UofA UNIVERSITY OF ARKANSAS DIVISION OF AGRICULTURE
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Agriculture and Natural Resources

Supplementing Grazing Cattle Series

Growing Cattle on Cool-Season Annual Grasses

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Reasons for Supplementing

Supplements are supplied to growing cattle in the following situations:

1) nutrient imbalances in the forage diet exist (supplementing),
2) increase pasture carrying capacity (substituting grain for forage),
3) provide a carrier for feed additives and/or mineral mixture.

Vegetative small grains (oats, wheat and rye) and annual ryegrass are highly digestible (75 to 80 percent) and contain high concentrations of crude protein (CP; typically 25 to 30 percent). These crude protein concentrations are sufficient for body weight gains of over 3 pounds daily, and digestible energy is adequate for body weight gains exceeding 2.5 pounds daily. The performance of steers grazing cool-season annual grasses often does not meet these expectations. Reasons for lower than expected performance are limited forage availability and nutrient imbalances in the forage. The production of amino acids in the rumen by microbes is limited by the availability of energy and its efficiency of use. Some of the nitrogen in these high-quality forages cannot be incorporated into microbial amino acids and proteins because energy is disproportionately low. The ratio of total digestible nutrients (TDN) to crude protein can be used to determine the balance of nutrients in the rumen. A TDN:CP ratio in the range of 4:1 to 7:1 is considered acceptable. Ratios greater than 7:1 are typically found in low-quality grasses in the late summer and fall and indicate a deficiency of ruminal degradable CP. Ratios that are less than 4:1 are typical for high-quality vegetative cool-season grasses and indicate a lack of energy relative to the amount of ruminal degradable CP.

Responses to Supplementation

Correcting Nutrient Imbalances. The low TDN:CP ratio commonly found in high-quality forages is easily corrected by supplementation with low levels of either starch- or fiber-based energy supplements. Supplementing with low levels of supplemental energy (less than 0.5 percent of body weight) can increase body weight gains without significantly affecting forage intake with supplemental conversion rates ranging from 2 to 5 pounds of supplements per pound of additional body weight gain. In Oklahoma, calves self-fed a supplement limited to 0.5 percent of body weight (2 to 3 pounds of supplement daily) gained 0.48 pounds more daily than calves receiving only a mineral supplement. Supplement conversions over the four-year trial averaged 6.0 pounds of supplement per pound of additional body weight gain. In Texas, calves were fed low levels, 0.15 to 0.20 percent of body weight (about 0.6 to 0.8 pounds daily for a 400-pound calf), of a corn-based supplement. Supplementation increased body weight gain by 0.40 pounds daily with a supplemental conversion of 2.2 pounds of feed per pound of additional body weight gain. The supplements in the above research supplied ionophores in addition to balancing dietary TDN:CP ratios.

Stretching Forage Supplies. Feeding high levels of supplemental feed can reduce forage intake. Supplement levels greater than

0.5 percent of body weight can decrease forage intake by up to 1 pound for every pound of supplemental feed. In an Oklahoma study, steers grazing wheat pasture in the fall and early spring were fed either corn or a high-fiber by-product-based supplement at 0.75 percent of body weight (3.75 pounds per day for a 500-pound calf) six days a week with increases in stocking rate of 22 to 44 percent. Supplement type did not affect substitution rate of supplement for forage that averaged 0.91, thus indicating that for every pound of supplement fed, forage intake was reduced by 0.91 pounds. Average daily gain was increased by 0.33 pounds, and the supplement conversion was 5.0 pounds feed per pound of additional gain per acre. This system can be exploited by stocker producers wishing to purchase calves in the fall ahead of seasonally high cattle prices and/or when forage mass is limiting. Research indicates there is a threshold level for forage allowance per steer (20 pounds or greater dry matter per 100 pounds of body weight), and forage mass (1,100 pound or greater dry matter per acre) must be maintained, otherwise forage intake, forage digestibility and animal performance will be dramatically reduced.

Carrying Feed Additives and Minerals. Feed additives (e.g., Rumensin, Bovatec and Gainpro) and feed grade antibiotics (aureomycin) are supplied to increase body weight gain or decrease health risks of grazing cattle. Metabolizable and net energy values of pasture grasses should be increased when ionophores are fed. Ionophore use in conjunction with high roughage diets (pasture, hays or silages) results in the same forage consumption but increased rate of body weight gain because of improved efficiency of nutrient usage. In numerous controlled trials, heifers and steers grazing various forage types (Native Prairie, bermudagrass, tall fescue, crop residue and wheat) and fed a small amount of supplement (1 to 2 pounds daily) containing an ionophore gained 8 to 45 percent (0.12-0.22 pounds daily) more than cattle fed supplements without an ionophore.

Mineral imbalances are typical in cattle grazing wheat pasture. Calcium is inadequate while phosphorus, magnesium and potassium are typically excessive. Additionally, the trace minerals copper, zinc and selenium are deficient in many areas of the state. Calcium supplementation is necessary to meet growth requirements and may reduce the incidence of bloat.

Winter-annual grasses grown on Coastal Plain soils in Arkansas are notably low in copper, zinc and selenium but may contain high concentrations of the minerals molybdenum and sulfur that are antagonistic to copper availability. Research in Arkansas indicated that calves grazing winter-annual pasture without supplemental trace minerals became deficient in copper, selenium and zinc within 60 days. Another Arkansas study indicated improved performance when organic sources of copper were fed for a short period of time (29 days) to calves grazing winter-annual pasture in addition to inorganic copper fed at "adequate" levels. In the former experiment, 150 milligrams of organic copper was fed daily in addition to the 21 milligrams of copper supplied from the inorganic copper sulfate before calves were shipped to a feedlot. Calves fed additional organic copper gained 0.31 pounds more daily than calves supplemented with just inorganic copper. Another trial completed in Arkansas found that growing steers grazing winter-annual pasture fed organic zinc sources gained 0.24 pounds more daily over 84 days than steers fed mineral supplements containing inorganic zinc sulfate as a zinc source.

Suggestions

- **Adequate Forage Availability.** Supplement 0.2 to 0.5 percent body weight of an energy supplement (grain or by-product feed) to help balance TDN:CP.
- **Limited Forage Availability.** Supplement at rates greater than 0.5 percent body weight when grain prices are cheap and cattle prices are improving, making larger fall stocking rates profitable. Expect similar substitution rates for high starch and highly-digestible fiber feedstuffs and plan for substitution rates of 0.8 to 1.
- **Feed an ionophore for improved feed efficiency.**
- **Add a high calcium, low phosphorus mineral containing copper, selenium and zinc that meets or exceeds 100 percent of the calves' requirements.** Providing organic sources of trace minerals may improve animal performance when mineral antagonists such as molybdenum and sulfur are high in the forages.

Sources

Horn, G. W., P. A. Beck, J. G. Andrae, and S. I. Paisley. 2004. Designing supplements for stocker cattle grazing wheat pasture. *Proc. Am. Soc. Anim. Sci.* Available: http://www.asas.org/symposia/04esupp/E156.pdf (Invited).

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