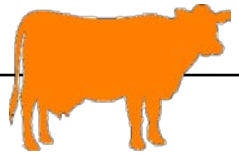
Feeding and drinking behavior of dairy cows at heat stress



Karatzia M.A., Kalogianni A., Sossidou E.N.

Hellenic Agricultural Organization-DEMETER
Veterinary Research Institute
Thessaloniki, Greece

E-mail: mkaratz@vet.auth.gr

Hellenic Republic
MINISTRY OF RECONSTRUCTION OF PRODUCTION ENVIRONMENT & ENERGY
HELLENIC AGRICULTURAL ORGANISATION «DEMETER»
European Union
HELLENIC REPUBLIC
Ministry of Rural Development and Food
MINISTRY OF LABOUR & SOCIAL SECURITY
OPERATIONAL PROGRAMME "HUMAN RESOURCES DEVELOPMENT"
Co - financed by Greece and the European Union
NSRF 2007-2013
EUROPEAN SOCIAL FUND

Introduction

Heat stress in dairy cattle

Increased body temperature
Panting
Drooling
Profus
Letha estlessness
Searc
Increas ne
Increased ntake
Reduced dry matter/feed intake
Reduced rumination
Reduced milk production
Reduced reproductive performance

- 420€
/cow/year

Introduction

Thermal Heat Index (T.H.I.)

Temperature		% Relative Humidity																		
°F	°C	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
72	22.0	64	65	65	65	66	66	67	67	67	68	68	69	69	69	70	70	70	71	71
73	23.0	65	65	66	66	66	67	67	68	68	68	69	69	70	70	71	71	71	72	72
74	23.5	65	66	66	67	67	67	68	68	69	69	70	70	70	71	71	72	72	73	73
75	24.0	66	66	67	67	68	68	68	69	69	70	70	71	71	72	72	73	73	74	74
76	24.5	66	67	67	68	68	69	69	70	70	71	71	72	72	73	73	74	74	75	75
77	25.0	67	67	68	68	69	69	70	70	71	71	72	72	73	73	74	74	75	75	76
78	25.5	67	68	68	69	69	70	70	71	71	72	73	73	74	74	75	75	76	76	77
79	26.0	67	68	69	69	70	70	71	71	72	73	73	74	74	75	76	76	77	77	78
80	26.5	68	69	69	70	70	71	72	72	73	73	74	75	75	76	76	77	78	78	79
81	27.0	68	69	70	70	71	72	72	73	73	74	75	75	76	77	77	78	78	79	80
82	28.0	69	69	70	71	71	72	73	73	74	75	75	76	77	77	78	79	79	80	81
83	28.5	69	70	71	71	72	73	73	74	75	75	76	77	78	78	79	80	80	81	82
84	29.0	70	70	71	72	73	73	74	75	75	76	77	78	78	79	80	80	81	82	83
85	29.5	70	71	72	72	73	74	75	75	76	77	78	78	79	80	81	81	82	83	84
86	30.0	71	71	72	73	74	74	75	76	77	78	78	79	80	81	81	82	83	84	84
87	30.5	71	72	73	73	74	75	76	77	77	78	79	80	81	81	82	83	84	85	85
88	31.0	72	72	73	74	75	76	76	77	78	79	80	81	81	82	83	84	85	86	86
89	31.5	72	73	74	75	75	76	77	78	79	80	80	81	82	83	84	85	86	86	87
90	32.0	72	73	74	75	76	77	78	79	79	80	81	82	83	84	85	86	86	87	88
91	33.0	73	74	75	76	76	77	78	79	80	81	82	83	84	85	86	86	87	88	89
92	33.5	73	74	75	76	77	78	79	80	81	82	83	84	85	85	86	87	88	89	90
93	34.0	74	75	76	77	78	79	80	80	81	82	83	85	85	86	87	88	89	90	91
94	34.5	74	75	76	77	78	79	80	81	82	83	84	86	86	87	88	89	90	91	92
95	35.0	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
96	35.5	75	76	77	78	79	80	81	82	83	85	86	87	88	89	90	91	92	93	94
97	36.0	76	77	78	79	80	81	82	83	84	85	86	87	88	89	91	92	93	94	95
98	36.5	76	77	78	80	80	82	83	83	85	86	87	88	89	90	91	92	93	94	95
99	37.0	76	78	79	80	81	82	83	84	85	87	88	89	90	91	92	93	94	95	96
100	38.0	77	78	79	81	82	83	84	85	86	87	88	90	91	92	93	94	95	96	98
101	38.5	77	79	80	81	82	83	84	86	87	88	89	90	92	93	94	95	96	98	99
102	39.0	78	79	80	82	83	84	85	86	87	89	90	91	92	94	95	96	97	98	100
103	39.5	78	79	81	82	83	84	86	87	88	89	91	92	93	94	96	97	98	99	101
104	40.0	79	80	81	83	84	85	86	88	89	90	91	93	94	95	96	98	99	100	101
105	40.5	80	80	82	83	84	86	87	88	89	91	92	93	95	96	97	99	100	101	102
106	41.0	80	81	82	84	85	87	88	89	90	91	93	94	95	97	98	99	101	102	103
107	41.5	80	81	83	84	85	87	88	89	91	92	94	95	96	98	99	100	102	103	104

Adapted from: Burgos Zimbelman R. and. Collier R.J. Tri-State Dairy Nutrition Conference, April 19 and 20, 2011

THI between 72 and 78

mild stress

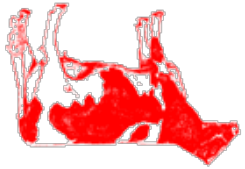
THI between 79 and 88

moderate stress

THI between 89 and 98

severe stress

THI above 98



DEAD COWS!

Adapted from: http://www.bom.gov.au/

Introduction

Heat stress in dairy cattle in Greece

- Period of Heat Stress risk: April to October
- 61.8% of Greek dairy farms located in Central Macedonia (Northern Greece)
- Rural area – Rice cultivation
- By 2021: av. Max Temperature (summer) +2.5°C
  +40 “tropical nights” per year
  (nights when av. temp.>20°C)

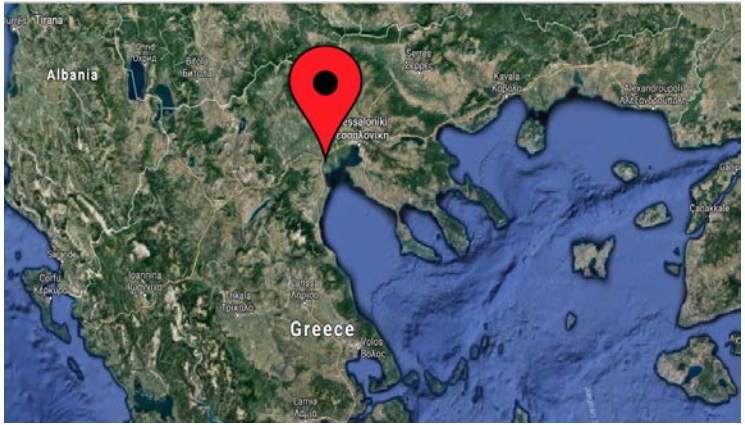
Adapted from: National Climate Change Adaptation Strategy (NCCAS), 2015

Objective

Effects of cows’ heat stress on nutritional behavior?

Materials and methods

- Free-stall system with individual beds
- 12 healthy Holstein cows
- 24h video recording for 5 months
- Temperature and relative humidity recorded at 5min. intervals
- Statistical analysis: SPSS® v.21 (a=0.05)



Materials and methods

- Two experimental groups

Controls-C
n=12
Within the thermo-neutral zone
av. T.H.I.=54.6

Heat Stressed-HS
n=12
Under heat stress
av. T.H.I.=87.6

Materials and methods

- Two 24h recordings were evaluated
- Behavioral aspects of feeding and drinking

Materials and methods

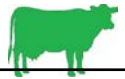
- Analysis for 3 time zones:

M Morning:8.00-12.00,

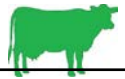
A Afternoon:16.00-18.00 and

E Evening:19.00-20.30

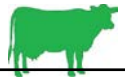
Results

Time Zone	Activity (minutes)	Group				Significance
						
		Mean	±SE	Mean	±SE	
M + A + E	**Feeding**	39.28*	4.955	70.43*	11.993	**P≤0.05**
	Drinking	12.63	4.752	11.72	2.477	Pe0.05

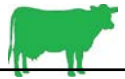
Results

Time Zone	Activity (minutes)	Group				Significance
						
		Mean	±SE	Mean	±SE	
M	**Feeding**	60.62*	9.276	144.22*	39.69	**P≤0.05**
	Drinking	26.57	12.359	12.385	2.831	Pe0.05

Results

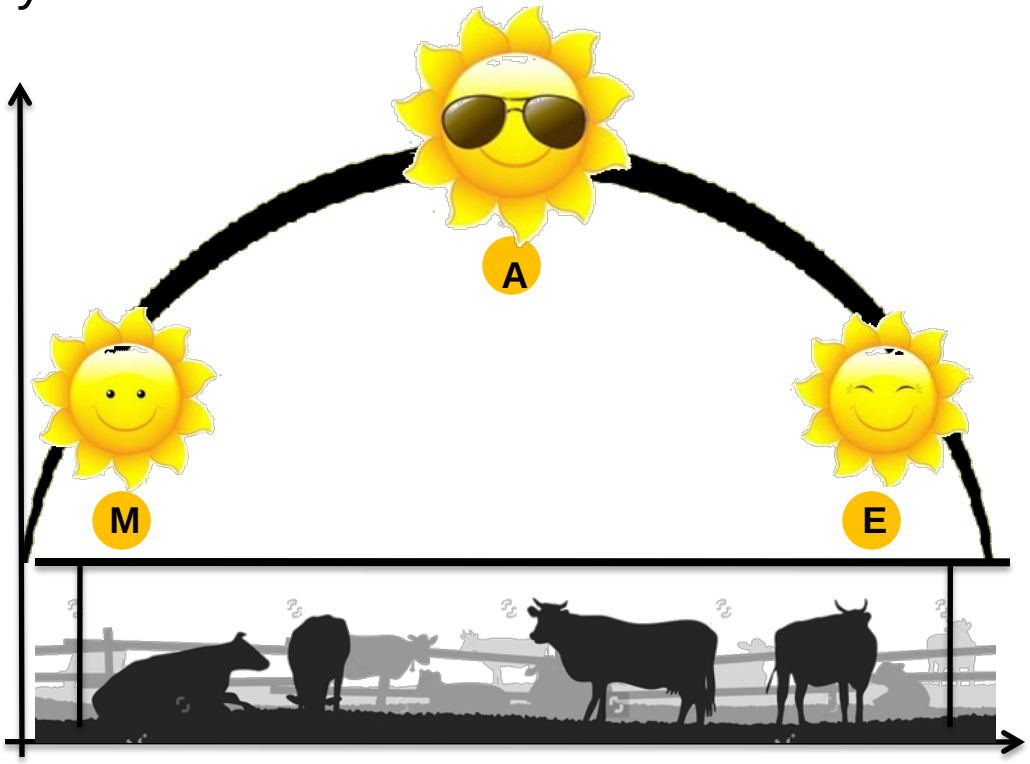
Time Zone	Activity (minutes)	Group				Significance
						
		Mean	±SE	Mean	±SE	
A	Feeding	22.95*	6.093	4.78*	1.316	**P≤0.05**
	Drinking	3.86*	0.596	19.76*	5.968	**P≤0.05**

Results

Time Zone	Activity (minutes)	Group				Significance
						
		Mean	±SE	Mean	±SE	
E	Feeding	32.33	5.383	27.84	3.340	Pe0.05
	Drinking	4.57	0.785	2.97	1.005	Pe0.05

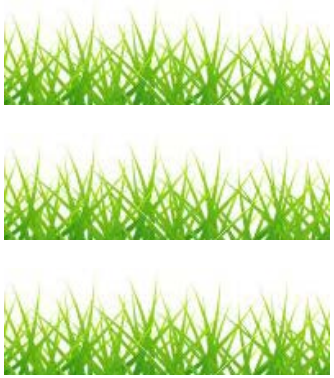
Conclusions

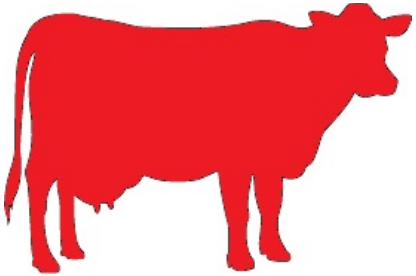
- Stressed cows spent significantly more time feeding in total, while their drinking activity was limited.



Conclusions

M



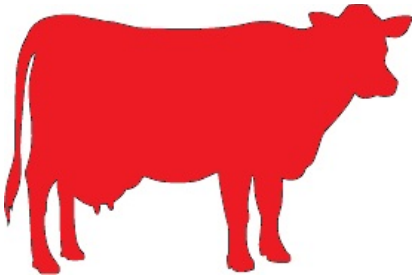


More feeding (Pd0.05)

53.4% less drinking

Conclusions

A

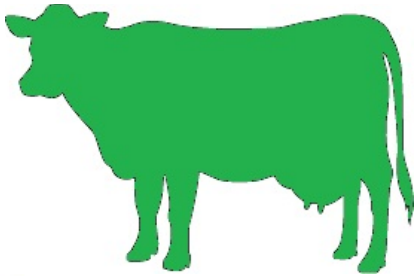


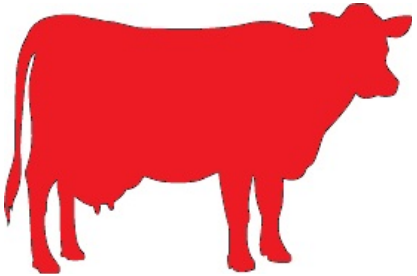
79.15% less feeding

80.45% more drinking (Pd0.05)

Conclusions

E





Similar eating and drinking time (Pe0.05)

Acknowledgements

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(Veterinary Research Institute / Scientific supervisor: Dr. E. N. Sossidou).

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Thank you for your attention!