

A Quantitative Approach in Determining the Profitability of Using the Natural Balance of Direct Fed Microbials in the Conventional Dairy Ration

Abstract

Proteins, fibers, and starches (PFS) are broken down in the rumen by enzymes produced by microbial bacteria. This study compared the digestion of PFS in a conventional dairy ration, to the digestion of PFS in a conventional dairy diet supplemented by direct fed microbials. Golden Link Microbials were used in the study, due to the fact that they contained both fiber and starch digesters, at the same ratio that they are found in the normal rumen flora. The findings show that the animals fed the Golden Link Microbials had significantly less undigested PFS in their manure.

Introduction

There are three essential components to surviving in the Dairy industry today. They are maintaining a dairy cow with a high production of milk volume, without sacrificing fat and protein, while sustaining her health throughout her lactation marathon. Many products have been introduced into the dairy industry to boost the efficiency of the modern dairy cow. Direct Fed microbials have been found to maintain the health of the cow during stressful periods. Much research has been done in both the animal and human fields on their efficacy in helping with antibiotic, heat, and fatigue induced stress. It has been assumed by many, that microbials are instrumental in helping with the breakdown of lactic acid to propionic and acetic acid, thus reducing acidosis. It is also assumed that the bacteria that secrete enzymes to break down the cellulose and hemi-cellulose walls help digest fibers. One of the problems encountered by feeding direct fed microbials has been that most of the products being fed only contain the lactobacillus species. These microbials mostly produce enzymes that break down the starches in the rumen. Through research, it has been found that one third of the conventional dairy ration is fiber, and that 90% of all fiber is digested in the rumen. Thus, it is not hard for us to realize, if we feed all starch digesters, and no fiber digesters, we will throw the rumen out of its normal microbial equilibrium, thus eventually maybe digesting even less fiber than if we hadn't fed microbials at all. An analogy of this would be, the fans of the winning football team converging on the field. After they fill the field, there is no room left for the "losing" team, yet alone their fans.

To overcome this situation, Golden Link Microbials (GLM) were used in this study. This product contains 300CFU/lb of a live yeast to enhance rumen pH levels, scavenge oxygen in the rumen and "feed" the microbials introduced into the rumen. It also contains 50 billion CFU/lb of Lactic acid bacteria (starch digesting bacteria) and 100 billion CFU/lb of total Bacillus spp (fiber digesting bacteria). The ratio of 2 to 1 of fiber digesters to starch digesters is used to mimic that of the natural occurring bacteria in the rumen. The goal of this study is to make the rumen an even more efficient digesting vat than it already is. This will be attempted by increasing the rumenal microbial activity, while maintaining the same naturally occurring microbial ratios.

The efficiency of the rumen digestion will quantitatively be determined by the amount of PFS that pass into the manure either non or semi-digested. This will be measured by a Nasco Digestion Analyzer. All material will be measured on a dry matter basis. The amount of non and semi-digested PFS will then be extrapolated to a per day basis by factoring the amount of manure produced by that individual cow breed per day.

Materials and Methods

The three screen Digestion Analyzer made by Nasco, was used to determine quantitative weights of non and semi digested PFS, in this study. The screens range from top 2 centimeter, middle 1/4 centimeter, to bottom 1/8 centimeter. The top screen retains the non digested PFS, the second screen retains less than 40% digested PFS, and the bottom screen retains up to 95% digested PFS. In this study, any manure that flows through all three screens has been determined to be almost completely digested.

Four pounds of manure was randomly gathered from multiple cow piles, with a three ounce scoop. The representative sample was then slowly flushed through the digestion analyzer approximately six ounces at a time. The particles found in each screen were collected, and weighed separately. All wet weights were recorded in grams. The individual samples were then dried to <5% moisture with a Nutritional Blending Moisture Tester. The dried samples were then weighed and converted into pounds. The dry matter weights were then multiplied by a factor of 30 for Holstein and **Brown** Swiss and by a factor of 25 for Jersey breeds. Large breed dairy cattle produce 120 lbs. and Jerseys produce 100 lbs. of manure daily. The wet weight of the manure sample taken was 4 lbs., multiplying by these factors gave the amount of PFS passing through the manure, per daily basis. The calculated weights of PFS in screens 1 and 2 were added together (these two screens contain the least digested PFS). Screen 3 was then added to give an overall weight of PFS not totally digested, as determined by the digestive analyzer.

Three different rations were tested:

- 1) Herds fed a conventional dairy ration, with no added microbials.
- 2) Herds fed a microbial product containing just lactobacillus spp. starch digesters.
- 3) Herds fed a conventional dairy ration, with both starch and fiber microbial digesters added, at a ratio of 2 to 1 of fiber to starch digesters, to maintain the natural microbial equilibrium in the rumen.

Results

Holstein herds fed a conventional dairy ration which incorporated the GLM, contained an average of 3 lbs. less non and semi-digested PFS in screens 1 and 2 of the digestion analyzer, on a per day basis, than herds fed a conventional dairy ration. Herds that were fed a microbial product containing different microbial products that were not direct-fed, were not significantly different than herds fed no microbials. The direct-fed microbial product tested, that contain only lactobacillus spp. had significantly more non and semi-digested PFS in screens 1 and 2 of the digestion analyzer. The bottom screen of the digestion analyzer contained an average of 11b. more PFS in the herds fed the GLM. Material found in this screen has been determined through research to be almost completely digested.