Can palatants offer an alternative to molasses in feed?

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Due to fluctuating prices and variations in the sensorial characteristics of molasses, feed manufacturers are looking for alternatives, both to reduce feeding costs and support animal performance.

Molasses is a by-product of sugar, extracted from sugar cane or beets. Molasses is used in several industrial fields: food, chemistry, biodiesel, and also animal feed. With about 60 million tons of molasses produced each year, 25% is dedicated to feed livestock. Molasses is commonly used as such for its palatability, its binding properties, and also for its nutritional value.

Indeed, cattle, sheep, lambs, and pigs are highly attracted to the taste and smell of molasses. It enables animals, particularly ruminants, to eat low palatable feed. This is of importance when adjusting feed formulation, especially in times of drought or shortage in winter.

Price fluctuation

Nowadays, feed formulators are more and more concerned by the increasing cost of molasses and its variability in terms of taste, smell, and nutrient density. Within 10 years, the price of molasses has fluctuated greatly with a global increase.

As for sugar, its price depends on demand variations in climate conditions, and crop quality. With the recent increase in use of molasses for biodiesel production, there has been a shortage of supply and, thus, a molasses price increase.

Sensorial fluctuation

Molasses is very heterogeneous and its sensorial properties vary depending on the origin, the period, and the production process. The odour of molasses can be variably described as caramel, fruity, liquorice, burnt, balsamic, smokey, honey or meaty. Sweetness perception can also vary a lot. This variability has been confirmed by a large number of sensorial and analytical tests performed in the Pancosma laboratory.

Technological constraints

Molasses is highly viscous and this can present several problems during feed mixing. Overuse of molasses may induce feed balls and swelling matters. Therefore, when added to the diet, it can cause feed variation through repartitioning of heterogeneous micro-ingredients.

Facing price volatility, sensory variability, and process constraints, feed formulators are tending towards a decrease in the use of molasses in feed. By taking out molasses, formulators face two issues. First, a decrease in energy value and, second, a loss in feed palatability thus impacting feed intake and performance.

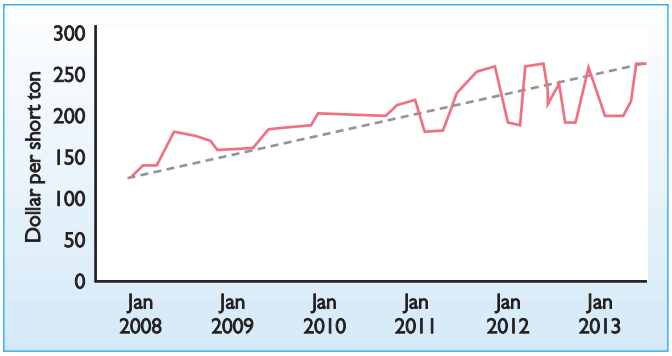

Fig. 1. Molasses price fluctuation in Kansas City over the past five years.

The first point can be easily solved due to the low energy value of molasses compared to possible substitutions, such as wheat, corn, or soya. The second point, palatability, is more difficult to solve.

In that context, Pancosma, the swiss feed additive manufacturer has developed solutions that are of great interest to molasses users:

- Palatants to standardise the molasses sensorial profile.
- Palatants to sensorially substitute molasses.

The problematic sensorial variation of molasses can be overcome thanks to the inclusion of palatants, which provides an intense and consistent sensorial profile. Different flavouring strategies can be applied, like reinforcing the main aromatic note with vanilla, caramel, and almond flavours that intensify warm notes and smooth profile variations.

A second radically different approach proposes using a flavour able to give molasses a new fragrance, such as raspberry, milky, fruity or honey vanilla.

These flavours overcome the natural profile variation of molasses and mask the off notes, such as meaty or smoky notes, which secures a consistent palatability and helps generate a regular and consistent feed intake.

Molasses has sophisticated olfactory and gustatory properties. In order to perfectly replicate the taste, the smell, and the sweetening power of high quality molasses, Pancosma has developed a product, Molasweet, which is a well balanced combination of molasses flavour and high intensity sweetener.

Based on several sensorial analyses made by expert flavourists and a

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Fig. 2. Sensorial description of flavoured molasses.

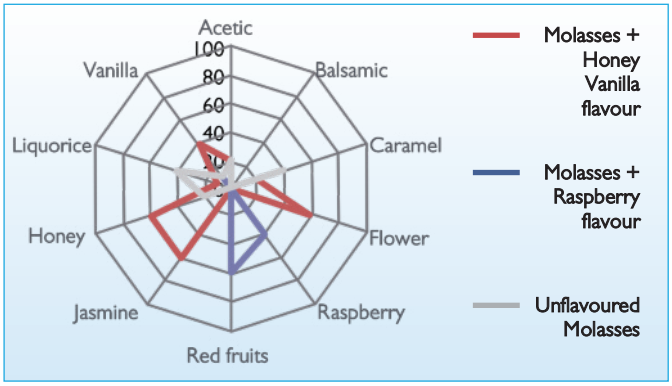
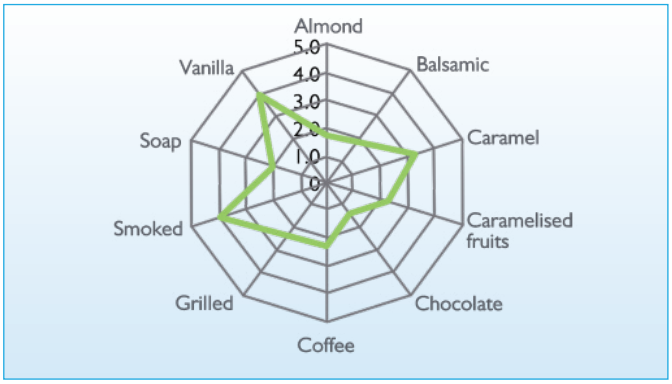


Fig. 3. The aromatic descriptors of Molasweet.



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trained panel, Molasweet has been developed with powerful vanilla, caramel, smoked and coffee notes enhanced by chocolate and almond nuances. Fig. 3 describes the aromatic descriptors of Molasweet. Cane molasses contains approximately 45% sugar. To provide an ideal sweetness close to sugar, Molasweet contains Sucram, the Pancosma high intensity sweetener.

These properties confer to the product a sensorial power (smell and sweetening power) 250 times stronger than molasses.

Therefore, 40g of Molasweet can sensorially replace 10kg of cane molasses. Such a substitution creates a lot of space in the diet that can be filled by a cheaper or better source of energy (such as corn). The final cost of the diet can be optimised.

Zootechnical evidence

In addition to being a cost saving alternative to molasses with a secured supply, Molasweet stimulates appetite and provides extra benefits. Indeed, though Molasweet does not contain carbohydrates, it has been shown that Molasweet could improve performance parameters thanks to its Sucram content.

Sucram is well known as the high intensity sweetener improving feed intake and inducing gut effects, which means better glucose absorption, better gut condition, and better feed efficiency. Several trials have already demonstrated the effectiveness of Molasweet through either direct substitution or in combination with molasses.

Close-up on dairy cows

In order to investigate the Molasweet palatability impact once added on top of feed at 160g/t (MS160), a study was carried out with 28 dairy cows in South Africa (Fig. 4).

During the first phase (11 days), animal feed contained no Molasweet (CON2). The feed was then flavoured with Molasweet for the second phase (17 days), and no

flavour was added during the third phase (13 days). Evolution of daily feed intake of the whole group was the only parameter checked.

Average daily feed intake (ADFI) was slightly lower during the first and third phase when compared to the second phase where feed was supplemented with Molasweet (respectively -2.4 and -5.0%). In addition, the standard deviation of feed intake was at least two times higher for animals receiving no Molasweet. With Molasweet, the reduction of ADFI's variability could be a way to improve rumen activity and subsequently increase milk production. Molasweet standardised feed profiles, smoothed feed intake fluctuations, and increased average daily feed intake.

Close-up on calves

A trial done in Saudi Arabia was conducted in order to check whether Molasweet could improve animal performance and to what extent. A total of 60 animals about 85 days old were used across four groups receiving different diets:

- The traditional feeding program (PC) consisted of a starter feed, straw, and finisher feed.
- A negative control (NC) consisted of a complete feed, cheaper than the traditional feeding program.
- NC supplemented with Molasweet at 250g/t (MS 250).
- NC supplemented with Molasweet at 500g/t (MS 500).

The main recorded parameters

were calves body weight (BW) and calculated body weight gain (BWG) (see Table 1). They were measured per animal at days 0, 30, 60, 90, 120, and 136. Additionally, ADFI was measured at the end of the trial per group. Based on these data, FCR was calculated per group, as well as feed costs per cow (Fig. 5).

Treatment	Final BW (kg)	Final BWG (kg)	Group (A,B,C: P<0.1)		
PControl	287.7	197.7	A		
MS at 250g	281.0	190.9	A	B	
MS at 500g	270.3	180.2		B	C
NControl	257.7	167.7			C

Table 1. Calves' body weight and body weight gain.

	Compared to NC	Compared to PC
Molasweet at 250g: ROI	10.4	4.7
Molasweet at 500g: ROI	5.7	2.2

Table 2. Return on investment (ROI).

Compared to the PC diet, the diet supplemented with 250g/t Molasweet cut feeding costs and led to a similar FCR and ADFI. This resulted in a reduction of involved costs to obtain a similar BWG (-6.6%).

Consequently, the PC diet could be replaced by the NC diet supplemented with 250g/t of Molasweet.

In both cases, calculations showed a similar reduction in FCR for animals fed diet supplemented with Molasweet. This resulted in a higher BWG than a diet not supplemented with this multisensory palatant.

Based on feed cost calculations and feed cost per kg of BWG, the most interesting solution is MS 250. This confirms that the expensive diet can be replaced by a cheaper one supplemented with Molasweet. Performance is maintained and feed costs are reduced: Molasweet brings performance at a low cost. A ROI calculation has been done based on feed intake and feed cost. In both cases (MS 250 and MS 500), Molasweet has a positive ROI (see Table 2).

Future opportunities

European, Asian, and USA markets for molasses have become very tight due to a lack of supply. Exporting countries are forecasting a low yield. Molasses demand for ethanol production is growing. This induced price increases and it looks to stay high for the course of the year.

The increasing price and erratic supply may be problematic for feed formulators. However, the molasses sensory profile is appreciated by animals and helps to improve feed palatability.

The multisensory palatant Molasweet perfectly replicates the smell, the taste, and the sweetening power of molasses. It can standardise the sensorial profile of molasses and help to partially substitute molasses.

In addition to being a cost-saving alternative to molasses with a secured supply, Molasweet stimulates the appetite and improves performance parameters.

This illustrates that palatants, in addition to providing a nice marketing impact, can bring real cost saving solutions for feed formulators. ■

Fig. 4. Evolution of average daily feed intake from day 1 to 41.

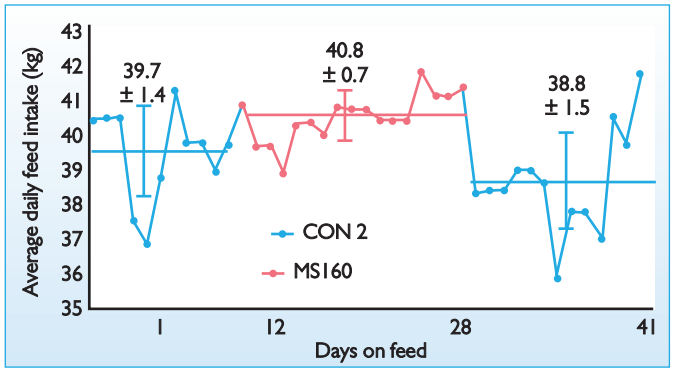

Fig. 5. Calves' performance compared to negative control at day 136.