



White sorghum crop pre harvesting stage.

White Sorghum – a resilient flexible forage



Last spring, the Queensland Department of Agriculture and Fisheries (DAF) C4Milk team had a series of regional workshops promoting a variety of new forage options. White sorghum was one option that several farmers decided to pursue in the summer of 2017.

White sorghum can be harvested as silage or as headlage (the grain portion) and footlage (the remaining forage after the grain is harvested). This article looks at the benefits of white sorghum as a crop compared to maize and the options that can be implemented at harvesting. Our conclusion is that white sorghum can handle some tough treatment on the irrigation or rainfall front and yet still deliver a cost-effective quality feed source.

Why white sorghum headlage?

The interest in white sorghum started with headlage when Amy Barber, a Research Scientist at (DAF) Gatton, was investigating how farmers could purchase or grow cheaper alternatives of starch rather than relying solely on purchasing grains.

After several crops being grown both at Gatton Research Dairy and on regional farms, DAF are confident that white sorghum is a good option to promote to farmers across several different regions.

White sorghum headlage is price competitive. Compared to a crop harvested as grain, headlage equates to eleven times the yield at 11.5 tonnes per hectare (or 6 tonnes dry matter per hectare). It is also a good source of nutrients for milking dairy cows. It has levels of starch, protein and fibre closer to cow nutritional requirements than a sorghum crop harvested for silage or grain. This allows for greater inclusion in milking herd diets. Please see Table 1 and Figure 1 on page 3.

Varieties and harvesting management

Liberty white sorghum is the variety that has been used for headlage to date. It performs well in dryland conditions and is capable of multiple cuts in a high rainfall or irrigated situation. When harvesting headlage, the plant must be cut below the

first leaf (flag leaf). Grain should be just past the soft dough stage and left slightly longer than regular silage (approximately 110 days depending on conditions). A draper style front (Honey Bee) should be used on the harvester with rollers closed as tightly as possible to crack a high proportion of grain. The combination of seed head with green leaf material should result in silage type material of 50% dry matter in the pit. Headlage should be inoculated at 1.5 times the rate you would inoculate regular sorghum silage due to it being a drier material and having lower leaf sugar content.

Managing post-harvest residues

After the first harvest of headlage, the remaining plant material can be harvested and ensiled as a product called footlage. This footlage can be used as a feed for heifers and dry cows, noting that it is particularly low in crude protein, meaning it could not be the sole feed for these animals. Alternatively, heifers or dry cows may graze the remaining forage. The likely yield of the footlage is 20 tonne/ha as fed (or around 5 tonnes dry matter/ha).

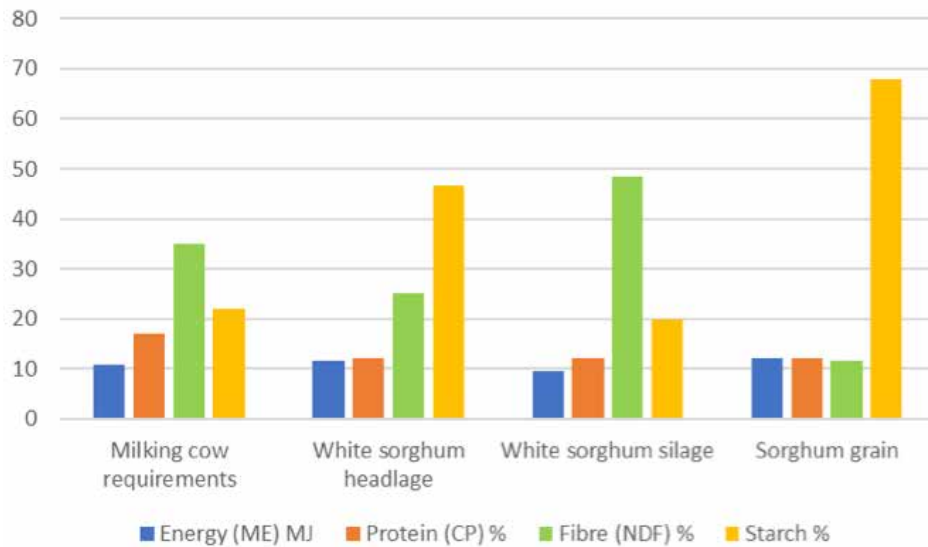
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Nutrients (dry matter basis)	Milking cow requirements	White sorghum headlage	White sorghum silage	Sorghum grain
Energy (ME) MJ	10.5-11.5	11-12	9-10	11-13
Protein (CP) %	16-18	11-13	11-13	12
Fibre (NDF) %	28-32	24-26	47-50	9-14
Starch %	22-24	45-48	20	68

Table 1 and Figure 1 Comparison of typical milking cow requirements versus the nutrient content of white sorghum headlage, white sorghum silage and sorghum grain

ME: Metabolisable Energy, MJ: Megajoules, CP: Crude Protein, NDF: Neutral Detergent Fibre. Please consult your nutritionist for milk cowing cow requirements for you herd.



Harvest height for white sorghum headlage.

In some cases, particularly if irrigated and fertilised, the crop will regrow from tillers and be ready for harvest some three months later. The ratoon crop will not have as high a grain yield as the first and should be taken as a whole silage crop or harvested before flowering as a high quality forage. If the recovery is too poor for a mechanical harvest it may be successfully grazed with dry stock.

White sorghum headlage becomes more digestible over time the longer it is stored

In demonstration silages, DAF has found that the longer the headlage is left ensiled, the more digestible the starch becomes. DAF trials have demonstrated that cows fed headlage after 3 months of ensiling have a greater proportion of whole sorghum grain in their manure than those which were fed headlage that had been ensiled for 12 months. A real advantage of headlage is it can sit in the pit until it is needed becoming more digestible over time. It is also a good substitute for purchased grains.

White sorghum headlage is a cost-effective source of starch

When compared to other sorghum and maize fodder options, sorghum headlage is the most cost effective source of starch at \$0.33/kg of starch amongst the sorghum feed alternatives as shown in Table 2 (page 4).

White sorghum versus maize

White sorghum headlage compares favorably with maize or high chop maize silage as a cheap starch source particularly when compared to forage sorghum silage. Maize silage will outperform white forage sorghum silage or headlage in sheer volume per harvest, the exception being when white sorghum is harvested twice as silage.

Sorghum is best suited to farms with limited water resources where rainfall is a major driver of yield. White sorghum is a low input crop with options that can be implemented depending on the seasonal conditions dealt. The problem often faced with



Honey Bee draper style front used for harvesting white sorghum headlage.



growing maize for silage on your dairy platform is that it has large water requirements and this can put pressure on water used to irrigate milker feed at that time. Growing white sorghum requires less irrigated water, it's far less demanding, meaning you can juggle irrigations around your grazing rotation and still get a good crop. In situations where this crop is grown off the dairy platform, it's so much easier to manage.

Maize silage is still the "premium" dairy silage, however, white sorghum fills a very important niche. Maize is an incredibly high input crop and if there are some slight impediments to growing

Table 2 Comparison of starch sources commonly used in milk herd diets.



and harvesting phases it may become very expensive. Whilst white sorghum is generally lower in starch availability and perhaps slightly higher in NDF, the growing costs are considerably less and the crop is much more forgiving than maize if weather problems occur. White sorghum made into silage is generally marginally higher in NDF and half the starch content of maize silage but almost twice the starch content of other forage sorghum types used for silage. For those who make white sorghum silage, so long as it is fed with a lower NDF feed like ryegrass or lucerne, then overall NDF in the diet will not be an issue.

On farm results during 2017

Five farmers on the Sunshine Coast planted the white sorghum last summer. In all cases they grew one full crop and in some cases farmers harvested crops twice or grazed with dry stock very successfully. Some farmers grew these crops on ex-cane and leased land, usually within 30 kilometres from home. Others substituted white sorghum on land at home on which they previously planted maize silage. Where the crops were cut twice, the total yield was as good as a maize silage crop on the same area of land, around 18-21 tonnes dry matter per ha. Some of the crop was cut higher, about 30cm, to reduce NDF and deliver a higher quality silage on the pad. ■ ■ ■

Feed	Starch %DM	CP %	Yield t DM/ha	As fed \$/t	\$/kg DM	\$/kg Starch
Sorghum						
White Sorghum Headlage	48	15	6	82	0.16	0.33
White Sorghum Silage – 1 cut	21	12	12	49	0.14	0.68
White Sorghum silage - 2 cuts combined	21	12	19	44	0.13	0.62
Forage Sorghum Silage	12	11	16	40	0.15	1.22
Sorghum Grain	68	12	-	240	0.27	0.38
Maize						
Maize Silage	39	9	19	61	0.15	0.39
High Chop Maize Silage	42	9	17	64	0.15	0.37
Maize grain purchased	66	11	-	350	0.39	0.59

