The Influence of Supplemental Alfalfa Quality on the Intake and Utilization of Low Quality Roughage by Beef Cattle with Varying Levels of Protein Requirements

Tim DelCurto, Christoph Weder, Tony Svejcar, Roxane Barton, and Alison Early

INTRODUCTION

Beef cattle production in the Pacific Northwest is dependent on feeding harvested forages during the winter feeding period. The cool Mediterranean climate and associated effects on forage resources and winter conditions necessitate feeding of 1.5 to 2.5 tons of forage per cow during each winter period. Relative to other areas of the United States, as well as world industry, this is a competitive disadvantage and often corresponds to smaller profit margins in times of less than desirable beef cattle prices.

The economic survival of beef cattle production in regions where high winter feed costs are common may be dependent on the ability of producers to optimize the use of low-quality roughage with minimal supplemental inputs and the maintenance of an acceptable level of beef cattle production. Evaluation of alternative winter forages and efficient/economical supplementation strategies may be a key in assisting producers to meet this challenge.

In the Pacific Northwest, alfalfa hay is the favored supplement for lower-quality hays and straws. Relative to by-product supplements (cottonseed and soybean meal), alfalfa hay is more readily available, and in most cases, is economically favorable even when evaluated on a crude protein (CP) equivalent. In most cases, however, beef cattle producers are content to purchase alfalfa hay that is unsuitable for "dairy-quality" markets or export markets. Frequently, the quality of alfalfa hay used in beef cattle feeding is of late maturity or has been exposed to excessive precipitation.

The objective of this research proposal is to evaluate three maturities of alfalfa hay and to determine how maturity, in turn, influences the value of alfalfa as a supplement to low-quality roughage. These alfalfa supplements will be evaluated in terms of beef cattle performance, reproductive efficiency, and detailed digestion efficiency.

Experimental Design

Alfalfa Hay Maturities. The second cutting of alfalfa hay from a 60-acre field will be utilized for obtaining the three maturities of alfalfa hay. The 60-acre field will be divided into four blocks, and within the four blocks the three maturities will be randomly obtained by evaluating the phenology of the plant to harvest at: 1) a late vegetative stage, 2) a early bloom stage, and 3) a mid-to-late bloom stage. The treatment maturities of alfalfa will be baled into small rectangular bales (100 pounds) and randomly mixed across blocks within maturity treatment groups.

Cow performance Studies. Two beef cattle performance studies will be conducted to evaluate the three maturities of alfalfa hay. In experiment 1, 90 head of mature Hereford x Angus cows will be utilized in a winter feeding study using a basal diet of moderate-to low-quality

meadow hay. The 90 head of cows will be divided into nine groups (10 head each) and fed one of the following supplemental treatments: 1) vegetative alfalfa hay (high quality), 2) early bloom alfalfa hay (moderate quality, and 3) mid-to-late bloom alfalfa hay (low quality). Treatment 1 will be fed at .5 percent body weight (BW), with treatments 2 and 3 adjusted to provide an equal amount of protein. In experiment 2, 84 head of weaned heifers will be utilized in winter feeding study to evaluate the same treatments as described above. However, in experiment 2, supplementation of treatment 1 will be set at .75 percent BW, and treatments 2 and 3 will be adjusted to reflect the same amounts of supplemental protein as treatment 1.

The two beef cattle performance studies will yield two distinctive groups of beef cattle with differing protein requirements and a potential to show divergent responses to supplemental alfalfa qualities. As a result, this research will yield data that will be applicable to both growing and mature beef cattle feeding strategies with low-quality roughage.

Both studies will be started in November or early December and treatment supplements will be fed for an 84-day period. Body condition and weights will be determined at days 0, 28, 56, and 84 following an overnight shrink. Subsequent body weight and condition measures will be obtained just prior to breeding and after the summer grazing period. Reproductive success will be evaluated by conception rates and calving interval evaluation.

Digestion Studies. Eight ruminally cannulated steers will be utilized in a dual 4X4 Latin square design to evaluate the following treatments: 1) control, basal diet, no supplement; 2) basal diet plus vegetative alfalfa hay; 3) basal diet plus early bloom alfalfa hay; and 4) basal diet plus mid-to-late bloom alfalfa hay. Like the performance studies, alfalfa supplements levels will be adjusted, so that equal quantities of crude protein are provided to the low-quality basal diets on a daily basis.

Square 1 will be comprised of yearling steers, whereas square 2 will be comprised of 4-year-old steers. These two sets of steers will effectively allow us to evaluate the influence of animal protein needs versus supplemental alfalfa qualities on the intake and utilization of low-quality roughage. Each steer (within a square) will be utilized across four study periods where they will be exposed to all four treatments. Each digestion period will consist of a 14-day adaptation period, 6-day intake period, and 6-day fecal collection period, respectively. On day 27, a ruminal profile will be conducted, followed by ruminal evacuation to determine digesta kinetics on day 28. Data from the digestion studies will include the following:

- dry-matter intake and digestibility
- In Situ rate and extent of digestion
- ruminal pH and VFA concentrations
- NDF digestibility
- liquid and particulate passage rates
- ruminal NH_3

Expected Results

Results from this research program will help clearly describe the value of alfalfa quality when used as a supplement for low-quality roughage. This, in turn, will aid beef cattle producers in designing winter feeding strategies which provide an optimal level of beef cattle nutrition and economic margins for successful production systems. This project is currently underway with completion expected by July, 1996.