POTENTIAL USE OF ESCAPE PROTEIN FOR GRAZING CATTLE

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INTRODUCTION

Supplementing nutrients to cattle grazing pasture can be a profitable practice. Calves following weaning are biologically ready for a rapid growth and development period. These calves have developed a functional rumen thus allowing efficient use of forage. The level of forage intake is a major restriction for production of stocker cattle. Supplementations may increase forage intake as well as correct nutrient deficiencies. Most forages, including improved forages, are not always nutritionally balanced for the type and class of cattle that are grazing the pastures. For maximum production efficiency, cattle should be given certain minimum levels of nutrients. The nutrients that are commonly deficient in grazed forages are: protein, energy, phosphorus, salt, and some trace minerals.

Supplementation is a method which allows the cattle to consume a feed or mineral and balances the forage grazed to optimize production. In some cases supplementation may become substitution, however, this may be a profitable situation. Supplements may be used for several reasons:

1. to supply deficient nutrients
2. to increase intake of forage
3. to improve growth rates
4. to better utilize the forage
5. to increase stocking rates

SUPPLEMENT CONCEPTS

A supplement program needs to consider the type of forage available, and the type of cattle that will be grazing the forage. An inventory of the nutrients available in the forage has to be considered. The primary nutrients necessary for optimal growth of cattle consist of energy, protein, minerals and vitamins. Forage nutrient values may be chemically determined or may be established from published values. However, these values may not represent the actual nutrients available from the forage. Irrespective, to establish a proper supplementation program, an estimation of these nutrient values must be available. The goals, or performance, of the cattle grazing these forages must be established. If cattle are

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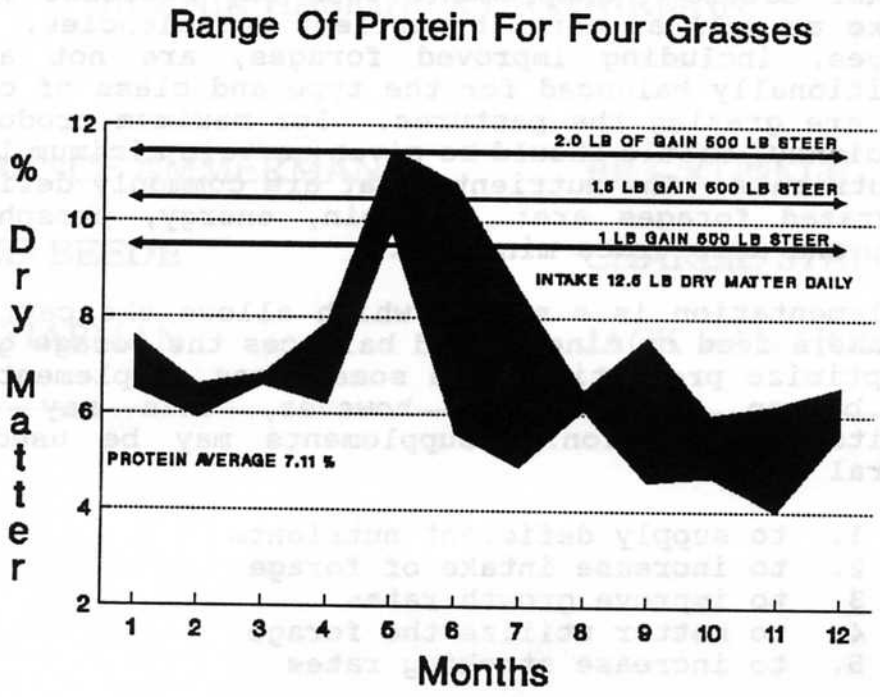
not to gain optimally, then a minimum of supplementation is necessary, or none.

Figure 1 represents the changes of a forage for protein within a growing season. This example illustrates the variability for protein during the growing season for short prairie grasses in the high plains of Texas. Two months of the year, May and June, will support optimum gains. The rest of the grazing season is deficient for protein. Thus, the first problem arises. Do you change supplements monthly or not? The cost of labor many times does not allow for month changes; therefore, a compromise has to be established.



How much to supplement often becomes a question when more than minerals are considered.

Data was summarized for cattle grazing mostly bermuda grass pastures to determine the effect of additional grain fed on the performance of cattle. Table 1 illustrates the expected additional gain of a 500 lb. steer at different consumption levels.

Table 1.
Gain from Supplemental Grain.

Supplement lbs/day	Expected Gain lbs/day	Feed to Gain
1	.12	8.3
2	.24	8.3
3	.34	8.8
4	.43	9.3
5	.51	9.8
6	.58	10.3
7	.64	11.0
8	.68	11.8
9	.72	12.5
10	.75	13.3

Protein is necessary for maintenance and growth of rumen microbes and animal tissue in the grazing calf. The National Research Council, 1985 developed a system for expressing the protein requirements for ruminants in terms of degraded intake protein (DIP) and undegraded intake protein (UIP). DIP is soluble and is utilized by the rumen microbes. UIP is referred to as escape, or bypass protein and is utilized by the tissue. The system can be used to determine deficient nutrients in forages and supplements can be designed to best use the forage. Bermuda and Rye grass pastures protein fractions are illustrated in Table 2.

Table 2. Percentage Protein Constituents for Bermuda and Rye Grass Pastures.

Pasture	Crude Protein (%)	Digestible Intake Protein (%)	Undigestible Intake Protein (%)
Bermuda	14	10.5	3.5
Rye Grass	20	16.0	4.0

Two trials were conducted using a commercially available condensed molasses, a condensed molasses block with fishmeal, a fishmeal supplement, dry protein supplement or minerals to cattle grazing bermuda grass pastures (Grigsby, K.N. et al., 1989; Grigsby et al., 1988; Grigsby et al., 1987)

The formulations for the supplements are found in Grigsby et al., 1989. Table 3 illustrates the performance and intake of the cattle during the two trials.

Table 3. Daily Gains and Intakes for Two Trials.

Supplements	Daily Gain lbs/d	Daily Intake lbs/d	Daily Gain lbs/d	Daily Intake lbs/d
Condensed Molasses Block	1.29	.44	1.10	.50
Fishmeal Block	1.21	.46		
Fishmeal			1.37	1.60
Fishmeal + Ionophore	1.92	1.12	1.49	.84
Cottonseed Meal	1.52	1.92		
Minerals	1.04		.84	

The fishmeal + ionophore supplement resulted in the best gains in both trials in different years. The crude protein for the pasture averaged 17.1% (Trial 1) and 12.0% (Trial 2). Based on the calculated needs the first trial met protein needs. The second trial was low for crude protein needs as well as UIP protein needs. However, a gain response was noted in both trials.

A summer trial was conducted with cattle grazing hybrid sorghum x sudan grass pastures and fed supplements containing fishmeal, cottonseed meal, corn or minerals (Hutcheson et al., 1986). The formulas are illustrated in Table 4.

Table 4. Composition of Supplements Fed to Cattle Grazing Sorghum x Sudan Pastures.

Ingredients	Fish % Dry	Cotton % Dry	Corn % Dry
Fishmeal	50.00		
Cottonseed Meal		85.85	
Corn			90.35
Dried Molasses	3.00	3.00	3.00
Calcium Carbonate		4.50	1.00
Dicalcium Phosphate		2.50	
Ammonium Sulfate	.25	.25	.25
Salt	3.00	3.00	3.00
Magnesium Oxide	.75	.50	1.00
Trace Minerals[1]	.25	.25	.25
Ionophore[2]	.15	.15	.15
Cottonseed Hulls	30.00		
Wheat Mill Run	12.60		
Fat			1.00

[1]Trace minerals contain Mg (15%), Zn (23.2%), Fe (14.1%), Mn (3.0%), Cu (2.8%), Ca (.5%), I (.3%), K (.2%), and Co (.2%).
[2]Rumensin 60.

Table 5 represents the daily gains and consumption of the supplements and minerals.

Table 5. Daily Gains and Intakes for the Trial.

Ingredients	Daily Gain lbs/d	Daily Intake lbs/d
Fishmeal	2.14	1.28
Cottonseed Meal	1.88	1.37
Corn	1.84	3.12
Minerals	1.50	.21

The fishmeal supplement resulted in the best gains and lowest consumption of the supplements.

Results of supplementation trials differ due to type of pasture (stage of growth) and age of cattle. Table 6 illustrates the results of the above trials grazing summer pastures.

Table 6. Performance of Various Supplements Grazing Summer Pastures.

Supplement	Daily Intake lb/d	Extra Gain Over Mineral lb/d
Condensed Molasses Block 32 % CP	.44	.25
	.50	.26
Fishmeal Block 32 % CP	.46	.17
Fishmeal 36% CP	1.60	.53
Fishmeal + Ionophore 37% CP	.84	.65
	1.12	.88
	1.28	.74
Cottonseed Meal, 34% CP	2.08	.48
Cottonseed Meal + Ionophore 36 % CP	1.37	.38
	1.92	.48
Corn + Ionophore 8 % CP	3.12	.34

Two trials were conducted using fishmeal supplements or corn for cattle grazing Rye-Ryegrass pastures (Grisby et al., 1988b). The composition of the supplements are presented in Table 7.

Table 7. Dry Matter Composition of Supplements Fed to Cattle Grazing Rye-Ryegrass Pastures.

Ingredients	Fish %	Corn %
Fishmeal	48.50	70.00
Corn		
Cottonseed Hulls	27.00	
Wheat Mill Run	11.34	
Animal Fat		.98
Cane Molasses	2.88	2.88
Salt	2.94	2.94
Minerals	1.24	10.21
Ionophore[1]	.15	.15

[1]Rumensin 60.

Tabe 8 illustrates the daily gains and consumption of the supplements fed.

Table 8. Daily Gains and Intakes for Cattle Grazing Rye-Ryegrass Pastures.

Supplement	Daily Gain lbs/d	Daily Intake lbs/d	Daily Gain lbs/d	Daily Intake lbs/d
Fishmeal + Ionophore	2.62	.76	2.54	.32
Corn + Ionophore	3.47	1.68	2.77	1.13
Minerals	2.21		2.40	

The fishmeal supplments were not consumed very well in two trials, but better in one trial. In contrast, fishmeal supplements were consumed better when fed to cattle grazing summer forages.

Table 9. Performance of Various Supplements Fed to Cattle Grazing Winter Pastures.

Supplement	Daily Intake lbs/d	Extra Gain lbs/d
Fishmeal + Ionophore, 37% CP	.32	.13
	.76	.41
Corn + Ionophore 8% CP	1.13	.37
	1.68	1.26

Table 10 illustrates values for estimates of UIP (Ruminant Nitrogen Usage) for selected products.

Feed	% Intake Protein	% UIP Total Protein
Corn	10	65
Sorghum	11	53
Cottonseed Meal, So_4	45	41
Soybean Meal	50	28
Blood Meal	85	82
Distillers Grain	25	62
Meat Meal	60	76
Fishmeal	62	80

Information is limited for UIP concentrations of various feeds and forages. The fractional UIP of the same protein sources may vary due to pasture type and maturity. Results in Table 11 were determined in grazing calves.

Table 11. The Fractional UIP of Forages and Supplements.

Feedstuff	UIP % of Total Protein Summer Pasture	Winter Pasture
Bermuda Grass	49	
Wheat-Ryegrass		23
Corn	35	50
Cottonseed Meal, Solvent	23	50
Blood Meal Ring-Dried		57
Fishmeal	37	58
Feather Meal	47	67

The values reported, in general, agree with other values reported for cottonseed meal, but as lower for animal products. Different protein processing methods may alter the UIP values.

SUMMARY

Cattle grazing forages do not always achieve their genetic potential for growth. In some cases, both warm season grasses and cool season grasses do not allow for maximum growth. As an example, protein from small grains is inefficiently digested and supplement protein that is undegraded may give a response. Supplementation of protein or energy should be accompanied by other nutrients that might be deficient and/or feed additives to stimulate efficiency.

Supplements can improve performance of cattle. However, economic consideration needs to be considered. Feed additives that should be considered are the ionophores. The ionophores do improve forage utilization as well as increase gains of pasture cattle.

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