

Reduced Starch and Protein in Dairy Diets: Overcoming the Issues of Feed Cost and Availability, Animal Health, and Environmental Quality

A Nikkhah* and MH Khabbazan

Ferdows Pars Agricultural and Livestock Holding Co., Tehran, Iran

***Corresponding Author:** A Nikkhah, Ferdows Pars Agricultural and Livestock Holding Co., Tehran, Iran.

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Abstract

Livestock and dairy industries compete with humans in consuming nutritious agricultural products such as cereal grains and soybean meal (SBM). During the time of feed shortage, optimizing dietary starch and protein levels for lactating dairy cows becomes economically important. In addition, overfeeding cereal grains and protein meals to dairy cows leads to health issues and environmental pollution. As such, practical strategies need to be developed to prevent overfeeding cereal grains and protein meals and to maximize feed efficiency and income over feed cost. Recent research suggest that dietary starch can be dramatically reduced (even close to zero) by feeding by-products such as sugar beet pulp (SBP). Dietary crude protein levels have also been successfully reduced (down to 14.8% of diet DM) without major impacts on milk production. Canola meal (CM), dried distillers grain (DDG), rapeseed meal (RM), and wheat bran (WB) instead of SBM have been fed to lactating dairy cows. Optimizing forage quality and feeding alfalfa and barley silage will ease dietary starch-protein reduction strategies. Education will play a determining role in highlighting the importance of reduced dietary starch and protein for sustainable world dairy industries and secured human nutrition and health.

Keywords: *Starch; Protein; Dairy Cow; Human Nutrition; Environment*

Philosophy

The objective of this article was to underline the importance of reducing dietary starch and protein for dairy cows to help overcome the increasing challenges of feed cost and availability, animal health, and environmental quality. Livestock industries utilize the majority of agricultural products. Thus, livestock compete with humans in consuming major human-edible products such as cereal grains and SBM [1]. As such, effective strategies should be developed to reduce cereal grains and SBM in ruminant and dairy diets. This reduction is of importance because overfeeding starch and protein to lactating dairy cows leads to ruminal and digestive upsets and complications and increases environmental pollution by elevating urinary and faecal nitrogen excretion [2,3]. International research findings show that dietary starch can be effectively reduced (even down to about zero) for lactating cows without major impacts on milk production [1,4-6]. Byproducts such as SBP can replace cereal starch in supplying rumen degradable energy to stimulate microbial protein synthesis and volatile fatty acids production. Moreover, dietary crude protein and rumen degradable protein have been successfully reduced to improve nitrogen efficiency without affecting milk production and feed intake [7]. Alternative human-inedible feeds such as CM, DDG, RM and WB can be fed instead of SBM to provide different proteins to lactating dairy cows [1,4].

Currently, many dairy farmers overfeed starch and protein to dairy cows [3]. Lack or inadequacy of practical education is a main reason for such inefficient dietary practices. Consequently, dairy cows usually encounter health issues of mainly rumen and digestive

complications and depressed fertility. Education and effective knowledge and insight dissemination will play key roles in improving the current understanding of dairy farmers regarding optimal dietary inclusion rates of starch and protein. Other strategies include ensiling high-quality forages like alfalfa and barley and feeding alfalfa and barley silages to replace at least some portion of high-energy and high-protein feed ingredients. Improving forage quality will provide more energy and protein to ruminants and will help to reduce concentrate portions of dairy diets worldwide [8-10].

Future research is required to investigate how optimizing forage quality alongside feeding byproducts will help to reduce dietary starch from cereals and protein from SBM in commercial dairy diets. Feeding alfalfa silage and haylage instead of alfalfa hay, and barley silage beside corn silage will enable formulating diets with reduced SBM and cereal grains.

Conclusion

Reducing dietary starch and protein for lactating dairy cows is a key practical strategy to optimize nutrient utilization, animal health, farm economics, and environmental quality. Feeding human-inedible ingredients and byproducts instead of considerable portions of cereal grains and SBM will help approach the above-mentioned optimization policy. Improving forage quality and feeding high-quality legume silage/haylage will ease formulating dairy diets with reduced concentrate, cereal grains and SBM.

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