Fine-tuning protein supplements for fresh period grazing dairy cows

First 100 days - Factsheet 2

Key points

Increasing the crude protein concentration of the grain mix post-calving resulted in extra milk production during the fresh period, but this extra milk did not cover the increased cost of the grain mix at the time of the experiment.

Differences in milk yield observed from varying concentrations of dietary crude protein did not persist once all cows were fed a common diet from 30 days in milk onwards.

Introduction

The fresh cow period is loosely defined as the first three to four weeks post calving. During this critical period of lactation, dairy cows are subject to many metabolic stressors that combine to cause reduced dry matter intake (DMI) in the first few weeks post-calving. Simultaneously during this period, daily milk production steadily increases towards its peak at around 50–70 days in milk. The cow is in negative energy balance at this stage, where the energy output in milk production is greater than energy intake via feed.

A good transition cow management program in the weeks leading up to calving, combined with optimal body condition score management of the herd in the previous lactation and throughout the dry cow period is crucial. Cows should be calving in the target range of 4.5–5.5 (8-point scale) to help limit the negative impact of these metabolic stressors during the fresh cow period.

Another key aim during the fresh cow period is to make sure that DMI of a nutritionally balanced diet is maximised to the highest possible level. This helps reduce the intensity of the negative energy balance phase in early lactation and is also a key driver of increased milk production.

Importance of feed type in the fresh cow period

The Dairy Feedbase – First 100 Days research team showed that feeding maize grain instead of wheat grain increased DMI and milk production, but only when average quality ryegrass pasture silage was replaced with high quality, digestible lucerne hay as the forage base in the fresh cow period (see Factsheet 1 of this series).

The next step was to introduce grazed fresh pasture as the forage base during the fresh cow period, which more closely resembles on-farm practice on most Australian dairy farms. A feature of early spring pasture is its high crude protein concentration, often up to 30 per cent of total dry matter. However, earlier research at the Ellinbank Smart Farm has shown that despite this high level of crude protein in fresh pasture, overall DMI and milk yield responses can still be increased by supplementing with canola meal, a high protein concentrate that contains a different form of crude protein to that in grazed ryegrass pasture. Commonly used high protein concentrate byproducts or grain meals tend to provide amino acids (protein's building blocks) that may be in short supply in pasture to adequately match the high producing cow's requirements.

DairyFeedbase GARDINER FOUNDATION AGRICULTURE VICTORIA

DELIVERING for DAIRY

Experimental design

Immediately post calving in spring 2021, three treatment groups were formed with different rates of canola meal as shown in Table 1. All cows grazed perennial pasture offered at a generous allocation so that daily DMI was not limited. The three treatment diets (0C, 1.5C and 3C) were fed from 1–30 days in milk, with the same carryover diet offered to all cows from 31–72 days in milk.

The three diets were designed to ensure the same amount of metabolisable energy was offered to all cows regardless of treatment, with the only difference being the varying levels of canola meal which resulted in the crude protein content of the grain mix differing across the three diets from 1–30 days in milk.

Table 1 Components in the fresh period grain mix treatments and carryover grain mix and the amount offered.

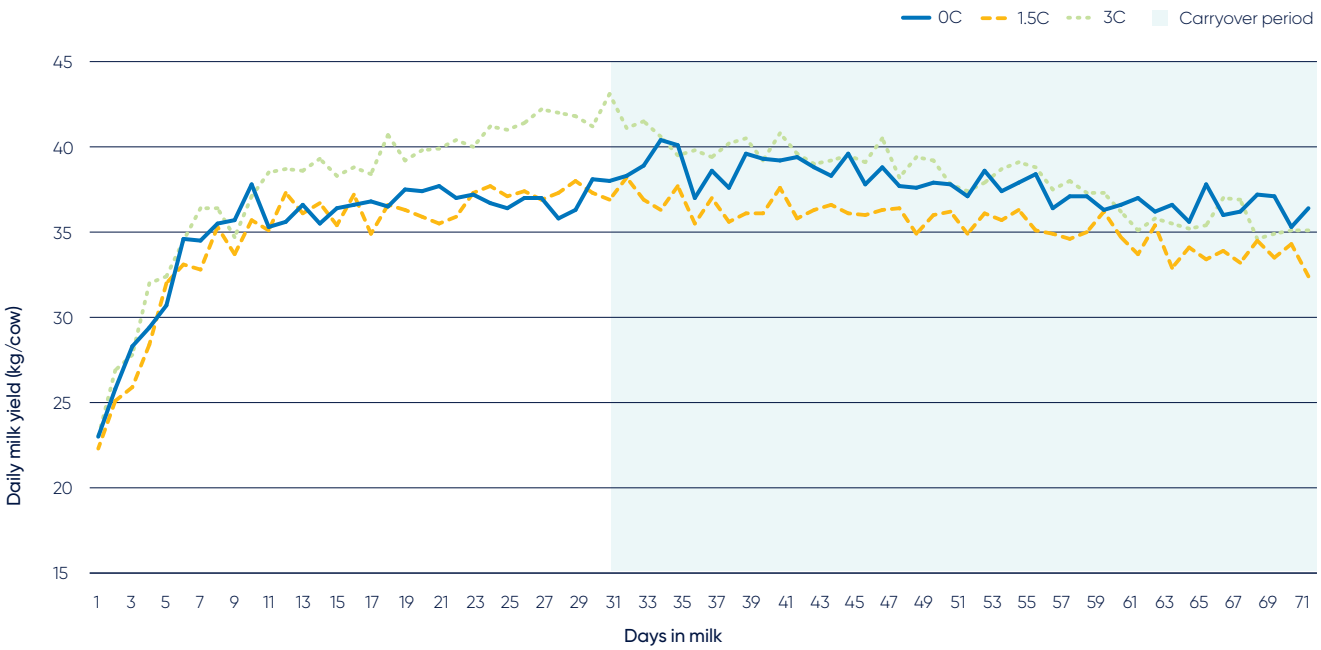
Grain mix treatment	Maize (kg DM)	Almond hulls (kg DM)	Canola meal (kg DM)	Wheat (kg DM)	Barley (kg DM)	Bergafat (kg DM)	Total amount offered (kg DM/cow.d)
0C	6.1	2.9					9.0
1.5C	6.1	1.4	1.5				9.0
3C	6.0		3.0				9.0
Carryover period mix	1.5		1.2	1.6	2.6	0.1	7.0

Milk production

Figure 1 shows the daily milk yield per cow for each of the three diet groups, across both the treatment period (1–30 days in milk) and the subsequent carryover period to 72 days in milk. During the fresh cow period, the cows receiving the highest level of canola meal (3C) produced more milk than the other two treatments. However, the differences did not persist into the carryover period when all cows received the same diet. Milk protein and fat concentration was highest for the 1.5C group during the fresh period, but it was not statistically different to the other two treatments. Overall during the treatment period (1-30 days in milk), the average daily milk solids yield was 2.61, 2.59 and 2.65kg/cow for the respective 0C, 1.5C and 3C treatments.

In the carryover period, milk protein concentration was higher for cows on the 1.5C diet than cows offered the 3C, but not significantly different to the 0C treatment. There was no difference in milk fat concentration shown at any stage. Average daily milk solids yield during the carryover period was 2.47, 2.34 and 2.40kg/cow for the respective 0C, 1.5C and 3C treatments respectively. Milk urea nitrogen, as well as blood urea concentration was significantly higher for the 3C cows than the other two treatments, reflecting the higher concentration of crude protein in the 3C diet.

Figure 1 Daily milk yield of each group during the treatment period (1–30 days in milk; 9 kg DM/cow of each treatment grain mix offered) and the subsequent carryover period (31–72 days in milk; 7kg DM of the same supplement offered to all cows).



Feed intake

Pasture intake was measured from all three groups for a five-day period between 22 and 26 days in milk but no differences were observed in daily pasture DMI between each treatment group. Cows consumed an average of 16.6kg DM of pasture per day across all three treatments, and total combined daily intake of grazed pasture and grain averaged 25.3kg DM/cow for all three treatments. While grain intake of the 0C cows was slightly lower than cows on the 1.5C or 3C diets, total DMI for all treatments was not statistically different and averaged 25.3kg DM/cow.

Economics of each treatment

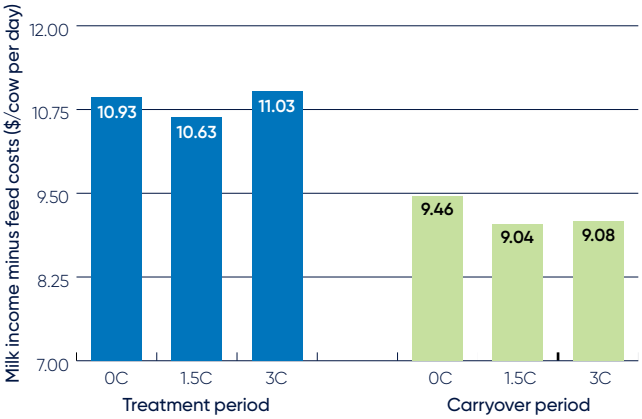
The milk price used in the economic analysis was AU$6.37/kg of milk solids (AU$9.09/kg protein and AU$4.13/kg fat, which was a six-year average milk price at the time of the experiment).

The cost of 0C, 1.5C and 3C treatments were substantially different at $359/t DM, $417/t DM and $465/t DM, respectively. This reflects the fact that canola meal is a significantly more expensive ingredient than almond hulls.

The cost of the carryover grain mix, which was the same for all three treatment groups, was $421/t DM.

During the fresh period, cows offered either diet that included 3kg of canola meal or no canola meal (3C and 0C) had similar profitability, and both were more profitable than cows fed the grain mix with 1.5 kg of canola meal, when profit was calculated as milk income minus the cost of feed (Figure 2). While the inclusion of 3kg DM of canola meal increased milk yield during the fresh period compared to the 0C treatment, the additional costs associated with the use of 3kg of canola meal cancelled out the benefits shown from increased DMI and milk production. Furthermore, in the carryover period when cows were fed a common diet, both canola meal treatments remained less profitable than 0C.

Figure 2 Milk income minus feed costs for each treatment



Implications and Outcomes

- The higher rate of canola meal (3C treatment) produced more milk than the other two treatments during the fresh cow period but contrary to expectations, this was not driven by dry matter intake which was the same for all cows in the experiment.
- Total daily DMI from 22-26 days in milk was over 25kg DM/cow, which demonstrates that relatively high levels of DMI are possible in grazing dairy cows fed these grain supplements.
- Body condition did not differ at any point between groups, which indicates that mobilisation of body reserves had no impact on the differences in milk production shown during the fresh cow period.
- In summary, altering the amount of metabolisable protein by adding canola meal to the grain mix during the treatment period did not provide any advantage in the carryover period. A different outcome was achieved when cows were offered a different type of starch source in the fresh period (maize vs wheat; See Factsheet 1 of this series).

Acknowledgement
Dairy Australia acknowledges the funding from levy payers and contribution by Commonwealth Government.

Dairy Australia Limited ABN 60 105 227 987
E enquiries@dairyaustralia.com.au
T +61 3 9694 3777
F +61 3 9694 3701
dairyaustralia.com.au

5567 | Nov 2024