

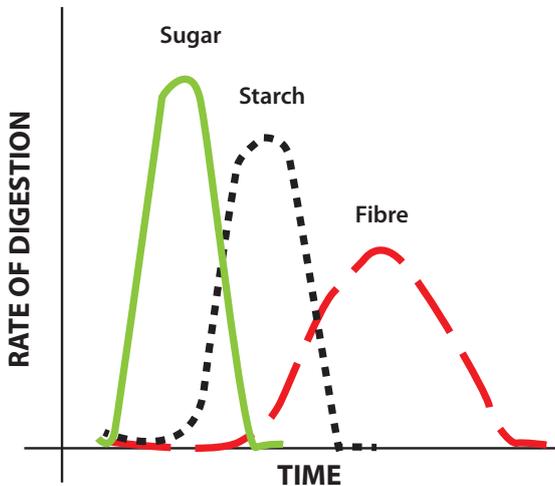
EFFECTIVE RATIONS

For maximum performance, good herd health and fertility, cows need a diet geared to maximising the population of rumen microbes. So it's essential to provide a ration which is balanced to provide a supply of sugars, starch and fibre. This then ensures a steady supply of VFA's (volatile fatty acids) as well as microbial protein for the small intestine. Sugars are added in the form of molasses or a molasses blend.

RATIONS NEED SUGAR

The key to fueling a rapid increase in rumen microbe numbers is the supply of energy in the form of quickly degradable carbohydrates, i.e. soluble sugars. Digestion of these sugars stimulates the rumen fermentation process. Whereas starch and fibre components have slower rates of digestion.¹

Figure 1: Relative Rate of Energy Breakdown in the Rumen



It is the sugars in the ration that are needed to increase the overall rate of feed digestion and so boost dry matter intakes.

So beware of the over-simplicity of the Metabolisable Energy (ME) value given to a ration. The ME value is only the sum of energy contributions from the sugars, starch and fibre in the diet. Where sugars are lacking, energy is not balanced, and the diet will not perform to

its potential. This will not be recognised using the ME system.

RATION ADVICE

The value of sugars in the supply of readily fermentable energy must be recognised and diets designed to provide a balance of energy sources. A ratio of starch:sugar of approximately 3:1, and dietary sugar levels of between 5% and 10%, are recommended.

Even when cereals are cheap, their use should be limited to around 4kg/head/day in dairy rations to prevent a decrease in butterfat levels and avoid metabolic disorders.

Sucrose and lactose have been shown to be the best forms of sugar. In trials, sucrose and lactose have been shown to give the highest production of microbial protein, and also be the most efficient at mopping up excess ammonia (see table 1).

Table 1: The Impact of Sugar Source in the Rumen²

	Silage Alone	Added Sucrose	Added Starch	Added Xylise	Added Lactose	Added Fructose
Microbial protein synthesis (g/d)	64	93	74	82	89	86
Rumen ammonia concentrate (average)	255	157	213	180	158	164



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A wholly owned subsidiary of ED&F Man Holdings B.V., The Netherlands and was formerly known as Hibernian Molasses

IMPROVE PERFORMANCE – ADD SUGAR

Cane molasses has over 60% sucrose in the dry matter and so represents the most cost effective source of sugar available to farmers. Many research trials have demonstrated the benefits of sugars on performance.

Sugar Gap is the difference between the sugar requirement of the dairy cow and the amount of sugars actually supplied by the ration. The difference can be expressed either in grams of sugar or as a % of the cow's sugar requirement.

IMPROVES DRY MATTER INTAKES

Balancing the diet to include a source of sugar improves digestion efficiency. So, the animal is able to consume more, sooner. This results in higher dry matter intakes (DMI) and in turn higher productive output (see table 2).

Table 2: DMI Increased with Increases in Molasses³

	Molasses inclusion, % of DMI			
	0	5	10	15
DMI kg/d	14.8	16.6	17.4	18.2
Milk Yield kg/d	22.1	23.2	23.3	23.7
Protein Yield g/d	30.6	30.9	31.0	31.4
Fat Yield g/d	38.1	37.4	37.3	36.1

As molasses is a liquid, there is a lower substitution effect compared to dry feed, again boosting DMI. And the palatability of molasses improves ration appeal and so enhances appetite.

IMPROVE MILK QUALITY

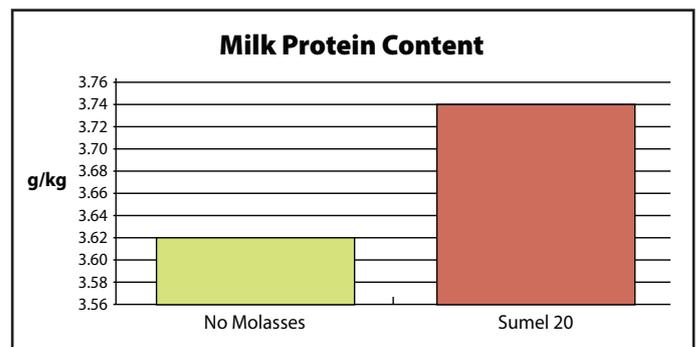
Increasing dietary sugar levels has been shown to raise milk protein and butterfat contents. Conversely, starch can suppress butterfat. So replacing some starch with sugar can lead to increases in the levels of butterfat and milk protein (see table 3).

Table 3: Milk Quality Improved with Increases in Sugar Levels

Sugar (%)	Starch (%)	DMI (kg)	Milk (kg)	Fat (kg)	Protein (%)
0	7.5	24.5	39.0	3.24	2.73
2.5	5.0	25.6	40.5	3.37	2.82
5.0	2.5	26.0	40.1	3.64	2.84
7.5	0	26.1	39.5	3.57	2.82

Adding sugar in the form of a molasses blend boosted milk protein content significantly by more than 0.1% in a trial at CEDAR (see figure 2).

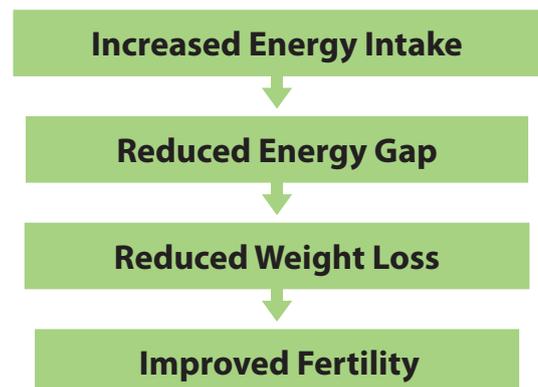
Figure 2: Adding a Molasses Blend Improved Milk Protein Content⁴



With many milk contracts paying a premium for solids, adding sugars can boost financial returns.

IMPROVE FERTILITY

For high yielding dairy herds, the challenge is always to get sufficient energy into the cow to support the demands of milk production and avoid creating an energy gap and consequent weight loss leading to poor fertility. In this, sugars have a key role to play.



The longer term benefit of ensuring diet is balanced to include sufficient sugar sources is better herd fertility.

REDUCE 'SORTING' – ADD MOLASSES

The formulation of a balanced TMR can all be in vain if some cows then sort through the ration, selecting out the tastier concentrate portion and leaving the more fibrous components such as silage and straw.

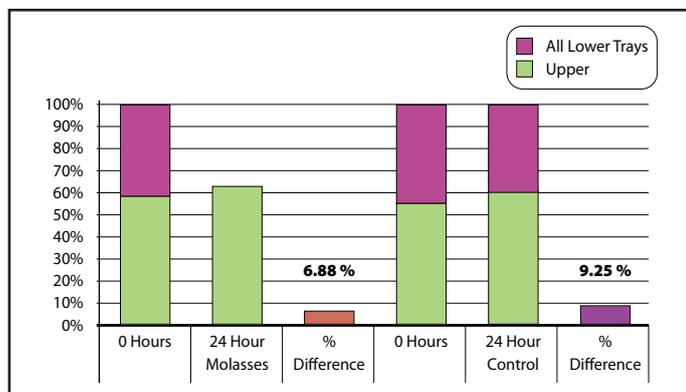
With insufficient intakes of effective long fibre these cows can then suffer sub acute ruminal acidosis. The consequences include low butterfat levels, inefficient feed utilisation, depressed production, loose dung, and production-related diseases such as lameness and ketosis.

The flipside is that the less dominant animals such as heifers, will not get their share of concentrate feeds and thus consume more high fibre, poorly digestible feeds. The result is animals in poor body condition, with all its associated health problems.

The addition of molasses has been shown to reduce sorting. It makes the meal/concentrate ingredients stick to the forage so it is more difficult for cows to sort out the ration. Secondly, as the ingredients are all coated with molasses, this masks the taste of any unpalatable components, another reason behind sorting.

This ability of molasses to reduce sorting was demonstrated in a trial carried out with the University of Edinburgh's Langhill dairy herd (see figure 3).

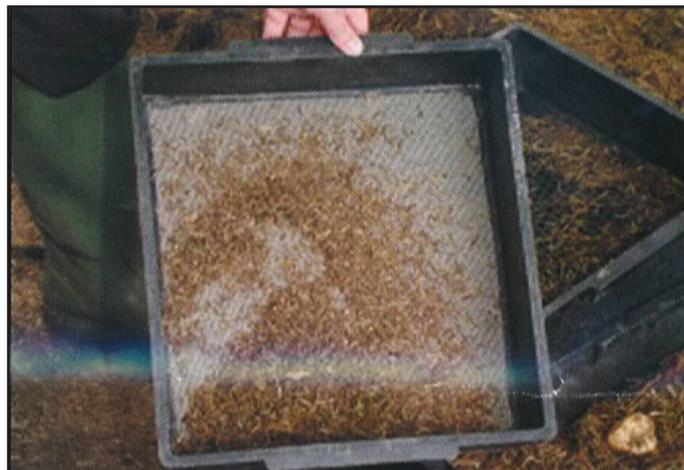
Figure 3: Adding Molasses Reduced Sorting of the TMR



A TMR consisting of concentrate (a 6mm pellet), brewers grains, wholecrop wheat and grass silage was mixed with or without molasses. The difference between the ration at 'put down' and then 24 hours later was assessed using a Penn State Forage Particle

Separator. This is a series of sieves with different sized holes which can be used to separate the diet constituents out by particle size, and so assess the amount of sorting that has occurred (see figure 4).

Figure 4: The Penn State Forage Particle Separator



On farms, stopping cows from sorting has resulted in: increases in herd milk yield and butterfat level, more consistent dung and less mastitis, less acidosis, less bullying and more consistent body condition across the herd, improved fertility.

First signs of a sorting problem

- **Bullying at the trough**
- **Loose dung in some but not all cows**
- **Fat (bully) cows and thin (timid/heifer) cows**
- **Sub acute ruminal acidosis in some cows**

REFERENCES

- 1 – Mould, F.L and Mackintosh, E
In vitro fermentation profiles of a number of commercially available sugar cane molasses bases liquid feeds described using the Reading Pressure Technique. British Society of Animal Science 2000.
- 2 – Chamberlain D.G., Robertson, S. and Choung, J.J. (1993)
Sugars versus starch as supplements to grass silage: Effects on ruminal fermentation and the supply of microbial protein to the small intestine, estimated from the urinary excretion of purine derivatives in sheep. Journal of the Science & Food & Agriculture, 63, 189-194.
- 3 – Murphy, J.J 1996
The effects of increasing the proportion of molasses in the diet of milking dairy cows on milk production and composition. Animal Feed Science and Technology, 78: 189-198.
- 4 – R.H. Phipps, A.K. Jones and P.Holder.
The effect of liquid feed additives on feed intake and milk production in lactating dairy cattle. British Society of Animal Science, 1999.

FEEDING METHODS:

Milking Parlour: A new and unique in-parlour liquid feeding system called Hydromoll, which can be installed beside an existing dry feeding system, is now available.

Diet Feed Wagons: Molasses blends can be incorporated in TMR feeds using your diet feed wagon.

As a Silage Additive: Molasses increases feed value.

	Molasses Application Rate			
	None	9 L	18 L	27 L
Irish Trial Work				
D.M.D.	70.3	71.7	72.6	--
Dutch Trial Work				
D.M.D.	72.8	--	--	77.9

Exclusive Offer: ED&F Man will pay the interest on the loan for your new molasses tank.

Including sugar in the ration in the form of molasses has a number of benefits to milk production and animal health.

A financial value to these benefits can only be a rough estimate, but some approximate values for individual benefits of molasses inclusion in the diet are highlighted in table 4.

MOLASSES BENEFITS

Table 4: Potential Financial Gains from Adding Sugars in the Form of Molasses

Benefit	Trial data/on-farm experience of adding molasses	Extra return per cow (€/£)
Higher dry matter intakes	Increase of 1kg/day = extra 2 litres of milk	+62c/day or +€189/lactation +52p/day or +£158/lactation
Improved milk quality: protein	Increase of 0.1%	+13c/day or +€39/lactation +11p/day or +£33/lactation
Improved milk quality : butterfat	Increase of 0.2%	+12c/day or +€36/lactation +10p/day or +£30/lactation
Improved fertility	5 day reduction in calving interval	+€30/lactation +£25/lactation
Reduced sorting	Improved production, health and fertility	Variable ?
	Total potential benefit	+€294 / lactation or +£245 / lactation

Rate of Exchange: 1GB£ = €1.20 12/1/2012

Assumptions: Cow yielding 20 litres/day; 305 day lactation; add 1 day of calving interval = €6 or £5.

Milk price = 0.31cpl or 0.26ppl, 0.1% Pr = 0.65cpl or 0.54ppl, 0.1% BF = 0.30cpl or 0.25ppl.

COST : BENEFIT

Based on typical molasses prices, including a molasses blend into the ration at 1.5kg/day, can give a potential return of **more than 3:1**.

Molasses – an excellent sugar source

- Its sugar content is 100% sucrose
- It's a liquid, so it binds up dust
- It's a liquid, so a low substitution effect
- It's highly palatable
- It reduces 'sorting' of the TMR
- It's convenient to feed
- Approved storage systems available – no need for shed space
- A range of formulations available

Typical Product Analysis (as fed)

Product	DM %	Total Sugars % +/- 2	C.P. % +/- 1
Cane Molasses (Blackstrap)	72	43	4
Sumel 20 (Blend)	71	32	6
Sumel 30 (Blend)	69	30	8
EPB5 (Hi-Pro) (Blend)	68	27	13
EPB Whey (Blend)	66.5	30	10

Minimum load size for farm delivery **10mt**

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