DS40

UF UNIVERSITY of FLORIDA
IFAS Extension

The Importance of Fiber in Feeding Dairy Cattle [1]

Barney Harris, Jr.[2]

The reduction in roughage content of the ration, as a result of high-grain, is closely related to changes in milk fat test and has been associated with metabolic problems, such as acidosis, hoof problems, displaced abomasum, liver abscesses, and a general decline in health. Adequate fiber and/or quality forage promotes good health and better performance.

Terminologies used in describing the fiber content of rations are crude fiber, effective fiber, acid detergent fiber (ADF) and neutral detergent fiber (NDF). Both ADF and NDF are newer ways to describe fiber and will be discussed later.

The beneficial aspects of feed fiber are primarily due to its effect on regurgitation (cud chewing), chewing, salivation, rumen pH (acidity) and rumen function. Chopping, grinding, or pelleting the roughage tends to reduce its fiber value and digestibility. Finely ground roughages may contain little effective fiber.

In feeding lactating cows, there is usually an economic advantage in using a maximum amount of forages and byproduct feedstuffs. To be successful, a maximum level of energy intake must be maintained in order to maximize production. Finding a consistent method of identifying the factors that maximize both intake and production has been the goal of considerable research. Dairymen have realized for years that more grain must be fed with poor quality forage than good quality forage to get the same amount of milk. Scientists have attempted to develop a similar system by using fiber as the measurement. In the newer system of identifying fiber, the fiber content of the feedstuff has been named according to the laboratory procedure, namely, acid detergent fiber and neutral detergent fiber. NDF is the more complete measure of total fiber since it measures all the cellulose, lignin and hemicellulose. Crude fiber measures only cellulose and some lignin whereas ADF includes cellulose and all the lignin. For this reason, ADF appears to be more closely associated with digestibility and NDF with rumen fill or dry matter intake. Dry matter intake and milk production are highly correlated so any component of the ration affecting dry matter intake would affect milk production.

Table 1 shows the optimal diet NDF levels suggested by Wisconsin workers and slightly modified for various levels of milk production when using silage and hay base rations. With cottonseed hull base rations, increase NDF by 3 to 5 percentage

1. This document is Fact Sheet DS 40 of the Dairy Production Guide, published September, 1992, originally published as part of Circular 594, Florida Cooperative Extension Service. For more information, contact your county Cooperative Extension Service office.
2. Retired Professor, Dairy Science Department, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville.

The Institute of Food and Agricultural Sciences (IFAS) is an Equal Opportunity Institution authorized to provide research, educational information and other services only to individuals and institutions that function with non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, marital status, national origin, political opinions or affiliations. U.S. Department of Agriculture, Cooperative Extension Service, University of Florida, IFAS, Florida A. & M. University Cooperative Extension Program, and Boards of County Commissioners Cooperating. Millie Ferrer, Interim Dean

units (30% vs 35%). Table 2 shows the fiber composition of feeds commonly used for dairy cattle.

The use of neutral detergent fiber values may be useful in purchasing hay and balancing rations for high producing cows. The use of NDF values should be used only as a guide since particle size, length of cut, effectiveness of fiber and palatability are not measured by NDF but are also important considerations in formulating rations for dairy cows. Cottonseed hull rations may need to be adjusted upward when using NDF values since they have a greater rate of passage than hay containing rations.

Table 1. Suggested optimal NDF levels as a percent of total ration dry matter at various production levels.

3.5% Milk (lb)	Optimal NDF Percent
65 or more	28-32
45-65	33-36
31-45	35-39
less than 30	40-45
dry cows	45-50

Table 2. Composition of feeds commonly used in dairy cattle rations (as fed).

	Effective Crude Fiber (%)	Crude Fiber (%)	ADF (%)	NDF (%)
Alfalfa hay, early bloom	**28.0**	**23.0**	**29**	**38**
Alfalfa hay, full bloom	**38.0**	**30.0**	**34**	**45**
Alfalfa, haylage	**20.0**	**16.5**	**17**	**23**
Alfalfa pellets	**12.0**	**25.0**	**34**	**44**
Alfalfa silage	**14.0**	**8.0**	**12**	**14**
Bahia hay	**42.0**	**31.0**	**34**	**65**
Bakery, dried product	**1.0**	**1.0**	**11**	**16**
Barley, grain	**5.2**	**5.2**	**6**	**17**
Beet pulp, dried	**20.0**	**19.0**	**29**	**48**
Bermuda hay (coastal)	**40.0**	**32.0**	**36**	**65**
Bermuda silage	**15.0**	**10.0**	**12**	**20**
Bermuda pellets	**15.0**	**31.0**	**31**	**63**
Blood meal	**1.0**	**1.0**	**3**	**5**
Brewers grains	**14.0**	**14.0**	**21**	**41**
Brewers grains, wet	**3.5**	**3.0**	**5**	**10**
Brewers grains, wet	**6.0**	**5.0**	**7**	**14**
Canola meal (Rapeseed)	**12.0**	**11.7**	**15**	**32**
Carrot, roots	**0.7**	**0.7**	**--**	**--**
Citrus pulp	**12.0**	**12.0**	**19**	**21**
Citrus pulp, silage	**4.5**	**4.2**	**5**	**6**
Citrus pulp, pelleted	**9.0**	**12.0**	**19**	**21**
Clover hay, alsike	**35.0**	**25.0**	**31**	**36**
Clover hay, ladino	**35.0**	**26.0**	**28**	**32**
Clover-grass mix	**38.5**	**30.0**	**35**	**52**
Corn meal	**2.0**	**2.0**	**2**	**8**
Corn, high moisture	**1.4**	**1.0**	**1**	**6**
Corn dust, pellets	**6.0**	**6.0**	**7**	**14**
Corn, high moisture ear	**5.6**	**5.6**	**2**	**8**
Corn ear, snapped	**8.0**	**8.0**	**10**	**25**
Corn silage	**12.0**	**7.4**	**10**	**16**
Corn cobs, ground	**41.0**	**31.5**	**35**	**75**
Corn gluten feed	**8.0**	**8.0**	**11**	**40**
Corn distillers	**12.0**	**12.0**	**15**	**38**
Corn gluten meal	**3.0**	**3.0**	**4**	**12**

Corrugated boxes, ground	**65.0**	**65.0**	**72**	**90**
Cottonseed, whole	**19.0**	**17.0**	**31**	**40**
Cottonseed meal	**11.0**	**11.0**	**17**	**24**
Cottonseed hulls	**43.0**	**43.0**	**66**	**81**
Cowpea hay	**42.0**	**24.0**	**36**	**45**
Feather meal	**5.0**	**2.0**	**2**	**17**
Fish meal	**1.0**	**1.0**	**2**	**4**
Hominy Feed	**5.0**	**5.3**	**8**	**12**
Lespedeza hay	**42.0**	**28.0**	**36**	**56**
Linseed meal	**9.0**	**9.0**	**15**	**20**
Malt sprouts	**5.0**	**8.0**	**12**	**26**
Meat and bone meal	**3.0**	**2.2**	**4**	**7**
Millet silage	**10.0**	**7.0**	**9**	**12**
Milo, grain	**2.0**	**2.0**	**5**	**15**
Molasses, cane	**---**	**---**	**---**	**---**
Molasses, cane, dehy.	**---**	**---**	**---**	**---**
Oats, grain	**10.0**	**10.0**	**14**	**28**
Oat silage	**8.0**	**6.5**	**4**	**10**
Oat hay	**38.5**	**28.0**	**35**	**54**
Oats, fresh	**5.2**	**5.0**	**6**	**10**
Pangola hay	**45.0**	**31.0**	**39**	**68**
Pea seed, field	**9.0**	**5.0**	**18**	**12**
Peanut meal	**4.0**	**4.0**	**5**	**11**
Peanut hulls, coarse	**50.0**	**50.0**	**58**	**65**
Peanut hulls, pelleted	**20.0**	**50.0**	**58**	**65**
Peanut skins	**18.0**	**12.0**	**18**	**25**
Peanut hay	**38.0**	**31.0**	**36**	**45**
Rye seed, grain	**3.0**	**3.0**	**3**	**6**
Rye silage	**11.0**	**9.0**	**12**	**15**
Rice bran	**10.9**	**10.0**	**16**	**29**
Rice hulls, ground	**35.0**	**40.0**	**64**	**73**
Rice millfeed	**12.0**	**18.0**	**25**	**30**
Sorghum, grain, silage	**12.0**	**9.8**	**12**	**19**
Sorghum, forage silage	**10.0**	**9.0**	**13**	**23**
Soybean meal	**5.0**	**5.0**	**6**	**12**
Soybean meal	**4.0**	**4.0**	**5**	**9**
Soybean hulls	**14.0**	**34.0**	**41**	**57**
Soybeans	**5.0**	**5.0**	**9**	**14**
Soybean silage	**12.0**	**8.0**	**13**	**18**
Soybean hay	**38.0**	**25.0**	**36**	**45**
Sudex silage	**10.0**	**7.0**	**8**	**14**
Sugarcane bagasse	**45.0**	**45.0**	**54**	**75**
Sugarcane silage	**13.0**	**8.0**	**12**	**15**
Sunflower meal	**26.0**	**26.0**	**30**	**36**
Sunflower meal	**11.0**	**11.0**	**14**	**16**
Wheat, whole	**2.0**	**2.0**	**4**	**10**
Wheat, midds	**6.0**	**7.0**	**9**	**32**
Wheat silage	**11.0**	**8.0**	**10**	**15**
Yeast, brewers	**3.0**	**3.0**	**5**	**9**