

# A to Z of fibre sources

## FORAGES AND HIGH-FIBRE BY-PRODUCTS AND THEIR EXPECTED FEED VALUES

When forage availability is limited, alternative fibre options may need to be considered. The fibre sources in the following table may be suitable for dairy stock provided they are supplemented with high-energy feeds and protein sources as part of a balanced diet.

### Fibre source

In a fodder shortage you might be forced to consider using feeds you have never used before. This table lists typical feed values for 51 different feeds – including a number of high-fibre by-products.

### Dry matter (DM)

This column notes the dry matter value of the feed – expressed as a percentage. Pay particular attention to the range. How would you establish exactly what you were getting?

### Metabolisable energy

The values here are averages too – again, pay attention to the range. Where does this fit in with other feed you are offering. How many megajoules of ME do your cows need to consume daily in order to achieve your production and body condition targets?

### Crude protein

Crude protein requirements vary according to stage of lactation and range from 16–18 per cent DM in early lactation, dropping to 12–14 per cent DM during the early (far-off) dry period.

### Neutral detergent fibre

Averages and typical range presented here. Remember, the suggested ideal NDF level for total dry matter intake in lactating dairy cows is 28–35 per cent DM. A dietary NDF level less than 28 per cent DM is high risk for acidosis, particularly when less than 75 per cent of this NDF comes from non-forage sources or feedstuffs are highly processed.

### KEY MESSAGES

Physically effective fibre is required by all ruminants

Alternative fibre sources can be used

If possible, conduct a feed analysis

Check with your advisor if you are using feeds you have never used before

### Nutritive value or digestibility

The shading flags levels – low values may be unpalatable.

### Physically effective fibre value (peNDF)

This refers to the ability of a feed to stimulate chewing activity and the production of saliva. Aim for at least 22 per cent of total diet DM as peNDF.

### Maximum daily consumption

The figures here represent the percentage this feed should represent out of the total dry matter intake. Make sure you get the balance right.

### Comments/risk

Often the comments explain the maximum daily consumption recommendations. See an adviser to check your assumptions and calculations, particularly with fibre products you are not used to handling.

**Table 1** A–Z of fibre sources (forages and high-fibre by-products) and their expected feed values

Fibre source	Expected composition <sup>†</sup> (mean with range of values in brackets)				Nutritive value or digestibility (Subjective Score L/M/H)	Physically effective fibre value (peNDF; % of total NDF)	Maximum daily consumption* (% DM intake)	Comment/risk
	Dry matter* (%)	Metabolisable energy* (MJ/kg DM)	Crude protein* (% of DM)	Neutral detergent fibre* (% of DM)				
Alfalfa cubes	91 (89.6–92.3)	n/a	18.8 (15.5–22.1)	44 (36.9–50.3)	Medium	40%	70	Processed through feed miller? = Seek vendor dec re fitness for purpose
Almond hulls	90 (88–92)	10 (8.5–10.5)	5 (4–6)	35 (30–45)	Medium	34% (milled) 90% (whole)	10	Feed value varies according to proportions of outer hull and inner husk. Higher NDF generally relates to higher proportion of outer hull and higher levels of ADF. Product is generally milled to increase density but this further reduces effective fibre level
Barley hay	87 (79.9–91.1)	8.8	8.6	60	Medium	99%	50	Potential residue risks (insecticides, herbicides, fungicides)
Barley straw	89 (73.4–93.6)	6.5 (2.2–8.5)	2.8 (0.2–28.8)	77 (54.7–87.3)	Low	99%	30	Potential residue risks (insecticides, herbicides, fungicides)
Brewers grains	32 (13.9–93.0)	10.5 (7.7–11.9)	21.9 (16.9–35.2)	55 (41.6–61.6)	High	30%	30	High moisture content – storage requires care, potential mycotoxins
Canola hay	85 (61.3–93.5)	10.4 (7.4–13.0)	16.8 (8.6–27.2)	38 (25.4–53.1)	Low	100%	50	Risk of sulphur toxicity. Potential residue risk (insecticides, herbicides, fungicides)
Canola silage	47 (24.8–75.7)	10.5 (7.4–12.4)	18.1 (10.3–26.0)	38 (25.6–52.2)	Low	90%	50	Risk of sulphur toxicity. Potential residue risks (insecticides, herbicides, fungicides)
Cardboard	93	0.5	0.8	95	Nil	Low	10	Glue, ink, staples or other metal items. Acids? Sulphides? Difficulty in processing for feeding.
Chickpea gradings	90	10.8	10.5	55	Med–High	Low	10	Whole seed is poorly digested. Potential residue risks (insecticides, herbicides, fungicides)
Citrus pulp (wet)	20 (17–21)	12.5	7.5	23.0	High	41%	12.5	Good intake characteristics, but when removed from diet can lead to feed rejection. Limonin in seeds (lemon and grapefruit) is toxic to young animals and can make the feed unpalatable to older stock. Poorly stored fresh material can mould easily leading to mycotoxin contamination. High feed levels can lead to milk taint.
Copra meal	90	12.0	20.0	52	High	23%	15	Aflatoxin risk (Note: Fonterra NZ suppliers can no longer use because of this)
Corrugated cardboard boxes	93	0.5	0.4	92	Nil	Low	10	Glue, ink, staples or other metal items. Acids? Sulphides? Difficulty in processing for feeding.
Cottonseed hulls	91 (88.7–92.7)	n/a	8.2 (4.5–12.0)	80 (70.7–88.8)	Low	90%	10	Palatable but low feed value. Potential residue risk (insecticides, herbicides, fungicides). May be GM
Cottonseed hulls – ensiled	88	2.8	6.1	90	Low	Medium	10	Palatable but low feed value. Potential residue risk (insecticides, herbicides, fungicides). May be GM
Cottonseed hulls – pellets	93	6.0	5.8	84	Low	40%	10	Palatable but low feed value. Potential residues risks (insecticides, herbicides, fungicides). May be GM
Distillers grains (dried)	92	13.6	26.9	29	High	4–12%	20	Check oil/fat level as high inclusion levels can reduce milk fat %. Very dark product with a burnt smell is likely to be overheated and so protein availability will be low. Potential mycotoxins

Fibre source	Expected composition <sup>†</sup> (mean with range of values in brackets)				Nutritive value or digestibility (Subjective Score L/M/H)	Physically effective fibre value (peNDF; % of total NDF)	Maximum daily consumption* (% DM intake)	Comment/risk
	Dry matter* (%)	Metabolisable energy* (MJ/kg DM)	Crude protein* (% of DM)	Neutral detergent fibre* (% of DM)				
Distillers grains (wet)	27 (14.2–40.4)	13.6	29.7 (16.7–42.7)	29 (17.9–39.2)	High	4–12%	20	Check oil/fat level as high inclusion levels can reduce milk fat %. Potential mycotoxins
Grape marc – raw	55 (19.6–93.9)	6.5 (2.3–12.1)	12.2 (5.4–18.5)	48 (20.3–60.6)	Low	34%	10	Wide range of nutrient specs. 6–10% oil. High tannins tend to bind much of the protein. Chemical residues risk (fungicides), also heavy metals. Whole seeds will be largely indigestible
Grape marc – pressed	50	10	13	33	Low	Low	10	Excess alcohol removed by distillation compared to raw grape marc from wine industry. Chemical residues risk (fungicides), also heavy metals. Whole seeds will be largely indigestible. Protein availability is low in overheated product
Grape marc silage – raw	36 (28.1–46.4)	8.1 (4.3–11.1)	17.9 (11.7–23.3)	n/a	Low	Low	10	Wide range of nutrient specs. 6–10% oil. High tannins tend to bind much of the protein. High chemical residues risk (fungicides), also heavy metals. Whole seeds will be largely indigestible
Hominy (corn)	89	15.4	13.1	23	High	22%	30	Potential residue risks (insecticides, herbicides, fungicides)
Lablab hay	90	8.4	13.5	57	Medium	99%	50	Potential residue risks (insecticides, herbicides, fungicides)
Millet hay	80	8.5 (5.5–10.6)	8.7 (2.5–23.3)	66 (48.3–80.1)	Medium	100%	40	Nitrate poisoning in stressed plants. Potential residue risks (insecticides, herbicides, fungicides)
Millet silage	41	9.7 (8.5–11.6)	14.4 (5.9–26.6)	58 (44.0–65.0)	Medium	90%	50	Nitrate poisoning in stressed plants. Potential residue risks (insecticides, herbicides, fungicides)
Millrun (wheat)	90	11.3	16.4	36.7	High	6%	30	Consists of wheat bran, endosperm and screenings. Variable nutritive value according to the production plant. Useful source of digestible fibre, but low in effective fibre. Limited supply
Newspaper	93	0.5	0.4	89	Nil	Low	10	Glue, ink, staples or other metal items. Acids? Sulphides? Difficulty in processing for feeding
Oat hay	90 (84.5–93.2)	8.3 (7.4–9.5)	7.1 (4.0–11.5)	62 (51.6–79.2)	Medium	99%	40	Potential residue risks (insecticides, herbicides, fungicides)
Oat hulls	92 (88.7–94.3)	n/a	6.2 (3.5–8.9)	70 (57.2–81.9)	Low	83%	10	Potential residue risks (insecticides, herbicides, fungicides)
Oat straw	89	6.2 (4.3–10.0)	2.8 (0.1–11.9)	73 (54.5–78.8)	Low	99%	30	Potential residue risks (insecticides, herbicides, fungicides)
Palm kernel extract (PKE) meal	94 (91.5–96.2)	11.1 (9.3–12.4)	15.7 (14.8–16.3)	65 (55.4–74.2)	Med–High	34%	30	Small particle size = low effective fibre value. 8–10% oil. Standard laboratory analysis will not accurately assess nutritive value. Potential residue and aflatoxin risks
Pangola grass hay	89 (88.5–89.9)	7.6 (7.0–8.4)	7.1 (6.4–7.7)	72 (68.6–74.3)	Medium	99%	40	Potential residue risks (insecticides, herbicides, fungicides)
Pea hay	85	9.7 (5.1–11.6)	14.9 4.5–21.6	43 (29.1–70.8)	Medium	92%	40	Potential residue risks (insecticides, herbicides, fungicides)
Peanut hay	90	8.7	7.3	n/a	Medium	95%	35	Aflatoxin risk. Potential residue risks (insecticides, herbicides, fungicides)
Peanut shells	90 (87.2–92.0)	1.6 (1.1–2.1)	5.8 (4.7–6.8)	86 (84.6–87.2)	Low	87%	10	Aflatoxin risk. Potential residue risks (insecticides, herbicides, fungicides)
Rhodes grass hay	90	7.3	13.3	74	Medium	99%	50	Potential residue risks (insecticides, herbicides, fungicides)

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	Dry matter* (%)	Metabolisable energy* (MJ/kg DM)	Crude protein* (% of DM)	Neutral detergent fibre* (% of DM)				
Rice bran	91 (88.6–92.6)	n/a	14.6 (10.9–18.4)	29 (17.8–40.6)	Medium	59%	10	Potential residue risks (insecticides, herbicides, fungicides)
Rice hulls	93	n/a	n/a	85	Low	90%	10	Can be abrasive and cause impaction. Potential residue risks (insecticides, herbicides, fungicides)
Rice pollard	90	13	13	24–28	High	10%	5	High ME largely due to high oil content (15–20%). Low effective fibre. Very limited supply
Rice straw	85 (52.2–93.5)	6.7 (5.3–8.9)	4.0 (1.9–5.0)	63 (53.4–68.5)	Low	100%	10	Palatability and intake issues. Potential residue risks (insecticides, herbicides, fungicides)
Sawdust – hardwood	n/a	n/a	1.6	91	Nil	Low	10	Splinters and/or impaction problems. Pesticide/chemical residues.
Sorghum hay	78 (48.1–93.4)	8.4 (6.4–10.4)	9.8 (2.1–18.2)	64 (45.3–75.8)	Med–High	99%	30	Prussic acid poisoning. Potential residue risks (insecticides, herbicides, fungicides)
Sorghum silage	36 (25.6–45.3)	8.6 (3.2–10.7)	9.4 (2.1–18.2)	58 (43.6–79.1)	Med–High	77%	30	Prussic acid poisoning. Potential residue risks (insecticides, herbicides, fungicides)
Soybean hay	92	n/a	15.8 (9.5–22.1)	52 (41.9–62.1)	Medium	92%	35	Potential residue risks (insecticides, herbicides, fungicides)
Soybean silage	n/a	8.8	15.2	53	Medium	85%	35	Potential residue risks (insecticides, herbicides, fungicides)
Sugar cane bagasse, dry	93	n/a	2.7 (1.7–3.6)	80 (67.1–92.3)	Medium	100%	30	Potential residue risks (insecticides, herbicides, fungicides)
Sugar cane silage	68 (37.7–97.9)	7.5 (3.0–9.5)	4.3	61	Medium	74%	30	Alcoholic poisoning risk. Potential residue risks (insecticides, herbicides, fungicides). Mineral imbalances.
Sugar cane top hay	93 (90.8–95.7)	7.5 (3.0–9.5)	6.5 (3.2–9.8)	67 (56.9–77.3)	Medium	High	40	Potential residue risks (insecticides, herbicides, fungicides)
Triticale straw	90 (62.7–95.7)	6.2 (4.1–9.0)	2.8 (0.7–6.7)	67 (50.1–86.5)	Low	99%	30	Potential residue risks (insecticides, herbicides, fungicides)
Wheat bran	90 (88.3–91.0)	n/a	17.4 (15.6–19.3)	41 (32.8–49.2)	Med–High	28%	20	Potential residue risks (insecticides, herbicides, fungicides)
Wheat straw	92 (64.7–96.7)	5.1 (3.8–9.3)	2.8 (0.2–8.8)	73 (53.6–86.2)	Low	99%	30	Potential residue risks (insecticides, herbicides, fungicides)
Whole cottonseed	94 (92.5–96.4)	13.3 (11.4–15.1)	23 (15.4–28.3)	55 (42.8–72.1)	High	90%	20	Potential residue risks (insecticides, herbicides, fungicides). May be GM

<sup>†</sup> The expected composition of fibre sources has been collated from FeedTest, Dairy One, Penn State, Feed Plu\$, Rumen8 and other databases.

# Maximum daily intake depends upon nutrient value, age of cow and stage of lactation.

\* Nutritive values of feeds can be highly variable and there is no substitute for actual sampling and testing of the feed in question.

These fact sheets were originally published in 2007 with the support of The Department of Agriculture, Australian Dairy Industry Council Inc, Cattle Council of Australia, and Meat and Livestock Australia.

#### FOR FURTHER INFORMATION

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