Information Sheet

7. NUTRITION

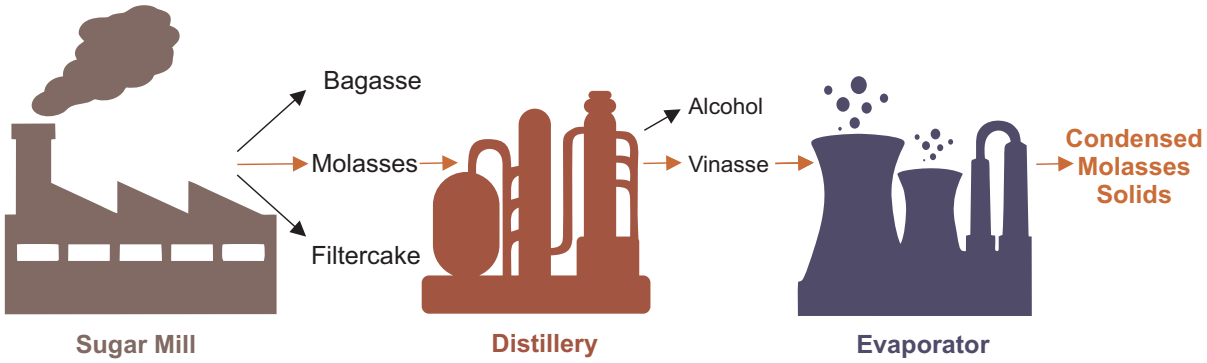
7.18 Condensed Molasses Solids (CMS) as a fertiliser

CMS is used extensively as a potassium fertiliser in the sugar industry in southern Africa. CMS also provides smaller quantities of Nitrogen, Phosphorus, Calcium, Magnesium and Sulphur. The product may be applied to both plant and ratoon cane.

What is CMS?

Molasses is a byproduct of the sugar manufacturing process. Molasses is sometimes used to produce alcohol and, in the fermentation process, a byproduct called vinasse is formed.

Vinasse contains 75-95% water and is therefore very bulky. In order to transport this product more economically, its volume is reduced through evaporation. The resultant product is called **Condensed Molasses Solids (CMS)**, and is used extensively as a fertiliser in the sugar industry in southern Africa. Because of its reduced volume, CMS can be profitably applied in the field even when transported over long distances.



CMS as a fertiliser

Much of the fertilisers used on a sugarcane farm end up in the sugarcane stalk. During the sugar milling process, sucrose is extracted from the stalk and the nutrients end up in the byproducts (bagasse, molasses, filtercake). During alcohol production, only the sugars in the molasses are converted to alcohol and the nutrients remain in the vinasse.

Molasses, vinasse and CMS are rich in potassium (K) and are regarded as K fertilisers. The typical nutrient composition of CMS is shown in Table 1. From these figures, one can see that CMS is equivalent to a N:P:K fertiliser with the ratio of 7:1:38. This becomes important when determining the quantities of product to be applied in a fertiliser programme. **Due to the variability in the composition of CMS, it is advisable to have it analysed at a reputable laboratory (such as SASRI's Fertiliser Advisory Service) in order to apply the correct amount.**

Table 1. Nutrient content of CMS.

Byproduct	CMS
Water %	45
N %	1
P %	0.16
K %	5.0
Cl %	3.8
Ca %	1.0
Mg %	0.8
S %	1.1
pH	4.5
OM %	38-45
Brix %	60

Application of CMS

Equipment

The biggest problem associated with CMS is its corrosiveness. Spraying equipment should therefore be made of corrosion-resistant material.

Unlike molasses, the viscosity (ability to flow) of CMS is not a problem. It can be applied easily with conventional spraying equipment mounted on any type of tanker. On fields with steep slopes, knapsacks should be used to apply CMS.

Application rates

Always start by referring to the nutrient requirements recommended in your soil test report.

When calculating the amount of CMS to apply, one should use the K requirement as a starting point. This is because K is the nutrient with the highest concentration in CMS. The CMS applied will satisfy your total K requirement, and partially satisfy your N and P requirement. Additional quantities of N and P will be necessary to satisfy the total nutrient requirement.

This is best demonstrated by way of example.

Calculating amounts of CMS to apply

Example: *Your FAS soil test report recommends the following: N: 130 kg/ha P: 20 kg/ha K: 150 kg/ha*

Start with the K requirement of **150 kg/ha.**

From Table 1 we know that the K concentration in CMS is **5.0%.**

Therefore, the amount of CMS required can be calculated as follows:

5.0 ÷ 100 x CMS required = 150kg/ha

CMS required = 150kg/ha x (100 ÷ 5.0)

= 3 000 kg (3.0 tons)

Using the proportions given in Table 1, we can establish that 3.0 tons of CMS will provide the amounts of nutrients shown in Table 2.

A further **100 kg/ha of N** and **15.2 kg/ha of P** will have to be added to bring the nutrient balance up to the levels recommended in the laboratory test report.

Table 2. Nutrient amounts in 3 tons of CMS.

Byproduct	CMS
Water kg/ha	1 350
N kg/ha	30
P kg/ha	4.8
K kg/ha	150
Cl kg/ha	114
Ca kg/ha	30
Mg kg/ha	24
S kg/ha	33
Product t/ha	**3.0**

Fortification of CMS

Instead of applying the N and P separately, CMS is occasionally fortified with urea or anhydrous ammonia and phosphoric acid to produce a balanced N:P:K product.

Because CMS is a thick concentrated product, it is very difficult to dissolve any substance in it. The integration of additives into CMS must be left to professional companies who have the proper equipment and the necessary skills. Growers should therefore not attempt to integrate additives into CMS themselves in the hope of reducing costs, as this could possibly result in an uneven application of the additive.

If you wish to make CMS tank mixes on the farm, you must invest in proper corrosion resistant continuous agitation systems.

CMS infiltration

CMS will infiltrate faster into soils with larger pores (sandy soils) compared to those with smaller pores (clayey soils) due to its high viscosity (or thickness). Thus, when applied to clayey soils, CMS will remain on the surface for longer. Additionally, as with any other N carrier, the longer the carrier is exposed to the elements (left on the surface) the higher is the possibility of N loss due to volatilisation. CMS should therefore be treated as any other N carrier with the objectives of minimising N losses due to volatilisation.

Due to the low water content of CMS, it will stick to the crop residue and not reach the soil for nutrient uptake. It will need additional water in the form of an irrigation or rain to "wash" the CMS from the crop residue into the soil. One can therefore expect to see a severe K deficiency in crops in rainfed areas if no rain has fallen after the application of CMS.

Split applications are recommended for cane growing on sandy soils (<15% clay) cut early in the season. On most other soils, growers could apply CMS early, and follow up in spring with the required nitrogen application.

Cautionary notes

CMS should not be applied to soils that are poorly drained (i.e. some alluvial soils with distinct differential textural layers, valley bottom soils, and soils with a high water table), as it might lead to the development of anaerobic conditions and a build-up of salts in subsurface layers. Thus, CMS may be applied to well-drained alluvial soils with no sign of an occasional water table.

CMS has a high oxygen demand which means that it will consume significant portions of oxygen in water should it end up there, and this may lead to the suffocation of most aquatic life. Care should therefore be taken to avoid spillage of large quantities into waterways, rivers, streams and dams.

Application of large volumes of CMS will require special application equipment. Also, there is a risk of corrosion when CMS is applied through a centre pivot.

Because CMS is an acidic product with a pH of about 4.5, many growers have expressed a concern that it might increase acidity of soils. However, investigations have shown that applying CMS does, in fact, lower acidity in the soil. The organic acids in CMS undergo rapid microbial decomposition in the soil leaving an excess of bases, which hydrolyse causing slight increase in soil pH.

Conclusion

CMS can be regarded as an organic fertiliser and is an efficient source of potassium and additional macro- and micronutrients. Through the use of CMS as a source of K, numerous other nutrients are recycled back to sugarcane. It also provides a welcome alternative to imported K fertilisers.

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