



## KEY MESSAGES REGARDING FEEDING

# Sugarcane Forage

Before feeding sugar cane forages in dairy cattle diets, it is critical that feed-testing is completed, and nutritional advice is sought

### **Nutrient content of sugarcane forage**

- There is considerable variation in the nutritive value of sugarcane forages. The average metabolisable energy (ME) content of sugarcane silage is 7.7 MJ/kg dry matter from the literature. The average ME content of sugarcane silage sampled in northern NSW during the early 2000's was 8.3 MJ ME/kg DM.
- Thick-rinded varieties of sugarcane are generally of poorer nutritional quality.
- The high sugar content of sugarcane forage can cause alcoholic fermentation during ensiling. This can vary in concentration.
- Severely frosted cane should be avoided as stockfeed.

### **Factors affecting the performance of lactating cows, dry cows and replacement heifers fed sugarcane silage.**

- The low energy content of sugarcane forage limits milk production per cow and hence its inclusion rate in lactating cow diets. Maximum feeding levels of sugarcane silage range from 5 - 8 kg dry matter per cow per day.
- Sugarcane silage has performed poorly in comparison to other forages fed to lactating cows.
- Intake of sugarcane silage by lactating cows is less than other forages.

### **Practical aspects to ensiling and storing sugarcane forage**

- Use an inoculant when ensiling chopped whole sugarcane.
- Roll silages well and seal well.
- Sugarcane silage is a cost-effective silage to transport.
- Young cane can ensile poorly.
- Sugarcane can be stored successfully on-ground, in earthen bunkers or concentrate bunkers and fed in paddocks with minimal wastage.

### **Chemical residues in sugarcane forage – reducing the risk**

- Obtain a fodder vendor declaration when purchasing sugarcane forage.
- Purchase crops which have a good record of chemical use and a low risk of spray drift from surrounding crops.
- Do not accept fodder containing soil.

# 1

# Feeding sugar cane forage to dairy herds

## A. Nutritive value

Table 1 compares the nutritive value of sugarcane tops and whole sugarcane silage versus the nutritive requirements of various classes of dairy cattle.

Nutritional data indicates that sugarcane silage is low in the majority of major nutrients required for different classes of dairy cattle, with the exception of neutral detergent fibre, magnesium and some

microminerals. Of concern are its high concentration of iron and aluminium. Iron concentrations in excess of 250 ppm have been linked to causing copper deficiencies. In regard to aluminium, one sample collected in northern NSW during 2002 measured 790 ppm in aluminium, a level approaching the maximum tolerance for lactating dairy cows (1000 ppm). This

high dietary level of aluminium may have implications for the absorption of macro-minerals, particularly phosphorus.

As with many tropical forages, sugarcane contains oxalate. Oxalate reduces the availability of calcium. Given that calcium is relatively inexpensive, assume that sugarcane forage will contribute no calcium during diet formulation.

**Table 1. Mean nutritive value of sugarcane tops and silage in comparison to the requirements of milking cows, dry cows and replacement heifers.**

Nutrient (dry matter basis)	Sugarcane tops	Sugarcane silage	Estimated nutrient requirements		
			Lactating cows <sup>1</sup>	Dry cows	Heifers
Dry Matter %	29	22 to 45			
Metabolisable energy (MJ/kg)	8	7.7	10.3	8.6	9.5
Crude protein (%)	5.5	3.9	16	12	12
Neutral detergent fibre (%)		67	28-34	33	33
Calcium <sup>2</sup> (%)	0.46 <sup>2</sup>	0.25 <sup>2</sup>	0.6	0.45	0.4
Phosphorus (%)	0.16	0.09	0.38	0.24	0.3
Magnesium (%)		0.28	0.25	0.16	0.16
Potassium (%)		0.42	1.0	0.6	0.6
Sodium (%)		0.02	0.22	0.2	0.2
Sulphur (%)		0.15	0.2	0.2	0.16
Iron (ppm)		227 <sup>3</sup>	50	50	50
Manganese (ppm)		198	40	30	30
Zinc (ppm)		27	55	40	40
Copper (ppm)		5	11	13	10
Cobalt (ppm)		0.4	0.1	0.1	0.1
Aluminium (ppm)		265	Max 1000.		

Average nutrient content data indicates adequate levels to meet requirements

Highly likely concentrations will limit production/growth

Subject to feed analysis and other dietary feedstuffs, supplementation will be required

<sup>1</sup> Based on a 550 kg cow producing 22 litres – no liveweight loss

<sup>2</sup> Calcium levels should be interpreted with caution as its availability can be low due to the presence of oxalates.

<sup>3</sup> Iron levels more than 250 ppm have been recorded to cause copper deficiency

## B. Limits to intake of sugarcane forages in milking herd diets

The low energy content, high fibre content, and the potential risk of alcohol poisoning limits the inclusion of sugarcane silage in lactating cow diets to a maximum of approximately 5 kg dry matter (DM) per cow per day for moderate levels of milk production. Provided alcohol concentrations are at safe levels, up to 8 kg DM per cow per day has been fed, however a reduction in milk yield can be expected.

Additionally, the fibre content in sugarcane forages degrades slowly in the rumen, further limiting intake due to rumen fill.

If it is feasible to segregate cows based on stage of lactation, then sugarcane forage should not be feed to fresh or peak lactation cows.

## C. Alcohol poisoning from sugarcane silage

Due to the high sugar content of whole plant sugarcane forage, yeast fermentation often leads to the production of significant quantities of alcohol. Observations in Hawaii have shown well preserved sugarcane silages (< pH 4) can have ethanol concentrations ranging from 7.5 % for 6-month-old cane to 17.5 % for 24-month-old cane.

Ruminants have a low tolerance for ethanol. In light of this, stock should be monitored when fed sugarcane silage that has a strong alcoholic smell.

In 2002, dairy cows at Wollongbar Agriculture Institute showed early signs of alcohol poisoning at a feeding rate of 5 kg DM per cow per day.

### What are the symptoms of alcohol poisoning in cattle?

- Reluctance to stand
- Stupor
- Staggered walk
- Loss of appetite

## D. Other health concerns for milking herds

There have been cows deaths recorded when sugarcane silage has been fed. Post-mortems showed severe ulceration typical of grain-induced acidosis. It has been speculated that the high silica content of sugarcane forage may lead to rumen wall damage.

## E. An example milking herd diet containing sugarcane silage

The diet shown below was fed to milking cows during the drought in 2002.

Diet	Amount (kg DM/cow.day)
Sugarcane silage	5
Lucerne hay	4
Barley grain	5.7
Kikuyu pasture	1
Cottonseed meal	0.9
Salt	0.13
Dicalcium phosphate	0.12
Sodium bicarbonate	0.12
Urea	0.10
Vitamin/mineral premix	0.02
Nutrient content (DM)	
Metabolisable energy (MJ)	9.5
Crude protein (%)	15.1
Neutral detergent fibre (%)	43
Non-fibre carbohydrates (%)	34
Calcium (%)	0.67
Phosphorus (%)	0.44

*Urea should be introduced to diets over a fortnight*

# 2

## Feeding sugarcane forage to dry cows and replacement heifers.

### a. Nutritive value

Table 1 (page 2) shows the average nutrient content of sugarcane silage relative to the nutrient requirements of dry cows and replacement heifers.

In respect to dry cows, supplementation with energy, protein and macrominerals would be required.

In respect to replacement heifers, similar nutritional limitations exist, albeit with additional energy, protein, calcium and phosphorus supplementation being required (especially for younger stock). Feeding to stock younger than six months of age should be avoided.

# 3

## Variation in the nutritive value of whole sugarcane forage.

### A. Energy content

Samples of sugarcane silage collected in northern NSW in 2002 showed a wide variation in digestibility and hence metabolisable energy content (Figure 1). The average ME content of these samples was 8.3 MJ/kg DM, which is low compared to typical forages fed to a milking herd. However, over 47 % of these samples had a ME concentration in excess of 9 MJ/kg DM. Other drought forages with a ME of 9 MJ (or less) include tropical grass hay, grassy legume hays, forage sorghum, low quality cereal hay and straw.

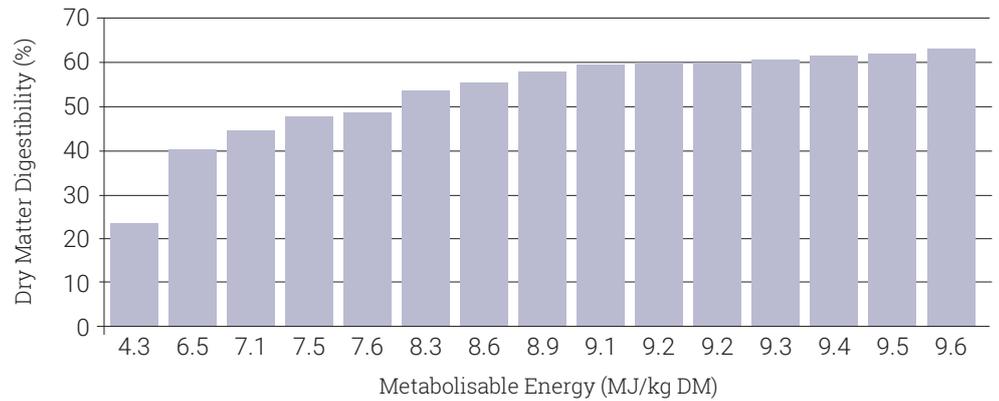


Figure 1. Dry matter digestibility and energy content of whole plant sugarcane silage samples collected in northern NSW during December 2002.

There are various factors that affect the nutritive value of sugarcane forage.

### B. Cane variety

There is little information available regarding differences in the nutrient content of sugarcane varieties for ruminants in Australia. One observation was that silage contractors refused to cut "thick-rinded" varieties of cane or varieties with multiple, recumbent stalks, stating that these varieties caused excessive wear on harvesting machinery. Anecdotally, it could be expected that these thick-rinded varieties would be higher in fibre and hence lower in digestibility.

Overseas research has shown considerable differences in digestibility amongst varieties with some fresh samples ranging up to 71% (10.0 MJ metabolisable energy/kg dry matter).

It would generally be expected that varieties that have higher yields of sugar would have a higher energy content as fresh samples. However, as discussed previously, high sugar content may lead to high alcohol production during ensiling, therefore ultimately having a negative effect on animal performance.

There appears to be little difference in protein content between sugarcane varieties.



# 4

## Practical aspects to ensiling sugarcane forage

### A. Dry matter content

Ensiling young cane (e.g. 6 months of age) with high moisture content (eg. 22 % DM) can potentially lead to clostridial fermentation and significant levels of butyric acid.

### B. Harvesting

Sugarcane is difficult (but quite possible) to harvest using conventional harvesters which would typically be used for maize or sorghum. Other alternatives include using a Kemper harvester which is commonly used for non-row crops. Difficulties are encountered because sugarcane is a high yielding crop, has tough stalks, tends to lodge easily and can have broad stooling characteristics. Sugarcane varieties should be selected which are erect to minimise equipment wear. Chopping knives also require servicing more frequently than would be the case if maize or sorghum was being harvested.

### C. Use of additives

As discussed previously, alcoholic fermentation due to yeast growth can be a negative result of ensiling sugarcane. To ensure this effect is minimised, additives should be used during the ensiling process. Options include the use of lactobacillus inoculants (choose a *Lactobacillus buchneri* based-inoculant).

### D. Rolling of sugarcane forage

Due to the high concentration of fibre in sugarcane forage, it is sometimes difficult to successfully compact this material to remove air. To assist with this, avoid ensiling frosted material. A short chop length should also be used. Using a short chop length also improves the intake of sugarcane forages. To minimise aerobic spoilage, sugarcane silage should also be sealed quickly at the completion of ensiling.

### E. Transport of sugarcane forage

The high dry matter content (up to 45% DM) of some sugarcane forage can make it a more efficient forage to transport. This can be offset by being more difficult to roll for ensiling.

# 5

## Chemical residues

Chemical residues in feedstuffs can potentially “find their way” into milk and meat products and significantly damage product quality. In the sugarcane industry, organochlorides were used up to the mid-1980s to control insects. There are concerns that residues from these chemicals can still be in soil years after application.

There are three main potential sources of chemical residues in freshly harvested fodder: chemicals applied, spray drift and contaminated soil.

### Ways to minimise chemical residue contamination:

#### Chemicals applied to the growing crop

Determine what chemical treatments, if any, were applied to the crop. If treatments were applied, were they done in accordance with label directions and were withholding periods properly observed? Also try to purchase sugarcane from paddocks where the chemical application history has been well recorded, and organochlorides have not been used.

#### Spray drift from surrounding crops

Assess the risk of the sugarcane crop being exposed or potentially exposed to other chemical contamination by spray drift.

#### Inclusion of soil containing persistent organochlorine chemicals

Cane land in production before June 1985 and cane paddocks where ‘mill mud’ (a by-product of the crushing process) has been applied may have organochloride contamination. Harvesting at a high cutting height (e.g. 20 cm) will reduce the risk of having soil incorporated into forages.

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