Project Progress Report

February, 1980

Nutritional Value of Almond Hulls for Dairy Cows

N. E. Smith and R. L. Baldwin
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Objectives: Develop more accurate values for almond hulls as a feed for dairy cattle and other ruminants and to better define optimum utilization of almond hulls in ration formulation.

Interpretive Summary: Almond hulls vary considerably in nutrient content both between varieties and within a specific variety. Crude fiber is currently used as an indicator of nutritive value of hulls. However, laboratory analyses and in vitro fermentations conducted thus far indicate that acid detergent fiber (ADF) or some combination of analyses (ADF, cellulose, soluble sugars, lignin, etc.) may be a much better indicator of nutritional value.

Laboratory studies have shown that ADF, and possibly the combination mentioned above, have a much higher correlation with rate of fermentation than does crude fiber. Also, addition of soluble nitrogen such as urea has increased rate of fermentation of hulls in laboratory fermentations.

Rate of fermentation of a feedstuff is extremely important in determining the value of a feedstuff and the optimum combination for dairy cows. The findings from the laboratory studies are being tested in feeding and digestibility studies with lactating cows to further assess the nutritive value of hulls. Final reports will be available next winter.

Experimental Detail: Almond hull samples from Non pariel, Merced and Neplus varieties were collected from several areas in California. Detailed laboratory analyses have been conducted with these samples and the results are summarized in Table 1. Crude fiber is much higher in Neplus than the other varieties and would be given a much lower nutritive value under the present system. However, the data also show that Neplus is higher than Non pariel in cellulose and hemicellulose, and about the same in lignin and soluble sugars. This latter data would suggest essentially equal nutritive value for ruminants such as dairy cattle. Other results reported previously have also shown that crude fiber is not well correlated with soluble sugars across varieties whereas ADF is well correlated with sugar content. This would indicate that ADF may be a better estimator of nutritive value than crude fiber.

Further tests of these findings have been carried out in laboratory fermentations using rumen (stomach) contents from cows being fed a diet containing 50% almond hulls. These studies have also shown that crude fiber is not as highly correlated with rate of fermentation as is ADF. However, they also indicate that other components such as cellulose, hemicellulose, lignin and soluble sugars may have the best relationship to fermentation rate when one is either compaing across varieties or using mixed hulls. The data are being analyzed further to determine the best relationships between chemical components and rate of fermentation. The studies have also shown that fermentation can be enhanced by adding a soluble nitrogen source such as urea. This could be of particular importance in formulating dairy rations since a nitrogen source must be readily available for maximum fermentation and digestion to occur.

To further evaluate the laboratory findings, feeding trials with almond hulls are being conducted with dairy cows to determine hull digestibility and effects on feed intake, milk yield and milk composition.

1979

Table 1. Average chemical composition of almond hulls.

Component	Variety		
	Non Pariel	Merced	Neplus
	% of dry matter		
Crude protein	6.1	5.4	6.1
Ether extract (fat)	4.9	2.5	3.2
Ash	6.0	7.3	7.6
Crude fiber	14.3	14.3	18.2
Nitrogen-free-extract	68.7	70.5	64.9
Acid detergent fiber (ADF)	25.7	21.2	28.1
Lignin	10.6	7.8	10.2
Cellulose	14.6	13.1	17.4
Hemicellulose	3.5	3.1	4.2
Pectin	3.1	2.7	3.3
Starch	2.8	2.5	2.8
Soluble sugars	24.3	27.7	24.7

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