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Utilizing Almond Hulls as a Concentrate Replacement

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Almond hulls are a versatile feedstuff in California dairy rations. From a 2019 survey, 70% of nutritionists reported utilizing almond hulls as both a forage and a concentrate in lactating cow rations. Almond hulls might serve as a replacement for forages as water shortages reduce silage production and availability. Challenges with feedstuffs arriving by rail might increase almond hull use as a concentrate replacement.

The Research: In 2019, a feeding study with 12 lactating Holsteins (first-calf heifers and multi-lactation cows) was conducted at UC Davis. Increasing amounts of almond hulls were added to the total mixed ration (TMR) to replace concentrates. Almond hulls are low in crude protein (< 6%) but high in fermentable carbohydrates (>30%). The highly fermentable sugars, such as sucrose and glucose, in almond hulls could make them a better replacement for concentrates in a lactating cow diet instead of forages that offer more digestible fiber.

The aim of this study was to determine if almond hulls plus soybean meal could be fed in varying amounts as a replacement for steam-flaked corn and soyhulls in a lactating cow diet. Production performance and digestibility were evaluated with different almond hull levels substituted for concentrates.

Four diets were fed. The TMR composition was based on formulating a diet for 62 lbs DM intake per cow that would provide cows with 0, 4, 8, or 12 lbs/day of commercial almond hulls. This design created 4 TMRs that contained 0, 7, 13, or 20% AH.

The Results: Almond hulls fed in our study were approximately 13% Crude Fiber *As Is* basis, so the hulls were high quality. Almond hulls of high quality replaced up to 20% of the concentrate ingredients in the TMR with no negative effects on production performance (feed intake, milk yield, milk composition, rumination time). There were no statistical differences in feed intake and milk yield between the treatments (table below). Milk fat percentage increased, and milk protein percentage decreased as diets increased from 0 to 12 pounds of almond hulls fed per day. Rumination time increased by 60 minutes in the highest fed almond hull diet.

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Table 1: Feed intake and milk yield for cows consuming each almond hull (AH) TMR.

	0% AH	7% AH	13% AH	20% AH
Dry Matter Intake (lbs/day)	58.7	60.1	58.1	58.6
Milk Yield (lbs/day)	85.4	86.5	81.2	82.9
Energy-Corrected Milk (lbs/day)	92.0	92.8	88.2	90.2

Take Home Messages: Almond hulls are an excellent, palatable feedstuff for lactating dairy cows. Higher levels of feeding may be possible depending on the level of milk production and other dietary ingredients. Higher amounts of feeding will be based on availability/cost of competitive ingredients. The consistency of the chemical composition of almond hulls are of utmost importance with higher feeding levels. Almond hulls are a versatile feedstuff. Work with your nutritionist to determine if almond hulls could alleviate issues with concentrate availability on your farm.

Additional Thoughts for Nutritionists: Replacing steam-flaked corn (high starch) with almond hulls (high sugars) should not be a concern because of the high fermentability of sugars. Research in the literature demonstrated that sugars tend to be fermented to butyrate while starch tends to be fermented to propionate. Increasing rumen butyrate could explain why we saw an increase in milk fat with feeding increasing amounts of almond hulls. In addition, the literature research also reports that feeding sugars does not result in a decrease in rumen pH that would be any different than expected with other fermentable carbohydrates.

Full feeding study details are available in the Journal of Dairy Science

For more information related to almond hull feeding considerations, see the California Animal Nutrition Conference presentation (May 2022).

Dr. Ed DePeters, Professor of Animal Science and Dairy Cattle Nutritionist, retired from teaching at UC Davis after an amazing 43 year career! Ed's impact on the dairy industry is evidenced by the important research topics he tackled over the years, as well as the numerous students he trained that are now working in the industry. If you worked with Ed over the years, shoot him an email to join us in congratulating him on a career well spent and retirement well earned! Congratulations, Ed!

Succession Planning:

Is the Next Generation Ready to Navigate Environmental Regulations?

Deanne Meyer - Livestock Waste Management Specialist, UC Davis and UC ANR

Just do it!

Dairying is a complex business. Transitioning from one generation to the next can be emotionally filled: pride, fear, anticipation, regret, etc. It's important to have a plan so the next generation has the skillsets to succeed. Your next generation needs skills in managing people, cow husbandry, feed inventory and farming. They'll work with the accountant, nutritionist, veterinarian and numerous other consultants to make informed business decisions. Determining where and when to invest in facility infrastructure is also critical to the success of the operation.

Let's spend time thinking through the quagmire of environmental regulations necessary to consider as your facility continues. Decisions in this area will impact the entire operation and economics. This is (unfortunately) not an exhaustive list. For dairies in the Central Valley the looming changes associated with sustainable groundwater management, improving groundwater quality and reducing greenhouse gases create a thought provoking trifecta.

Growing forage controls feed costs AND uses manure nutrients. Both are critical for sustainability. Modifications to water use and manure management effect the use of nutrients on cropped fields and the need to export nutrients (nitrogen).

Sustainable Groundwater Management. You're enrolled in a local groundwater management agency. As such, you make decisions on how to allocate your water allotment wisely. Producers already fallow some winter forage fields to save water for corn. Alternative forages, increased use of byproducts and other nutritional modifications will aid to offset the reduced forage production.

Nitrate Control Program. Many of your dairies are in either a Priority One or Two Nitrate Management Zone. Dairies in these locations pay into their management zone. Each management zone is a defined area. All permittees are required to provide safe drinking water to those with elevated nitrate. There's also a requirement to reduce nitrate concentration of water. This is directly related to nitrogen application from both manure and synthetic fertilizers.

Dairy General Order modifications. Litigation making its way through the State Water Resources Control Board is nearing its final phase. Anticipated in the second half of this year are instructions from the State Board to the Central Valley Regional Water Quality Control Board to modify the Dairy General Order. This will mean updated requirements for your facility. Watch for additional information from the California Dairy Quality Assurance Program, Dairy Cares, your dairy trade association and your processor related to the impacts of these modifications. Changes in manure management to protect groundwater and improve nitrate concentration will be front and center.

Methane emissions reduction. We're getting closer to 2024, a pivotal point along the SB1383 greenhouse reduction timeline. Anaerobic digesters are capturing biogas which is further conditioned and processed for use as fuel. This effective method to reduce greenhouse gases results in a liquid manure stream with smaller particles. The process treats carbon and can remove sulfur. If more manure is collected in the liquid stream, then more nutrients are heading toward the lagoon. Good? Maybe or maybe not.

Your Annual Report (water quality) is a fountain of information. Think first. As always, be sure all permits or permissions are in place from regulatory agencies before changing manure management. Before infrastructure changes ask a few simple questions. Where is my nitrogen balance now? The answers are in your annual reports. What happens to my nitrogen balance if I need to fallow some number of fields in winter or perhaps for an entire year? The data to make these calculations are also in your annual report. Can my nitrogen balance handle more nutrients heading to the lagoon? Again, dig into your annual report to calculate these answers.

Important decisions on environmental issues will need to be made. It is important that you and the next generation fully understand ramifications of changes to the operation. As you evaluate effects of manure management technology and management options on manure management consider your succession plans.

University of California Cooperative Extension

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