

Hot weather reduces quality of irrigated dairy forages

Feeding Cool Cows – Fact Sheet 1

KEY POINTS

There is a consistent decline in the nutritional value of perennial ryegrass, tall fescue and lucerne as temperature rises between 24°C to 40°C.

Fibre concentration of these three forages increases for each degree increase in temperature from 24°C to 40°C.

Energy and sugar concentrations in forages decrease for each degree increase from 24°C to 40°C.

Dietary options to include forages with lower fibre concentration and supplements with higher energy concentration should be considered to help maintain milk production during periods of hot weather.

Introduction

Many regions within the Australian dairy industry rely heavily on irrigated perennial pastures over the summer as the primary forage source for milking cows. The frequency of heat events is increasing across Australia. This means that the management of home-grown forages during summer should be considered in combination with managing the direct impact of heat stress on cows.

It is well known that the nutritive characteristics of perennial ryegrass decline under high summer temperatures. However, the magnitude of this nutritional change is not well quantified with very little information available to help understand what happens within the plant when temperatures are high. The result of this is that the impact of heat events on the nutritional value of pastures is often underestimated by farm managers as the focus is more on animal welfare through modifications to the cow's environment.

Work conducted as part of the Dairy Feedbase program's Feeding Cool Cows project has assessed the impact of hot weather on the nutritional characteristics of three commonly grazed forage species – perennial ryegrass, lucerne and tall fescue – that are often grown under irrigation in Australia's dairy regions. This knowledge provides farmers with a better understanding of how the nutritional characteristics of grazed pasture changes during heat events – allowing farmers and advisors to fine tune diet formulation at a herd level, help to mitigate against the negative impact of hot weather on milk production.

Impact of heat events on Perennial Ryegrass, Tall Fescue and Lucerne

Forages were sampled during and after heat events at a number of locations in Northern Victoria during the summer of 2018/19.

Samples of each forage type were collected at temperatures between 24°C and 40°C. Analysis showed that for each degree Celsius rise in the 3-day maximum daily temperature:

- Metabolisable energy (ME) and water-soluble carbohydrates (WSC) concentration decreased by 0.2 per cent meaning a less energy dense plant is available to the cow.
- Fibre concentration measured as Neutral Detergent Fibre (NDF) increased by 0.2 per cent and Acid Detergent Fibre (ADF) increased by 0.15 per cent resulting in a less digestible plant for the cow.

The effect of increased temperatures on these nutritional components of perennial ryegrass, lucerne and tall fescue was similar for all 3 species. There was no evidence that lucerne or tall fescue were able to better withstand the heat than perennial ryegrass in terms of the impact on nutritional components.

Table 1 Observed range of mean nutritive characteristics in the experiment for each species.

	Dry matter digestibility (% DM)			Neutral detergent fibre (% DM)			Water soluble carbohydrate (% DM)			Crude protein (% DM)*
	24°C	32°C	40°C	24°C	32°C	40°C	24°C	32°C	40°C	Average
Perennial Ryegrass	73.1	71.6	69.9	47.4	49.0	50.6	12.0	10.5	8.9	19.8
Tall Fescue	69.1	67.5	65.9	53.4	55.0	56.6	11.4	9.8	8.1	15.8
Lucerne	71.7	70.2	68.5	30.3	31.9	33.5	4.7	3.1	1.6	26.0

*Crude protein (CP) concentration of all samples was also measured but was not affected in any way by temperature changes.

This study shows that as temperatures rise above 24°C, cows are consuming forages that may be declining in nutritive value. In addition, the increased levels of fibre in these forage means that cows may have a reduced dry matter intake if the diet remains the same. These factors, in combination with other negative impacts of heat on a cow's metabolism, may contribute to reduced milk production.



What to do on farm

An improved understanding of the impact of heat on grazed forages, as demonstrated in this study, means that steps can be taken to modify the diet of cows grazing these pasture species in summer during periods of high temperature to minimise reduce milk production losses. These may include the addition of extra sources of fermentable energy on a short-term basis to the diet by using feeds such as grain or non-forage fibre sources (eg. almond hulls) to compensate for the reduced energy concentration of the heat affected forages.

Understanding the impact that heat has on forage nutritive characteristics can also be used when making harvest decisions for hay or silage. Harvesting before a heat event may result in a higher quality and less fibrous conserved feed to offer cows later in their lactation.

Another option to combat the negative effects of hot weather on forage quality may be the use of a low fibre forage in summer such as chicory. This reduces the likelihood of lower dry matter intake during periods of heat stress. Incorporating a low fibre forage such as chicory into the diet will require longer term planning as part of your overall feedbase management.

When looking at nutritional changes to help manage heat stress in your herd remember that this is just one component in a variety of heat management strategies such as shade, sprinklers and adjusted milking times.

It is highly recommended that any changes to the herd diet are made in consultation with your nutritionist or advisor.



Further Reading

'Effects of extreme summer heat events on nutritive characteristics of dairy pastures in northern Victoria, Australia'. *Animal Production Science*. Rogers et al., (2022)

MORE INFORMATION

Read more about managing heat stress in cows here [Cool Cows | Dairy Australia](#).