The Sugarcane Industry and Rabbit Feed Manufacture

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Abstract
Results on the utilisation of sugarcane molasses as a binder and a source of energy in the formulation of blocks and crumbs for rabbits are reported.

Good growth performance (31.0±9.3 g/d) was obtained with blocks containing 40-45% molasses, used to supplement fresh forage-based diets. Poor growth was obtained with complete blocks (10.2±5.1 g/d) and with supplementary blocks fed with poor quality forages (9.2±3.8 g/d).

These limits were overcome with crumb feeds with a lower level of molasses (10-15%), which could be fed as a sole feed or even to supplement poor quality roughage. Daily growth rates were 25.8±6.9 g/d and 22.4±5.2 g/d respectively.

Blocks and crumbs are easily manufactured at farm level. The technology is suitable for developing countries and can be used on a large scale by the sugarcane industry to produce feeds which are not perishable and easy to store and transport.

KEY WORDS: Rabbit, sugarcane, molasses, integration.

Introduction

The importance of livestock integration in the sugarcane industry has been underlined by Perez (1996). Our experience on this topic is limited to rabbit feed formulation.

Molasses-based multi-nutritional blocks for rabbit feeding have been

tested (Finzi and Amici 1996; Perez 1994; Velasco *et al.* 1994), but unsatisfactory results have sometimes been obtained. In fact, a fresh soya bean forage feeding system is now overtaking the use of molasses blocks in Cuba (Perez 1996). Fresh forage gives better results than multi-nutritional blocks where the amount of molasses ingested by rabbits may be excessive. Still better results can be obtained when molasses blocks are used to supplement a diet based on fresh leguminous fodder (Amici and Finzi 1995).

Materials and Methods

The following aspects of the problem have been studied:
1) Formulation of supplementary and/or complete feeds.
2) Physical characteristics of feeds (blocks, crumbs).
3) Use of binders.
4) Manufacturing schedule.
5) Chemical and nutritive characteristics of available forages.

Experimental conditions are summarised in Table 1.

Results

Results can be summarised as follows:
Blocks can be manufactured using molasses (max 50%), cement (max 10%) and/or starch-rich flour (mixed with warm water) as binders. To prepare blocks the ingredients should be milled to a particle size less than 2-3 mm. When milling devices are not available, larger ingredients such as broken rice, bran and alfalfa hay leaflets are also suitable. Excessive particle size makes the product difficult to mix, and very light and friable.

The best shape for blocks was cylindrical, measuring 8x15 to 10x25 cm. They are easily manufactured by rolling the mixture in any kind of paper (including newspaper). The wrapped cylindrical blocks are easy to transport immediately to a suitable place to be sun dried in a few days (3-6 according to temperature and solar radiation,) to obtain a water content of about 10-14%, which is suitable for storage. The paper which absorbed molasses avoids losses and is also eaten by rabbits.

Table 1: Feed formulation, chemical composition and nutritive value (as fed basis)

Feeds	Blocks				Crumbs	
Components	Complete	Supplement			Complete	Supp.
Alfalfa meal(dehydrated)	-	-	-	-	-	-
Alfalfa hay (milled)	14.7	17.2	17.2	-	-	-
Alfalfa hay (leaflets)	-	-	-	27.4	-	14.4
Wheat straw (milled)	16.3	-	-	-	20.9	-
Broken rice (unmilled)	-	11.3	7.1	8.8	-	10.8
Wheat bran (unmilled)	-	17.5	17.6	10.6	24.2	49.2
Wheat meal	-	-	-	-	20.0	12.8
Soya bean meal	17.6	-	-	-	21.2	-
Barley meal	-	-	-	-	-	-
Corn meal	-	-	-	-	-	-
Wheat middling	-	-	-	-	-	-
Carob meal	-	-	-	-	-	-
Mineral mix	-	-	-	-	-	-
Molasses	48.1	50.8	50.1	50.0	11.9	11.8
Cement	3.3	3.2	8.0	3.2	1.8	1.0
Crude protein (%)	14.2	9.3	9.0	12.5	15.5	12.5
Crude fibre (%)	12.0	6.5	6.6	5.9	13.1	8.0
DE* (MJ/kg)	10.1	10.8	9.5	11.2	9.8	10.8

*Calculated: Maertens *et al*, 1988

Trials with complete blocks alone, or to supplement poor quality hay or straw, gave poor performances (10.2±5.1 and 9.2±3.8 g/d respectively; Table 2). This was probably due to the excessive ingestion of soluble carbohydrates (Morisse *et al.* 1983) since poor quality forages are ingested in limited quantities (Perez 1994).

Table 2: Results obtained with different block formulations

Technological conditions	COMPLETE	SUPPLEMENT	
		Fresh forages ***	Hay (or straw)
MOLASSES*			
<45 %	Breakable (excessive losses)	Breakable (excessive losses)	Breakable (excessive losses)
45-50 %	Good hardness (no losses)	Good hardness (no losses)	Good hardness (no losses)
	Good palatab-ility	Good palatab-ility	Good palatab-ility
	Reduced intake	Good perform-ance (ADG 31 ±9.3 g/d)	Excessive block vs. hay intake
	Soft faeces		Soft faeces
	Poor perform-ance (ADG 10.2 ±5.1 g/d)		Poor perform-ance (ADG 9.2 ±3.8 g/d)
CEMENT *			
2 -4 %	No effect	No effect	No effect
> 10 %	Not tested	Very hard Poor intake	Not tested
PARTICLE SIZE			
Milled (or small particles)	Good hardness	Good hardness	Good hardness
	Good density	Good density	Good density
Non milled (chopped straw**)	Formulation problems	Too light Friable	Too light Friable

* in addition to molasses.
** Only technological test of manufacturing have been performed.
*** Mainly alfalfa or alfalfa with grass not exceeding 25 %.
ADG = average daily gain.

In fact, when blocks containing 45-50 % molasses were administered together with fresh palatable forages, satisfactory growth performance was obtained (31.0±9.3 g/day; Table 2). Similar results were also observed by Velasco *et al.* (1994).

Table 3: Results obtained with different crumb formulations

Technological conditions	COMPLETE	SUPPLEMENT	
		Fresh forages ***	Hay (or straw)
MOLASSES*			
10-14 %	No losses Sufficient performance (ADG 25.8 ±6.9 g/d)	Not tested	No losses Sufficient performance (ADG 22.4 ±5.2 g/d)
> 15 %	Not tested Supposed molasses excess	Not tested	Not tested
PARTICLE SIZE			
Milled (or small particles)	Suitable particles No powder	** Suitable particles No powder	Suitable particles No powder
Non milled (alfalfa leaflets)	** Formulation problems	** Rather light Enough suitable	Rather light Enough suitable

*In addition to 2-4% cement and 10-12% starch from wheat flower.
**Only technological test of manufacturing has been performed.
***Mainly alfalfa or alfalfa with grass not exceeding 25%.
ADG = average daily gain.

Problems of formulating complete blocks were overcome by producing crumbs (Table 3) which needed only 10-15% of molasses. Cement (2-4%) and starch from wheat flower (10-12%) were useful additions to molasses. Satisfactory growth performance was obtained with complete crumbs (25.8±6.9 g/day) or with crumbs used to supplement poor forages such as hay or straw (22.4±5.2 g/day). It was also easier to include alfalfa hay leaflets in crumb diets.

Conclusions

Results confirm that leguminous forages give better results than complete molasses blocks, as found by Perez (1996). Still better results can be obtained by blocks balanced to augment green leguminous fodders. When fresh palatable forages are not available and only hay is on offer, better results are obtained with crumbs.

Blocks and crumbs need only simple manufacturing technologies that allow the utilisation of local feedstuffs and by-products in developing countries. Small-scale industrial production is also possible. In this case, the best location of the plant is adjacent to the sugarcane mills where molasses is produced.

References

Amici A. and Finzi A. 1995. Molasses blocks as supplementary feeds for growing rabbits. World Rabbit Science. 3 (2): 69-73.

Finzi A. and Amici A., 1996. Unconventional feeding techniques for rabbits in developing countries. 6th World Rabbit Congress. 3: 341-345.

Maertens L., Moermans R. and De Grotte G. (1988). Prediction of the apparent digestible energy (ADE) content of commercial pelleted feeds for rabbits. J. Appl. Rabbit Res. 11: 60-67.

Morisse J.P., Andrieux J., Boilletot E. and Maurice R. 1983. Toxicite pour le lapin d'un produit issu de la fermentation de la melasse de betterave. Rev. d'Alimentation Animale. 67: 18-19.

Perez R. 1994. La alimentacion de conejos con enfasis en la cana de azucar. Ministerio del Azucar. La Habana, Cuba.

Perez R. 1996. Integration of livestock in sugarcane industry in Cuba. Second FAO Electronic Conference on Tropical Feeds Livestock feed resources within Integrated Farming Systems.

Velasco C.I., Cardona A. J. and Espinel R.G.M. 1994. Dos niveles de melaza y vinaza en bloques multinutricionales para conejos en la fase de engorde, suplementados con nacedero. Actas I Seminario Latinoamericano de Cunicultura. Guanare, Venezuela. 26-37.