

# SHADE FOR CATTLE ON PASTURE: A GUIDE FOR ONTARIO PRODUCERS

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## ABSTRACT

In tropical climates, adequate shade may be essential to ensure the survival and productivity of grazing animals, but in the temperate Ontario climate, the necessity or benefits of providing shade for grazing cattle are less clear, and have proved controversial. Meteorological data indicate that beef cattle in Ontario may be at risk of suffering from heat stress on more than 25% of days during July and August, and may decrease feed intake and benefit from the provision of shade for more than 50% of days during the two hottest summer months. A booklet, entitled '*Beat the Heat. A Guide to Hot Weather and Shade for Ontario Cattle Producers*', has been written for the Ontario Cattleman's Association, as a means of providing basic information on heat biology in cattle, and as a focus for discussion on the value of shade to Ontario beef producers.

## KEYWORDS

Cattle, grazing, shade, heat balance, animal performance, behaviour

## INTRODUCTION

Cattle grazing in both temperate and tropical regions experience a wide range of environmental conditions. As mammals, they are homeotherms and able to maintain their core body temperature within narrow limits (around 39°C) over a wide range of environmental temperatures. However, under sufficiently adverse weather conditions they will suffer from either cold or heat stress. A number of studies (Blackshaw & Blackshaw, 1994) have considered the effect of shade type and availability on the productivity and behaviour of heat stressed cattle, but most of these studies have addressed the problem of heat stress in very hot climates where the provision of shade is essential to maintain animal productivity and ensure animal survival. In cooler temperate climates, the necessity or benefits of providing shade for grazing animals are much less clear.

The environmental temperature experienced by the homeothermic animal depends on the ambient air temperature, humidity, air movement, thermal radiation from surrounding surfaces, and solar radiation. When this integrated, effective environmental temperature (EET) rises above the thermoneutral zone, the animal cannot maintain its body heat balance without using energetically expensive mechanisms such as sweating or panting, which allow body heat to be lost by evaporation from the skin or respiratory tract (Ames, 1980; Curtis, 1983). Feed intake also decreases to reduce the thermogenesis associated with feed digestion (National Research Council (NRC) 1981, 1996). Thus the animal is using more energy to maintain its body temperature while at the same time reducing intake of feed energy (3 - 10% reduction between 25° - 35°C, NRC 1981). This can result in an overall reduction in productivity either as growth or milk production. A number of studies suggest that temperate breeds of beef cattle (*Bos taurus*), may begin to have difficulty losing excess body heat when air temperatures rise above 25°C, and may show initial signs of heat stress, sweating or panting, at about 28°C (Whittier, undated; Blackshaw & Blackshaw, 1994).

In the province of Ontario, Bruce, Peterborough, and Renfrew counties are areas where some of the highest populations of beef cattle are found. Using meteorological data from Environment Canada, the maximum daily temperatures for these areas, for July and August, 1991 to 1995, were reviewed. With the exception of 1992, a cool wet summer, maximum daily temperatures equal to or

above 25°C were observed for about 60% of the days in July and August, and equal to or above 28°C were observed for about 28% of the days. Although maximum daily temperatures only represent the temperature during the hottest part of the day, such temperature records, which are taken in the shade, do not take into account the exacerbating effects of either solar radiation or humidity. These data indicate that beef cattle in Ontario may be at risk of suffering from heat stress on about 25% of days during July and August, and may benefit from the provision of shade for about 50% of days during these two hottest summer months. However there may be costs associated with the provision of shade to grazing cattle, in addition to the cost of shade construction, or tree planting. Shade concentrates manure, reducing the effective redistribution of nutrients to the pasture, and increasing the potential for ground water or watercourse contamination.

In this context, a review of the potential costs and benefits of supplying shade to cattle grazing in temperate climates was carried out for the Ontario Cattleman's Association summarised in a booklet, entitled '*Beat the Heat. A Guide to Hot Weather and Shade for Ontario Cattle Producers*'. This booklet is scheduled for printing in early summer 1997 and includes a brief, clearly written discussion of the following topics.

### Heat Balance: The Basics

- A Critical Balance
- Heat Gain
- Heat Loss
- Coping in a Hot Environment

### How Hot Does it Feel ? "It's not just the heat, it's the humidity"

- Climatic Factors
  - Solar Radiation
  - Surrounding Surfaces
  - Wind
  - Relative Humidity
  - Night Cooling
- Temperature-Humidity Index

### Animal Factors

- Acclimatisation
- Coat Colour and Coat Type
- Breed Differences
- Every Animal is Different

### Heat Stress

- At What Temperature does Heat Stress become a Concern ?
- Signs of a Heat Stress Emergency
  - Refusal to Lie Down
  - Huddling
  - Body Splashing
  - High Respiratory Rates and Open-Mouth Breathing
- What You can Do

### Heat Stress-Nutrition Interactions

- When It Comes to Heat Not all Feeds are the Same
- Keeping Cool Takes Energy
- Keeping Cool Takes Water
- Fescue Toxicosis and Heat stress

How Much Water do Cattle Need ?

### **How Hot Does it Get in Ontario ?**

- Maximum Daily Temperatures
- Average Daily Temperatures
- Alert Days, Danger Days, and Emergency Days

### **Shade: What are the Benefits ?**

- Shade Improves Gain in Hot (and not so hot) Places
- Shade and Reproduction
- Shade can make a Difference

### **Shade: What are the Costs ?**

- Cattle Recycle Pasture Nutrients
- Shade Concentrates Manure
- Ecological Considerations
- Some Suggestions to Reduce Manure Accumulation

### **Shade Construction**

- Not all Roof Materials are the Same
- Shade Orientation
- Shade Height
- Roof and Structure Design
- Other Building Tips
- Space Requirements
- How Shadows Move during the Day
- Portable Shade Structures

### **Shade Trees**

- Are Trees better than Constructed Shade ?
- Problems with Shade Trees

### **Hot Weather Habits - Cattle Behaviour in the Heat**

- Daily Grazing Patterns
- Shade Seeking to Gain Relief from the Sun
- Shade Seeking and Grazing
- Shade Seeking in Cool Weather
- Attraction to Water
- Why do Cattle Bunch in Hot Weather ?
- Cattle Behaviour on a Warm Sunny Day and on a Cooler Overcast Day

### **Pests and Parasites - Are They Affected by Shade ?**

- Intestinal Parasites
- Face Flies
- Disease Organisms

### **Emergency Systems: Sprinklers & Sprayers**

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