

TOTAL MIXED RATION: DAIRY



BASICS

OVERVIEW

Total mixed rations (TMR) is a feeding strategy in which all the ingredients of the diet are added and mixed simultaneously in a special mixer wagon. This system allows complete mixing of forages and non-forages (concentrates); therefore, animals will not be able to sort the different components of the diet. Total mixed rations are used routinely in dairy cattle and growing and finishing beef cattle (feed-lots).

Since the ration is entirely mixed, the animal will consume a homogeneous diet and ruminal fermentation will be more uniform and efficient. The key to this system is that animals will eat highly fermentable carbohydrates in conjunction with fiber in forages (NDF). As a result, the amount of acid produced in the rumen, especially lactic acid, will be buffered by the effect of the fiber during the process of rumination and saliva production (rich in bicarbonate and phosphates).

PATHOPHYSIOLOGY

Total mixed ration will allow a more homogeneous and efficient rumen fermentation. Therefore, rumen acidosis will be diminished. When ingredients of a diet are fed separately, the dynamics of rumen fermentation are altered since concentrates will depress rumen physiology because of the high organic acid production (mostly lactic).

SYSTEMS AFFECTED

If TMR is not well managed, the digestive system, especially the rumen, will be the primary organ affected, with the consequent reduction in milk production and the increased incidence of related disorders.

RISK FACTORS

Important factors to consider when using a TMR are: ingredients and their dry matter content, the amount and order in which ingredients are added to the mixer, and the time used to mix the ingredients to reach the desired TMR. Both long and short periods of mixing are inadequate. Over mixing can lead to a small particle size of forages resulting in shorter rumination time, less saliva production and less buffering. Short mixing times can result in long pieces of hay. With increased particle size, cows may sort the ingredients and eat more concentrates resulting in the same negative effect of consumption of highly fermentable carbohydrates; rumen acidosis.

PRODUCTION MANAGEMENT

Total mixed rations have been demonstrated to be the most efficient way to feed dairy cattle today. The objective of any nutritional program in dairy cattle is to maximize milk production, maintain good fertility, and reduce the incidence of disease. In order to reach the level of milk production in modern dairy cattle that need to express their genetic potential, diets must contain a large amount of concentrates rich in energy and protein. Energy is mostly contained in soluble or highly fermentable carbohydrates (starch). If starch is fed alone or separately from forages (as in the past) it will be rapidly fermented to lactic acid inducing a condition called rumen acidosis. This condition may be subclinical or clinical (acute). If starch is fed in conjunction with fiber

(forages), the dynamics of rumen fermentation will be more homogeneous. This is because fiber will induce rumination, more saliva production and buffering of acids produced by the rapid fermentation of starch. Therefore, a well prepared TMR is the most efficient way to offer a uniform diet to cattle avoiding sorting and allowing a more consistent consumption of all of the ingredients at the same time.



MISCELLANEOUS

SEE ALSO

- Feeding for Milk Components (www.fiveminutevet.com/ruminant)
- Dairy Nutrition: Ration Evaluation for Milking and Dry Cows (www.fiveminutevet.com/ruminant)

ABBREVIATIONS

- NDF= Neutral Detergent Fiber
- TMR= Total Mixed Ration

Suggested Reading

National Research Council. 2001. Nutrient requirements of dairy cattle. 7th edition. Washington, DC: National Academy Press.

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