breaths/min	59.7	58.6	0.8	0.15	60.5	58.3	0.5	<0.01
Body Condition Score	3.53	3.51	0.02	0.38	3.61	3.65	56	0.48
BW change, lbs	19.0	87.8	24	<0.01	-3.0	12.5	21	0.45

ADS-ST = Advanced Dairy Systems Shade Tracker Cooling System, KK = Korral Kool Cooling System.

Table 4. Summary of the reproductive, herd health and culling parameters of cows cooled with ADS-ST or KK evaporative cooling systems.

	All Cows	
Item	ADS-ST	KK
% Pregnant @ VWP + 65d[1]	40.33	44.34
% Open @ VWP + 65d	57.14	52.17
% Not diagnosed[2]	2.52	3.47
Average DIM	122.43	129.44

ADS-ST = Advanced Dairy Systems Shade Tracker Cooling System. KK = Korral Kool Cooling System. [1]VWP = Voluntary waiting period, [2]As of September 30th

Table 5. Summary of the reproductive, herd health and culling parameters of cows cooled with ADS-ST or KK evaporative cooling systems.

	All Cows					
	Visited hospital		Left herd[1]		Died[2]	
Disorder	ADS-ST	KK	ADS-ST	KK	ADS-ST	KK
Mastitis	88	72	4	2	-	1
Digestive	6	15	-	6	-	-
Respiratory	5	14	-	3	-	3
Lame/Injury	15	12	8	8	2[4]	3[4]
Reproductive	1	-	-	-	-	-
Other	2	-	2[3]	1[3]	-	1[3]

ADS-ST = Advanced Dairy Systems Shade Tracker Cooling System, KK = Korral Kool Cooling System, [1]Number of cows (ADS = 7, KK = 20) that left the herd from 06/03/04 to 09/30/04, [2]Number of cows (ADS = 2, KK = 8) that died from June 06/03/04 to 09/30/04, [3]Cancer, [4]Downer.

Table 6. Summary of the CBT, ST, RR, in multiparous cows cooled with ADS-ST or KK evaporative cooling systems from 08/25/04 to 08/28/04.

	Multiparous			
Item	ADS-ST	KK	SEM	P
Mean CBT, ?F	102.2	102.1	1.3	0.47
Mean ST, ?F	91.0	90.3	0.1	0.83
RR, breaths/min	61.4	62.5	0.5	0.20

ADS-ST = Advanced Dairy Systems Shade Tracker Cooling System, KK = Korral Kool Cooling System

Table 7. Summary by time of the CBT, ST, RR, in multiparous cows cooled with ADS-ST or KK evaporative cooling systems from 08/25/04 to 08/28/04.

	Multiparous							
	ADS-ST			KK				
Hourly measurements	1200	2000	0400	1200	2000	0400	SEM	P
CBT, ?F	102.2	102.1	102.1	102.1	101.6	102.0	NA	NA
ST, ºF	92.3	90.7	90.9	90.5	89.6	90.5	0.5	0.02
RR, breaths/min	67.6	61.9	50.6	65.9	64.8	50.0	1.9	<0.01

ADS-ST = Advanced Dairy Systems Shade Tracker Cooling System, KK = Korral Kool Cooling System

Table 8. Summary of investment and operating costs of ADS-ST and KK systems.[1]

Variable	ADS-ST	KK	**Difference**
Cooling System Investment, $[2]	58,500.00	118,067.51	**$59,567.51**
Cooling System Investment, $/cow	234.00	472.00	**$238.00**
Electrical Usage, KWh/d	526	723	**197**
Electrical Cost, $/d	23.46	32.33	**$8.87**
Electrical Cost, $/cow/d	0.09	0.13	**$0.04**
Water Usage, gal/d	76.9	80.6	**3.70**
Water Cost, $/d	3.84	4.03	**$0.19**
Water Cost, $/cow/d	0.015	0.016	**$0.00**
Variable Cost, $/day[3]	27.30	36.36	**$9.03**
Variable Cost, $/cow/day	0.11	0.15	**$0.04**
Variable Cost, $/cwt/day	0.10	0.14	**$0.04**

ADS-ST = Advanced Dairy Systems Shade Tracker Cooling System, KK = Korral Kool Cooling System, [1]Per day computations were divided by 119 days and per cow computation were divided by 250, [2]Seventeen 36 inch ADS-ST fans and twenty 60 inch KK coolers (curtains included), [3]Water ($0.05/gallon) and electrical (0.0446/KWh) rates were calculated from Stotz Dairy, Buckeye, AZ.

HIGH COW REPORT
OCTOBER 2004

MILK

Arizona Owner	Barn#	Age	Milk	New Mexico Owner	Barn #	Age	Milk
* Mike Pylman	5836	4-11	41,500	* Pareo Dairy	8146	5-09	38,689
* Mike Pylman	5956	4-10	39,710	* Providence Dairy	4080	5-05	37,770
* Mike Pylman	999	6-07	39,560	* Pareo Dairy	1189	6-03	37,613
* Mike Pylman	1007	3-11	39,390	* Providence Dairy	4852	3-11	37,490
* Mike Pylman	4392	4-10	38,810	* Providence Dairy	4415	4-09	37,300
* Stotz Dairy	19816	4-09	38,600	* Providence Dairy	9179	3-10	36,950
* Stotz Dairy	14928	4-10	38,490	* Pareo Dairy	1449	6-09	36,880
* Mike Pylman	4117	6-11	38,050	* Providence Dairy	4828	3-11	36,710
* Mike Pylman	1388	3-10	37,650	* Providence Dairy	4230	5-01	36,560
* Dutch View Dairy	740	5-05	37,400	* Providence Dairy	4312	5-00	36,370

FAT

* Mike Pylman	6269	4-06	1759	* New Direction Dairy	34	-----	1765
* Mike Pylman	4117	6-11	1566	* Pareo Dairy	9692	5-01	1464
* Stotz Dairy	19816	4-09	1530	* Pareo Dairy	1618	6-00	1430
* Mike Pylman	32	6-10	1494	* Hide Away Dairy	4494	5-06	1428
* Mike Pylman	19	3-04	1483	* Tallmon Dairy	697	5-00	1379
* Mike Pylman	7329	3-10	1483	* Hide Away Dairy	3023	6-06	1354
* Mike Pylman	2065	4-04	1476	* Pareo Dairy	8088	6-00	1348
* Mike Pylman	6481	3-10	1464	* Pareo Dairy	1449	6-09	1333
* Mike Pylman	6572	6-08	1432	* Pareo Dairy	1867	6-01	1329
* Mike Pylman	999	6-07	1431	* Pareo Dairy	8146	5-09	1325

PROTEIN

* Mike Pylman	5836	4-11	1242	* Hafliger Dairy	6185	6-06	1188
* Mike Pylman	1007	3-11	1212	* Goff Dairy	14376	7-06	1138
* Saddle Mountain Dairy	2332	3-11	1138	* Providence Dairy	8873	4-00	1124
* Mike Pylman	5956	4-10	1133	* Goff Dairy	6944	5-06	1114
* Mike Pylman	241	3-02	1123	* Hide Away Dairy	3645	6-06	1113
* Mike Pylman	1388	3-10	1122	* Pareo Dairy	1189	6-03	1097
* Mike Pylman	999	6-07	1121	* Hide Away Dairy	4565	5-06	1096
* Stotz Dairy	19816	4-09	1110	* Providence Dairy	4665	4-03	1093
* Stotz Dairy	14928	4-10	1106	* Providence Dairy	4312	5-00	1088
* Mike Pylman	2155	3-11	1105	Ken Miller Dairy	958	4-00	1086

*all or part of lactation is 3X or 4X milking

ARIZONA - TOP 50% FOR F.C.M.[b]
OCTOBER 2004

OWNERS NAME	Number of Cows	MILK	FAT	3.5 FCM	CI
* Stotz Dairy West	2,102	26,089	951	26,697	15.4
* Red River Dairy	4,590	24,662	888	25,058	13.6
* Mike Pylman	4,308	24,186	866	24,496	14.5
* Triple G Dairy, Inc.	4,559	25,434	945	26,316	13.8
* Stotz Dairy East	1,187	24,173	851	24,247	16.2
* Treger Holsteins, Inc.	2,120	23,190	827	23,433	14.5
* Danzeisen Dairy, Inc.	1,458	22,978	835	23,471	14.8
* Arizona Dairy Company	5,907	23,313	824	23,438	14.0
* Del Rio Holsteins	811	23,314	831	23,551	13.1
* Withrow Dairy	5,268	24,006	776	22,959	13.1
* Saddle Mountain Dairy	2,841	23,763	766	22,692	13.9
* Butler Dairy	626	23,310	778	22,691	14.5
* Shamrock Farm	8,544	23,155	785	22,737	13.6
* DC Dairy, LLC	1,047	22,326	802	22,654	13.7
Paul Rovey Dairy	404	22,238	794	22,486	13.5
* Dairyland Milk Co.	2,910	22,527	770	22,222	13.9
* Zimmerman Dairy	1,153	21,865	794	22,325	14.9
* Hillcrest Dairy	2,319	22,169	747	21,695	14.4
* RG Dairy, LLC	1,339	22,081	769	22,013	14.0
Lunts Dairy	553	21,681	783	22,067	13.5
* Goldman Dairy	2,015	21,744	756	21,657	14.0
* Parker Dairy	4,303	20,812	760	21,319	15.0
* Yettem Dairy	2,942	17,708	807	20,738	13.4
* Dutch View Dairy	1,573	20,781	726	20,754	14.1
* Jerry Ethington	632	19,929	716	20,224	14.1
* Cliffs Dairy	314	19,534	698	19,761	13.7

NEW MEXICO - TOP 50% FOR F.C.M.[b]
OCTOBER 2004

OWNERS NAME	Number of Cows	MILK	FAT	3.5 FCM	CI
* Pareo Dairy #1	1,452	26,192	942	26,769	14.1
* Tallmon Dairy	461	25,653	870	26,769	14.8
Ken Miller	400	24,931	861	24,742	14.0
* Providence Dairy	2,714	26,064	818	24,535	13.5
* Macatharn	1,010	24,745	846	24,418	13.4
* Hide Away Dairy	2,175	25,998	803	24,263	13.3
* Do-Rene	2,330	23,913	816	23,572	13.8
* Pareo Dairy #2	3,127	23,158	828	23,440	13.4
* New Direction Dairy 2	1,750	22,369	825	23,051	14.5
Prices Roswell Farm	-----	23,081	805	23,034	18.2
* Goff Dairy 1	4,312	22,416	811	22,844	14.6
* Milagro	3,387	22,605	794	22,650	13.3
* Halflinger Dairy	2,135	21,653	806	22,433	13.2
* Baca Linda Dairy	1,208	22,968	765	22,337	13.5
Vaz Dairy	1,712	22,541	779	22,379	14.1
* Butterfield Dairy	1,747	22,276	781	22,297	13.9
Breedyk Dairy	2,710	22,914	745	21,989	14.2
* SAS Dairy	1,961	22,600	749	21,918	13.6

* all or part of lactation is 3X or 4X milking

[b] average milk and fat figure may be different from monthly herd summary; figures used are last day/month

ARIZONA AND NEW MEXICO HERD IMPROVEMENT SUMMARY FOR OFFICIAL HERDS TESTED OCTOBER 2004

		ARIZONA	NEW MEXICO
1.	Number of Herds	53	29
2.	Total Cows in Herd	89,270	53,825
3.	Average Herd Size	1684	1,856
4.	Percent in Milk	8515%	87.1
5.	Average Days in Milk	205	200.5
6.	Average Milk – All Cows Per Day	54.4	60.4
7.	Average Percent Fat – All Cows	3.7%	3.59
8.	Total Cows in Milk	71,685	46,657
9.	Average Daily Milk for Milking Cows	64.3	57.2
10.	Average Days in Milk 1st Breeding	81	72.1
11.	Average Days Open	159	146.9
12.	Average Calving Interval	14.1	13.94
13.	Percent Somatic Cell – Low	88	78.3
14.	Percent Somatic Cell – Medium	8	14.7
15.	Percent Somatic Cell – High	4	6.0
16.	Average Previous Days Dry	62	63
17.	Percent Cows Leaving Herd	32	32.1
		STATE AVERAGES	
	Milk	21,858	22,909
	Percent butterfat	3.6	3.6
	Percent protein	3.0	3.1
	Pounds butterfat	787	807
	Pounds protein	652	709

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UPCOMING EVENTS:
Southwest Nutrition &
Management Conference
Tempe, Arizona
February 24-25, 2005