WHAT A DAIRY NUTRITIONIST NEEDS FROM ALFALFA

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ABSTRACT

Alfalfa has many inherent challenges that affect the quality of the feed offered to the dairy industry. The dairy nutritionist attempts to feed the resulting diverse qualities of alfalfa to the various categories of animals within each dairy and among dairies with different feeding programs. The description of this quality based on traditional and more novel laboratory measurements has to be universally understood among grower and user. An indication of the quantities of alfalfa required by the nutritionist in each category has historically been conveyed back to the grower via premiums and/or discounts in the marketplace.

Key Words: alfalfa, nutrition, rumen, palatability,

INTRODUCTION

Alfalfa is a feed source available to the dairy nutritionist that is inherently predisposed to large quality variations. It is harvested as it rapidly progresses through its vegetative growth stages and relies on favorable weather conditions to cure and prepare for baling. Alfalfa is a perennial crop that aims to maintain a pure stand over a number of years, competing with vigorous germinating weeds in year one and persistent grass weeds in later years. Alfalfa growers continually overcome these difficulties to provide a feed that is pivotal in the construction of healthy rations for the modern dairy cow.

DAIRY COW NUTRITION

The dairy cow and heifer are ruminants, possessing a stomach in four compartments, the largest of which is the rumen. The rumen is a fermentation vat that provides microorganisms a suitable environment to grow rapidly using the ingested feed. In the wild, almost all of the ingested feed eaten by ruminant animals is high in a fiber that can only be utilized with the help of these microorganisms. These microorganisms along with minute feed particles eventually pass out of the rumen to be digested using normal intestinal enzymes and absorbed as nutrients into the animal's bloodstream. To achieve a long productive life for the cow, the dairy nutritionist has to maintain the health of this rumen.

The healthy rumen requires a certain quantity of high fiber feedstuffs, referred to as forages, to create a mat of fiber. This mat traps larger particles of undigested feed from leaving the rumen too soon. This fibrous mat also stimulates the animal to regurgitate and chew small bite-size quantities of the rumen contents referred to as "cud". The importance of cud chewing in a modern dairy cow diet is not only to physically break down the food particles with the chewing action of the molars but also to add very large quantities of saliva to the rumen. This saliva has buffering qualities essential to the maintenance of normal rumen pH, especially with rations that have marginal quantities of forages present. Fluctuations in rumen pH have to be minimized by

the dairy nutritionist to prevent the undesirable rumen acidosis and it's side-affects of diarrhea, reduced milk butterfat concentration, lameness and inverted stomachs.

Higher milk production is achieved using balanced diets with increasing levels of energy. The forages are relatively low in energy and are included in lesser quantities in rations as energy levels are increased. Rations with forage levels as low as 35% are sometimes fed in an effort to achieve top milk production. To ensure a very healthy rumen 45% of the diet as forage would be desirable on these top rations. The dairy nutritionist usually compromises between these levels depending on the quality and type of forages available.

Higher milk production is concurrently achieved by increasing dry matter intake. Higher intakes are achieved by allowing the feed to pass more quickly from the rumen. In general, feed passes more rapidly through the rumen when forage levels are lowered. However the simplistic measure of the forage percentage of the diet does not fully explain the factors affecting intake. The dairy nutritionist has to study the fiber from forages in more detail.

FIBER - DO DAIRY NUTRITIONISTS NEED IT OR NOT?

There are a number of ways to measure fiber. Other papers at this symposium will discuss in detail the issues involved in sampling and laboratory analysis. A dairy nutritionist has two approaches to fiber measurement.

The first is the **chemical estimation** of fiber. It is expressed as A.D.F.%, or N.D.F.%, or the outdated, M.C.F.%. Each of these numerical values give a slightly different measurement based on what part of the plant they include as fiber. They are all shown to be inversely proportional to the energy value (T.D.N.%, N.E.L., E.N.E., R.F.V.) and in practice are used to give each feed an energy value based on a formula. Inversely proportional means that, as the fiber value gets higher in an alfalfa sample, the energy value decreases. Not all nutritionists, laboratories, nor regions use the same mathematical formula, so exercise caution. What all agree is that N.D.F.%, which measures the structural fibers plus the hemicelluloses, is also inversely proportional to intake. High N.D.F.% levels are therefore undesirable. A.D.F.% is a measure of just the structural fibers that give forages their beneficial effect in the rumen. An optimal range exists where some A.D.F.% is essential, while excess levels reduce the energy and slow passage through the rumen too much.

The second approach to fiber measurement is to estimate the **physical features** of a feed. The effective fiber is the physical size of the feed particles as they are being presented to the animal. The chop length of the hay, haylage or silage is measured using , for example, a Penn State Particle Separator. Fibrous particles will stay on the top screen if above 0.75 inches and due to the horizontal shaking method, most alfalfa stem pieces are retained on the top screen. Recommended values in percent dry matter of the ration exist for each screen.

Where does alfalfa fit in this outline? Alfalfa has the desirable A.D.F.% fibers that the rumen requires without always having the very high N.D.F.% that has the undesirable effect on intake. Alfalfa in its dry cured form, has the ideal physical feature that if fed unground, leads to excellent rumen mat formation.

PROTEIN - THE MORE THE BETTER?

Protein levels in alfalfa typically are highest when the energy level is highest. Protein is desirable in dairy rations and has a value based on the current cost of proteins from other commodities. In dairy heifer rations adequate protein needs can be supplied from alfalfa protein alone, thus eliminating the need for mixing in additional commodities entirely.

Alfalfa grown at higher elevations will typically have 1 - 2% less protein at a given energy level than the more rapidly growing alfalfa at lower elevations. The dairy nutritionist usually discounts the value of the upland hay accordingly except in certain rations where excess protein is a problem. This occasion can result on dairies with alfalfa as the only forage source and barn mix is the only grain source. Veterinarians have concern that excess protein resulting in elevated blood urea nitrogen can have negative effects on reproduction.

MOISTURE - WHY BUY WATER?

Dairy nutritionists usually view feedstuffs on a 100% dry matter basis. High moisture in a feed reduces the value accordingly. In states with low humidity all hays dry out to approximately 10% moisture so moisture content is not an issue with cured hay purchases. The marketplace usually adjusts the price accordingly. A nutritionist is more concerned with the effect of moisture, especially at baling, on the physical appearance, smell, and **palatability** of the hay.

MINERAL LEVELS - WHICH ONES?

The mineral content of the forages used by dairy animals was always important in balancing the ration and was often undertaken from composite samples on the dairy. Recently the use of mineral testing prior to purchasing alfalfa for the small group of cows, usually 5% of the herd, referred to as close-ups, has gained popularity. Dietary Cation/Anion Difference (DCAD) values calculated on the ration to this group of cows helps reduce metabolic problems at calving. The trend has been to replace the traditionally fed oat hay and silage with alfalfa containing low DCAD levels. The DCAD level is determined by combining results of 4 mineral values. Low DCAD levels are calculated in alfalfa found to have low potassium, low sodium, high sulfur and high chloride ions. Ground capable of producing this type of hay is limited, so this niche market has resulted in premiums paid in the marketplace. The dairy nutritionist values this hay by the cost savings in reducing the mineral supplements needed if this hay is fed.

ALFALFA TESTING FOR THE COMPUTER AGE

Currently moisture, protein and fiber and occasionally DCAD minerals are the most common tests performed prior to sale of alfalfa. Increasingly more complicated testing of alfalfa is being performed after the sale, to accommodate the use of computer nutrition models that attempt to simulate the breakdown of the feed within the animal. These tests are listed under names like CNCPS package, cost $50-$100 per sample. These computer models need to estimate what types of protein and fiber fractions that are in the diet if they are to guide nutritionists to a more detailed explanation of why the cow does not always do as she is told to do!

NUTRITION IN THE TRENCHES!

In reality, there is never going to be enough high quality alfalfa! The majority of dairy nutritionists agree in the unique value of alfalfa in a high producing ration. The nutrition programs in place currently, all have room for more high quality alfalfa if it were to become available. Grower practices and plant breeders have shown us that they can repeatedly produce alfalfa with 25% A.D.F.%@100%DM and keep the N.D.F.%@100%DM below 28% (Caution: adjust if using standards other than California Hay Testing Consortium Standards). Each dairy feeding system, the available forage and fiber-containing byproducts and its target milk production all determine how much, if any, of this type of hay they can afford to feed.

The premiums that the dairy nutritionist calculates for the various levels of hay quality are directly related to the value of the extra milk the dairy receives when higher quality hay is fed. The projections on milk price for the next six months estimate prices considerably below that of the last four years. The value the dairy places on the health benefits of maximizing alfalfa use is related to the cost of replacing a cow culled for lameness or metabolic problems. This cost is currently very high and is likely to stay high. Other factors affecting the price dairies are willing to pay for alfalfa is the cost of grains. The grain price is projected to remain low for the third year in a row. All grades of alfalfa have commanded a premium during this time, confirming that the traditional positioning of alfalfa as the least expensive portion of a dairy diet has been altered. Increasing the fiber level using alfalfa has been the most costly change that dairy nutritionists have been recommending during this period.

The requirement to have adequate acreage adjacent to the dairy facility to spread waste manure has positioned more home grown silages on dairies. Rations with 10 -20% of the ration already allocated to silage, will have a more urgent need for quality alfalfa that provides that physical fiber characteristics required for rumen health.

CONCLUSION

The continued importance of palatability and physical appearance when selecting alfalfa will have bales in the back of the hay broker's pickup long after AgZone.com goes public!