

## BEHAVIOUR OF LOT FED CATTLE WHEN EXPOSED TO HOT ENVIRONMENTAL CONDITIONS

John B. Gaughan\* and John P. Goopy  
The University of Queensland, Gatton, Queensland Australia 4343

### 1. INTRODUCTION

High heat load has the potential to severely impact on cattle performance, and impinges on their well-being. Shade structures have been used to reduce the impact of hot conditions on cattle. The purpose of this study was to assess differences in panting score and behaviour of cattle with and without access to shed during the summer months.

### 2. MATERIALS AND METHODS

#### 2.1 The feedlot

The feedlot was located 16 km north east of Dalby, Queensland Australia (151°15' E, 27°10' S), and has a capacity of 18,000 head with a pen size approximately 3200 m<sup>2</sup>. Four pens were used in the study. Two pens were shaded, and these had stocking rates of 17.8 (180 head) and 23.8 m<sup>2</sup>/steer (134 head). The remaining two pens were not shaded and these had stocking rates of 27.4 (118 head) and 21.2 m<sup>2</sup>/steer (151 head).

The type of shade structures used at the feedlot was as follows.

A permanent 13 m wide x 4.5 m tall shade structure composed of galvanized iron sheets. The sheets were placed to give approximately 5.4 m<sup>2</sup> of shade interspaced by a 0.5 m gap. The shade structure ran the length of the pen with a north south orientation. All cattle could access the shade at one time. The area under shade was approximately 702 m<sup>2</sup>. The shaded area per steers was 3.9m<sup>2</sup> for the 180 head pen and 5.2 m<sup>2</sup> for the 134 head pen.

#### 2.2 Animal data

The genotype, coat colour, expected days on feed, body condition score and/or live weight were recorded at the start of the study, and the number per pen (done daily to keep track of pulls) were recorded throughout the study.

Each day, (12 data collection days between 12 December 2001 and 8 February 2002) at two hourly intervals between 0600 h and 1800h the number of cattle at the feedbunk, at the water trough, standing or lying under shade (shaded pens) or standing or lying in sun were recorded. Cattle were determined to be at the water trough if they were within 1 m of the trough or further if crowding around the trough was evident.

\* Corresponding author address: John Gaughan, School of Animal Studies, The University of Queensland, Gatton, Qld. Australia 4343. email: jbg@sas.uq.edu.au

Cattle were determined to be at the feedbunk only if they were eating. Daily feed intake was also recorded and average dry matter intake determined.

Specific abnormal behaviour patterns (e.g. milling around, water splashing) were also noted.

In addition panting scores (PS) were recorded. The number of animals in a pen with panting scores of 0 to 4 were determined by counting cattle at the three times outlined above for each feedlot (Table 1).

**TABLE 1.** The panting scores for observed breathing condition and respiration rate.

Breathing Condition	Respiration Rate (bpm)	Panting Score
No panting	Less than 40	0
Slight panting, mouth closed, no drool or foam	40 – 70	1
Fast panting, some drool or foam, occasional open mouth <sup>c</sup>	70 – 120	2
Open mouth + drooling	120 – 160	3
Open mouth tongue out + drooling	< 160	4

#### 2.3 Weather data

Weather data was collected at 30-minute intervals (just prior to cattle observations). The climatic data collected was: dry bulb temperature, relative humidity, black globe temperature, wind speed, wind direction and cloud cover. Rainfall events were also recorded.

### 3. RESULTS

#### 3.1 Weather Data

Over the study period conditions were hot and dry. The mean climatic conditions between 0600 and 1800 h on data collection days were as follows. Mean ambient temperature (Ta) = 35.7° C (range 26 – 39°

C), relative humidity (RH) = 25.4% (range 2 – 70%), black globe temperature = 41.7°C (range 33 – 53°C), wind speed = 4.5 m/s (range 0 – 9 m/s) and cloud cover = 18.9% (range 0 – 90%). On eight collection days total cloud cover was less than 4%. On two days cloud cover exceeded 70%. No rainfall was recorded.

The mean temperature humidity index {THI =  $T_a \times 0.8 + (RH/100 \times (T_a - 14.4)) + 46$ } was 79.5 (range 71 – 96).

### 3.2 Cattle Data

Animal data was collected on two cool days (THI < 70) to establish a base line for panting score and the behavioral traits. On these days all cattle were observed with a panting score of 0 (PS0). Approximately 85% of cattle were at the feedbunk at the 1300 h observation, and less than 5% of cattle in the shaded pen were under the shade at any given observation.

The panting scores are presented in Table 2. There were greater ( $P < 0.05$ ) numbers of cattle in the unshaded pens with PS>0 in comparison to the shaded pens (79.9% vs. 33.1%).

**Table 2.** The number of cattle observations and percentage for panting scores of 0, 1, 2, 3 or 4.

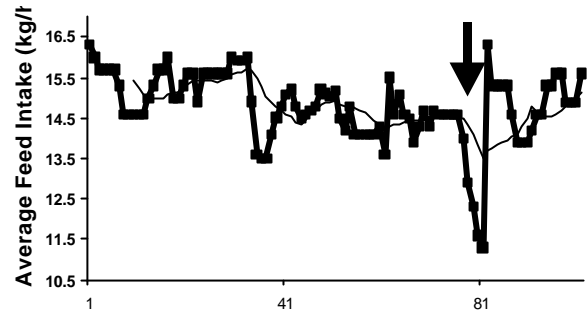
	PS0	PS1	PS2	PS3	PS4
Shaded	6944 (66.9)	3390 (32.6)	46 (0.5)	0	0
Unshaded	1782 (20.1)	6412 (72.2)	656 (7.4)	27 (0.3)	0

### 3.3 Eating Behaviour and Feed Intake

Most cattle were observed eating at 1700 hours. The eating time reflects the feeding program employed by the feedlot. When THI exceeded 85 average daily feed intake declined by 8% or greater. The impact was more severe when the maximum THI exceeded 80 for four or more hours on two or more consecutive days (Figure 1).

In Figure 1 the arrow indicates a 22.6% reduction in feed intake (14.6 to 11.3 kg) over a 3-day period. During this period the THI > 80 by 0700 hours on each day. On the first day the cattle were exposed to a THI > 80 for 4 hours, and greater than 85 for 5 hours. The maximum THI on this day was 90.2. On the second day the cattle spent 4 hours with a THI > 80, 4 hours with THI > 85 and 2 hours with THI > 90. Maximum

THI on this day was 95.9 (1400 h). On the third day THI was again > 80 by 0730 hours. In comparison over the same period the daily feed intake in the shaded pens fell by 9.9% (14.1 to 12.7 kg/head).



**Figure 1** The average daily feed intake (kg/head) for unshaded cattle over a 100-day period. (The thin line is the moving average).

### 3.4 Positional Behaviour

Positional data is presented in Table 3. The unshaded cattle made more use of the mounds than did the shaded cattle and spent more time standing than the shaded cattle (71.4% vs. 48.0%). The unshaded cattle spent more time generally milling around probably in an attempt to find a cooler place in the pen. They also made more use of the mounds than the shaded cattle.

**Table 3.** The number (total observations) and percentage of cattle either standing or lying in the sun, standing or lying in the shade, at the water trough or at the feed bunk.

Observation	Shaded	Unshaded
Stand shade	3270 (31.9)	-
Stand sun	1421 (13.9)	5558 (62.6)
Lying shade	1815 (17.7)	-
Lying sun	2310 (22.5)	2335 (26.3)
Stand water trough	116 (1.1)	390 (4.4)
Lying water trough	4 (<0.01)	26 (0.3)
Stand mound	116 (1.1)	390 (4.4)

## 4. Conclusions

Provision of shade had a significant effect on cattle respiration rate as measured by panting scores. Shaded cattle also spent less time standing and less time at the water trough than did the unshaded cattle. Although hard to quantify, the shaded cattle appeared to be more comfortable on the hot days.