

TECHNICAL BULLETIN

DAIRY

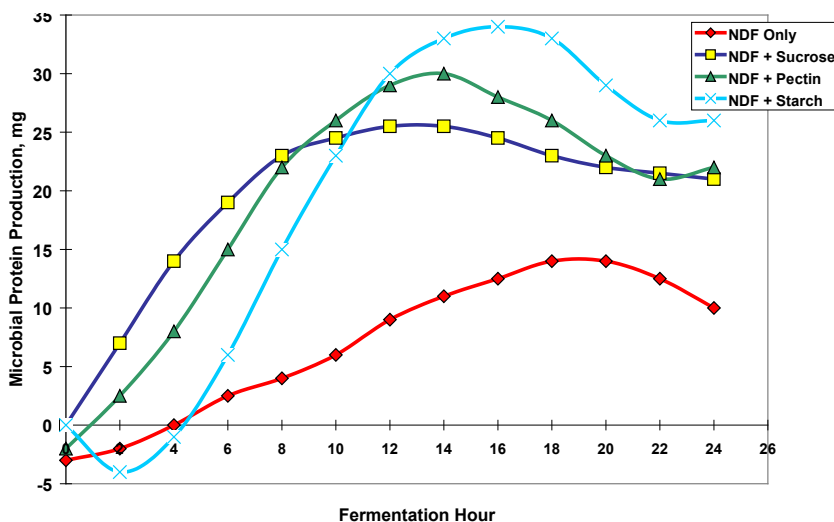


LIQUID SUPPLEMENTS ENHANCE DIGESTIBILITY OF DAIRY QUALITY FORAGES

Cane molasses-based liquid supplements increase digestibility of low quality forages, but do they also improve digestibility of dairy quality forages? Of course! Feeding high quality forages enhances a lactating cow's performance and improves milk production efficiency, as improving forage quality provides increased amounts of digestible energy and protein to the cow. Liquid supplements provide soluble sugars, which increase fiber digestion of dairy quality forages. Enhancing NDF digestion by 1% increases DMI 0.37 lbs and 4% FCM 0.55 lbs (Oba & Allen, 1999), so improving forage utilization improves productivity and profits. This article provides details of how cane molasses-based liquid supplements improve digestibility of high quality dairy forages.

Sugars Stimulate Microbial Growth

All rumen microbes require energy to grow and reproduce, and utilize non-structural carbohydrate feedstuffs as energy sources. Sugars are the most quickly utilized carbohydrate source in the rumen, due to their simple structure. The primary sugar in cane molasses-based liquid supplements is sucrose. In the presence of forage NDF, sucrose stimulates microbial growth more quickly than starch or pectin, as shown in the figure below.



Hall & Herejk. (2001) J. Dairy Sci. 84:2486-2493

Maximizing microbial growth increases the number of microbes available to digest feedstuffs, which improves diet utilization. In the above graph, sucrose provides maximum microbial growth within 8 hours, compared to 14, and 16 hours for starch and pectin, respectively. In addition, no microbial “lag time” exists for sucrose, compared to 4 hours for starch. Diets that contain a combination of sugars and starches take advantage of sucrose’s “jump start” of the rumen microbes, and the large peak of microbial growth fueled by starch.

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Cane Molasses Improves NDF Digestibility of Dairy Quality Forages

Sucrose's quick stimulation of microbial growth improves fiber digestibility. Research has demonstrated that liquid cane molasses, replacing a portion of dietary high moisture shell corn (HMSC) increases fiber digestibility in dairy diets containing good quality dairy forages. Researchers formulated diets that were 52:48 Forage:Concentrate, and forage program was 62% alfalfa silage and 38% corn silage.

Silage nutrient composition is shown below:

Item	Alfalfa Silage ^a	Goal ^c	Corn Silage ^b	Goal ^c
DM, %	47.7	40-50	31.5	30-40
CP, % DM	21.3	20-22	7.9	7.1-7.9
NDF, % DM	41.3	40-42	38.9	46-50
ADF, % DM	31.4	30-31	24.5	23-30
Ash, % DM	10.3	9-10	5.5	4.5-5.5
Ammonia-N, % of total N	7.4	<15	10.8	<10
ADIN, % of total N	4.2	<10-12	3.9	<10-12
pH	4.8	<4.5	3.8	<4.0

^aAlfalfa silage ensiled in large tower silo
^bCorn silage ensiled in large bunker silo
^cAdapted from Seglar (2003), and Hutjens (1998)

As the table shows, silages used in the study were of dairy quality. Diets contained alfalfa silage, corn silage, HMSC, soybean meal, roasted soybeans, minerals, and vitamins, and were identical except for liquid cane molasses replacing some of the HMSC.

Diet nutrient composition is shown below:

Item	No Molasses	6% Liquid Molasses
CP, % DM	15.5	15.5
NDF	25.9	26.5
NFC	48.1	46.5
Starch	31.4	27.5

Replacing HMSC with 6% liquid cane molasses stimulated microbes to grow and capture rumen ammonia, thereby improving microbial growth and fiber digestibility:

Stimulating microbial growth and fiber digestion improves nutritive value of forage within the cow. QLF recommends inclusion of 0.75 to 1.25 lbs supplemental sugar in lactation diets, to provide rumen fermentable carbohydrate and stimulate forage utilization. When including supplemental sugar in the diet, be sure rumen degradable protein levels are adequate, so ammonia is available to meet microbial N needs. Improving forage digestibility allows lowering dietary starch and NFC levels, and increasing dietary

Item	No Molasses	6% Liquid Molasses
Rumen Ammonia mg/dL	7.58	6.50
Microbial Purines, mMol/d	529	541
Digestibility, %		
DM	63.6 ^a	65.4 ^a
NDF	36.3 ^a	44.6 ^b
ADF	42.2 ^a	49.6 ^b

^{a,b} Values in the same row with different superscripts are significantly different (P<0.05)
 Broderick & Radloff. (2004). J Dairy Sci. 87:2997-3009

forage levels, which can improve rumen health, dry matter intake, and milk production. In addition, liquid supplements increase ration palatability and forage consumption. Please see TB-4317, TB-4318, and TB-4319 for additional details on high forage dairy lactation diets.