



Cattle Producer's Handbook

Nutrition Section

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Vitamin Nutrition of Cattle Consuming Forages: Is There a Need for Supplementation?

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Suboptimal animal performance with adequate supply of protein and energy has been observed when cattle are consuming forage-based diets. Under this condition, insufficient supply of micronutrients may be involved because ruminants, like nonruminants, must receive all the essential nutrients in proper quantities to maintain good health, grow, and reproduce at their maximum potential. This section will focus on the vitamins that may impact production of cattle consuming forages.

Vitamin A—Functions and Utilization

Dietary vitamin A, and perhaps β -carotene, enhance host defense mechanisms toward infections, decrease the incidence of certain reproductive disorders, and serve as effective antioxidants. Because of the aforementioned effects, in addition to vitamin A's role in maintaining epithelial integrity, supplementation of vitamin A to cattle may be advisable when forage is likely to be low in carotene.

Vitamin A Levels in Plant Matter

The biologically active form of vitamin A (*all-trans*-retinol) is present in plants as precursors known as carotenoids. The precursor with greatest biological activity is β -carotene, which constitutes 75 to 95 percent of the total carotenoids in forages.

Consumption of plant species and(or) specific plant parts, as well as mature forage, could greatly impact vitamin A status of cattle. Browse plants, such as sagebrush, rabbitbrush, and winter fat, generally have greater levels of carotene than grasses (Table 1).

Portions of this article were obtained from data compiled by the Western Region Coordinating Committee on improvement of forage utilization by ruminants in sustainable production systems in the western region.

The carotene content of plants with dry leaves or stems will decrease 30 to 50 percent from early to late maturity. Conversely, the presence of green basal leaves and(or) regrowth may increase the carotene content.

The amount of carotene in forages may also vary according to harvesting, processing, and storage conditions. Wilted forage retains 75 percent of its carotene content from harvesting to storage, whereas sun-cured forage only retains 35 percent of its initial carotene level. The carotene content of stored forage will drop approximately 50 percent every 6 months. Increasing storage temperature will accelerate carotene loss.

Vitamin A Supplementation

It is not uncommon for liver stores of vitamin A to be reduced when cattle are consuming a diet of low-quality, mature forage. Increasing dietary vitamin A 5,000 IU per day can double the amount of vitamin A stored in the liver. Supplementing brood cows with vitamin A before (16,000 IU/d) and after (40,000 IU/d) calving season can increase conception rates 10 percent and decrease calf morbidity by as much as 50 percent. The beneficial response noted for the calf is most likely associated with vitamin A being concentrated in colostrum and milk.

Supplemental vitamin A may not always be necessary when cattle are grazing rangelands during suspected dormancy or when cattle are fed properly cured and stored hay. This is especially the case if cattle consume reasonably green forage for at least 8 months out of the year.

The presence of green leaves presumably increased carotene levels of grass samples collected on the Red