

# Diurnal Fibrous Meals for Healthy and Yielding Nocturnal Starch Assimilation: Nature Bioprocesses

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This article develops an innovative pragmatic strategy to optimize starch assimilation in high-merit ruminant through optimizing sequence of fibrous and starch meals provision. The philosophy is based on natural circadian patterns of plant nutrient density and those of rumen and host ruminant metabolism capacity. Fibrous diurnal meals can allow high-producing ruminant effectively and healthfully bioprocess starch nocturnally. This is a lesson taught by nature for a sustainable global ruminant agriculture.

## Pragmatic Theory Development

Basically, plants accumulate photosynthesis-driven highly digestible nutrients during day and utilize them via respiration overnight. Reports suggest that evening-cut forages are more nutritious and more digestible and induce more eating than morning-cut forage [1,2]. Such circadian patterns of natural plants have greatly contributed to corresponding circadian rhythms of rumen fermentation and ruminant splanchnoperipheral metabolism. Recent discoveries established that provision of the same total mixed ration to dairy cows at night vs. morning increased eating rate, rumen fermentation and milk energy production [3,4]. Therefore, the circadian nature of both feed nutrient content and ruminant physiology determine production response to management strategies.

Based on the above scientific well-established concepts, a theory is being constructed to help firmly develop a functional rumen fibre mat by feeding more fibrous ingredients during day to set the ruminal stage for healthy starch fermentation overnight. The theory gains support from the discovery that rumen realizes a larger volume and fermentation capacity overnight vs. morning and thus should be more tolerant of apparently unfavourable conditions e.g., overly high and fluctuated rumen acidity [5]. Starch has long challenged the modern ruminant industry in many ways [6-10]. Nature as an ultimate mentor of the global ruminant agriculture has led ruminants to evolve receiving more nutritious plants as day progressed into evening and night. As a result, the ruminant is more metabolically prepared to assimilate starch later in the evening and overnight. This natural pattern in ruminant production fuels the theory that provision of more fibrous meals during

day for efficient and healthy utilization of more starchy meals delivered during evening and night can optimize animal production and health.

## Industrial Implication

The modern ruminant agriculture must strive to be insightfully mentored by the Mother Nature. One significant lesson is to optimize starch use in high-merit ruminants through providing more fibrous diurnal meals for healthy bioprocessing of starchy meals delivered in evening and overnight.

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