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Production Curve Management of Starch Nutrition in Ruminants: A Global Biotechnique

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This article aims to develop a global strategy to time-manage starch nutrition according to ruminant production curves. Such a strategy necessitates adopting optimal choices of cereal grains, grain varieties, bioprocessing techniques, and dietary starch provision rates that match the lactation or tissue growth curve towards improved productivity and health.

High-merit ruminants including high-producing dairy cows undergo dramatic shifts in rumen and intermediary metabolism during the transition period i.e., three weeks before through three weeks after parturition. Such shifts in cell physiology persist to varying degrees later on up to the lactation peak and afterwards when tissue deposition favours over milk production later in lactation [1,2]. These specific periods demand matching management of starch nutrition that can stabilize metabolism and minimize risks from metabolic disorders, notably Subacute Rumen Acidosis (SARA), fatty liver, ketosis, immune malfunction, and mastitis.

As for cereal type, hard grains such as corn, sorghum, and few varieties of barley are most suitable for when intake level is higher, and when rumen and host sensitivity to extensive rumen fermentation is high. This is because harder grains possess lower rumen degradation rates that in turn impose much lower risks to functional rumen microbes and the host immunity, when compared to highly-degradable starches and proteins [3,4]. Such periods represent fresh and early lactation cows when milk production and to a lower degree dry matter intake continue to rise. Concurrently, however, especially shortly postpartum, insulin sensitivity is quite low and the rumen ecosystem and host immune system are highly sensitive to fluctuations in nutritional strategies that occur over the transition period [2]. Such metabolic characteristic do not necessarily dictate feeding solely hard grains but rather caution feeding softer grains (e.g., most barley and wheat varieties) as the only or major portions of diets.

As for dietary inclusion rate, relatively lower starch must be formulated in diets that are fed to transition and low-producing ruminants such as late lactation and dry-off cows. This prevents exacerbating the metabolic and immune challenges of the early postpartum period when rumen and the host physiology need time and management to effectively adapt to the dramatically changing conditions.

In terms of grain bioprocessing, the techniques that overexpose starch and protein to extensive and rapid rumen fermentation must not be used carelessly. For instance, fine grinding of barley and wheat and extensive steam-flaking of corn and sorghum are not considered optimal for early postpartum and times of peak dry matter intake. Instead, depending on techniques availability and cost, very coarse grinding, moderate dry-rolling, and modest steam-rolling could be utilized to reduce risks from SARA and weakened immunity [5-8].

In summary, this article generated a global formula to help optimize starch nutrition in high-merit ruminants based on lactation or tissue growth curves. Such an optimization involves adopting appropriate cereal types, grain varieties, dietary grain inclusion rates, and bioprocessing biotechniques according to the production curve. The global goal is to improve efficiency and productivity without jeopardizing animal health and longevity.

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