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Bioavailability of alfalfa calcium (1984)

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BIOAVAILABILITY OF ALFALFA CALCIUM

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L. H. Harbers, G. M. Ward, and A. D. Dayton

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Summary

The availability of oxalate and non-oxalate calcium in alfalfa was determined using a chick assay. Oxalate-bound calcium was found to contribute only 16% as much influence as nonoxalate calcium. The nonoxalate calcium in alfalfa was 18% more available than calcium carbonate (precipitated chalk).

Introduction

Previous work at Kansas State University demonstrated that part of the calcium in alfalfa is relatively unavailable to animals because it is in the form of insoluble calcium oxalate. Further studies were made comparing the relative availability of calcium from alfalfa, acid-extracted alfalfa with added calcium oxalate, and calcium carbonate, using the chick growth assay.

Materials and Methods

Alfalfa hay was extracted with 1N HCl (final pH 0.6) to add as a fiber source, so all groups received a 17.5% alfalfa base. Two alfalfa hays were treated with .28 N HCl (final pH 3.0) to extract soluble calcium, but leave calcium oxalate in the fiber. Twelve diets were prepared, all containing 17.5% alfalfa, or acid-extracted, or both. Reference diets contained three levels of laboratory grade calcium carbonate.

Day-old white Leghorn cockerels were allotted to three replicates of each treatment. Chicks were sacrificed on the 25th day. Response criteria were weight gain, pen feed consumption, and tibia bone ash.

Results and Discussion

Bird weight gain, intakes of oxalate calcium, non-oxalate calcium, total calcium, and tibia data (Table 1) indicate that gain and bone deposition are related to total calcium intake and oxalate-bound calcium. Statistical analyses of the data indicate that non-oxalate calcium in alfalfa is utilized 18% more efficiently in the chick than calcium carbonate. Oxalate calcium had only 16% as much influence as non-oxalate calcium. The two lots of alfalfa used had 23 and 27% of their calcium tied up with oxalate, thus the net utilization of total calcium from alfalfa would range from 79 to 94% of that from calcium carbonate (precipitated chalk) for chicks. We previously found that oxalate calcium ranged from 20 to 33% of total calcium in alfalfa.

Table 1. Least square means of chick weight gain, calcium intake, tibia weight, and ash from alfalfa hays and their extracted residues

Treatment	Oxalate Calcium	Non- Oxalate Calcium	Total Calcium	Weight gain	Tibia	
					Dry	Ash
	(g)					
1	.05	.32	.37	67	.181	.063
2	.07	1.06	1.13	130	.286	.121
3	.08	2.01	2.09	185	.449	.214
4	.09	3.05	3.14	199	.512	.252
5	.15	.67	.82	123	.261	.102
6	.30	1.29	1.59	174	.370	.166
7	.38	.52	.90	104	.220	.080
8	.82	.70	1.52	128	.267	.106
9	.18	.77	.95	130	.277	.113
10	.38	1.35	1.73	174	.383	.175
11	.38	.48	.86	93	.211	.078
12	.87	.69	1.56	131	.272	.108

