Mineral supplements for stockers grazing small grains pasture

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Bottomline
Forage analyses shows that mineral concentrations in small grains pasture can range from adequate to severely deficient. Research has demonstrated that stocker cattle grazing small grains forages will respond efficiently and economically to both non-medicated and medicated mineral supplements.

Gazing out across a field of green wheat or rye or triticale forage, one might assume the nutritional needs of stocker cattle are being adequately supplied by the forage. However, concentrations of macro- and trace minerals can range from deficient to adequate in these forages. Mineral deficiencies can retard growth and impair immune function. Calcium is involved in smooth muscle contraction and a calcium deficiency may play a role in the incidence and severity of bloat on small grains pasture.

Mineral concentrations in small grains forages and recommendations for supplements
Mineral concentrations in fresh forage samples submitted to the Dairy One Lab over a 13 year period are shown in table 1. The data include average concentrations and the standard deviations (s.d.; illustrates the variation around the average) for observed values. For comparative purposes, the recommended dietary concentrations of these elements for growing calves are shown in table 2.

Relative to calf requirements, the calcium concentration in small grains forages ranges (ave. concentration +/- 1 s.d.) from adequate to marginal to very deficient. Phosphorus can be slightly deficient to adequate. Magnesium concentrations are marginal to adequate for stocker calves. Copper and zinc, two trace minerals of concern, also range from very deficient to adequate.

Based on these comparisons, calcium is of primary concern in a small grains mineral supplement and supplement concentrations (more than 12%) will be in excess of those normally included in range or warm-season pasture supplements. Phosphorus may be of some concern but the concentrations required in a supplement (less than 5%) would be about half or less of that normally included in range or warm-season pasture supplement. A low concentration of magnesium (less than 4%) may be included but the role of supplemental magnesium in preventing metabolic disorders in stocker calves has not been definitively demonstrated. Trace elements are also needed in the supplements and the concentrations will be similar to those in range and warm-season pasture supplements. Salt is also required and is included in adequate amounts in complete mineral supplements.

Research has demonstrated that stocker cattle grazing small grains pastures will respond efficiently to a complete mineral supplement. "Complete" meaning a supplement containing salt, macro-minerals and trace minerals in appropriate concentrations. In addition to supplying necessary mineral elements to stockers, mineral supplements are a means of delivering ionophores (Rumensin, Bovatec) that can further enhance weight gain. Supplements containing ionophores are referred to as medicated mineral supplements.

Stocker performance - Non-medicated mineral supplements compared to no supplement or salt only
On wheat pasture in northwestern Oklahoma, supplementing a complete non-medicated mineral supplement was compared to no supplement (no salt or other feeds) during the winter grazing period

and the subsequent graze-out period (Gunter and Combs, 2010). During the winter period, providing a complete mineral supplement increased gains 0.51 lb/hd/d (43 lb/hd total) with a daily supplement consumption of 0.16 lb/hd. In the graze-out period, the complete mineral supplement increased gains 0.57 lb/hd/d (48 lb/hd total) with a daily supplement consumption of 0.37 lb/hd. If the value of added gain on a stocker calf is $0.80/lb, then the supplement was adding $0.41 to 0.46/hd/d value to the stockers compared to no supplement. *Based on this added value and the reported supplement consumption rates, the breakeven purchase cost for the mineral supplement was over $3000/ton.*

Over 4 winter wheat pasture grazing seasons in north-central Oklahoma, stockers consuming a complete non-medicated mineral supplement gained an average of 0.24 lb/hd/d (or 26.4 lb/hd total over 110 d) more than stockers grazing with no supplements (no salt or other feeds; Horn et al., 2002; Fieser et al., 2007). Stockers consumed an average of 0.46 lb/hd/d of the non-medicated mineral supplement. If the value of added gain is $0.80/lb, then the mineral supplement increased calf value $0.192/hd/d compared to the unsupplemented calves. *Based on this added value and the reported supplement consumption rates, the breakeven purchase price for the non-medicated mineral supplement was about $835/ton.*

In another trial in south-central Oklahoma, stocker calves grazing rye pasture in the winter were offered white salt or a complete non-medicated mineral supplement (Reuter, 2013). The stockers on the complete mineral supplement consumed 0.23 lb/d of the supplement and gained 0.19 lb/d faster (16 lb/hd total) than those receiving only white salt (0.09 lb/d salt consumption). *Based on the reported daily consumption rates, value of added gain at $0.80/lb, and white salt at $160/ton, the breakeven purchase price for the complete non-medicated mineral supplement was $1350/ton.*

Stocker performance - Medicated mineral supplement compared to no supplement, non-medicated mineral supplement, or salt only

The 4 year winter wheat pasture grazing work in north-central Oklahoma (Horn et al., 2002; Fieser et al., 2007) also compared a medicated mineral supplement containing Rumensin (@ 1600 gm/ton mineral) to the same non-medicated mineral supplement (no Rumensin) and to no supplement. Stockers consuming the medicated mineral supplement with Rumensin gained 0.23 lb/hd/d more (or 25 lb/hd total in 110 d) than those calves consuming the non-medicated mineral supplement. The stockers consuming the medicated mineral supplement gained 0.46 lb/d more (or 51 lb/hd total in 110 d) than the stockers receiving no supplement. Average consumption of the medicated mineral supplement was 0.15 lb/hd/d as compared to 0.46 lb/hd/d for the non-medicated supplement. Rumensin reduces palatability of the supplement which results in lower daily consumption. *Compared to no supplement, the breakeven purchase price of the medicated mineral supplement at the reported daily consumption rates would be $4900/ton if value of added weight on the stocker calf is $0.80/lb.*

The south-central Oklahoma study on rye pasture (Reuter, 2013) also compared a medicated mineral supplement containing Rumensin to the same non-medicated mineral supplement (no Rumensin) and to a salt only supplement. The calves receiving the medicated mineral consumed 0.19 lb/d supplement and gained 0.19 lb/d more (16 lb/hd total) than the calves on the non-medicated mineral supplement (intake = 0.23 lb/d) and 0.38 lb/d more (32 lb/hd total) than the calves receiving salt only (intake = 0.09 lb/d). *Based on the differences between medicated mineral supplement and salt only, and assuming added gain is worth $0.80/lb and white salt is $160/ton, the breakeven purchase price for the complete medicated mineral supplement would be over $3250/ton.*

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Table 1. Concentration of selected minerals in fresh small grains forage samples[1]

Forage		Calcium %	Phosphorus %	Magnesium %	Potassium %	Zinc ppm	Copper ppm
		Concentration, dry matter basis					
Rye	Ave	0.58	0.4	0.26	2.98	50	10
	s.d.[2]	0.2	0.1	0.08	0.88	155	11
Wheat	Ave	0.39	0.31	0.17	2.44	30	9
	s.d.[2]	0.2	0.1	0.07	0.94	13	5
Triticale	Ave	0.36	0.31	0.17	2.58	31	8
	s.d.[2]	0.16	0.08	0.06	0.88	18	6

[1]Dairy One Forage Laboratory, Ithaca, NY; accumulated crop years 5/2000 to 4/2013; http://dairyone.com/analytical-services/feed-and-forage/feed-composition-library/; accessed August, 2013.

[2]Expect 68% of observations to lie within +/- 1 s.d. of the average

Table 2. Recommended dietary concentration of selected minerals for growing calves[1]

Calf wt lb	Gain lb/d	Calcium %	Phosphorus %	Magnesium %	Potassium %	Zinc ppm	Copper ppm
		Recommended dietary concentration, dry matter basis					
400	1.5	0.5	0.24	0.1	0.6	30	10
	2.5	0.76	0.35	0.1	0.6	30	10
600	1.5	0.38	0.2	0.1	0.6	30	10
	2.5	0.54	0.26	0.1	0.6	30	10

[1] NRC, 2000. Nutrient Requirements for Beef Cattle.