Feeding Value of Reconstituted High-Tannin Sorghum in a Practical Ration in a Chick Trial

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Story in Brief

The effects of reconstituting a high-tannin sorghum grain variety were studied in a chick feeding trial utilizing 96 commercial broiler chicks. Sorghum grain was reconstituted by the addition of water to increase grain moisture content to 30 percent and incubating at 35°C for 1, 2, 4, and 8 days. Reconstituting sorghum grain decreased its tannin content by 74, 73, 78 and 85 percent for the 1, 2, 4, and 8 day incubation periods respectively. Sorghum grain reconstituted for 4 days promoted similar rates of gain compared to the corn and sorghum grain control diets. Reconstitution increased feed efficiency by a mean of 8.6 percent. The basal diet contained 8.2 percent more protein than dictated by NRC requirements which may have masked any gain response. Reconstituting sorghum grain may reduce the tannin content and enhance feeding value of high-tannin sorghum grain. More studies, however, are needed to better understand these effects.

Introduction

Although sorghum grain is a human staple in many developing countries where it grows well under stressful climatic conditions, most sorghum produced in the United States is consumed by livestock. Brown sorghum varieties containing a high tannin content have been reported to have production advantages such as higher per acre yield and better storage properties than white or yellow grain types. However, sorghum tannin may decrease nutritive value of the grain by irreversibly binding to dietary proteins. Such tannin-protein complexes are probably not digested by poultry and may render sorghum protein amino acids unavailable.

Reconstituting sorghum grain via the addition of water to bring the grain to 70 percent dry matter and subsequent incubation at 35°C has been demonstrated to decrease the detectable tannin content by up to eighty-five percent and may provide a means to detoxify high tannin sorghum grain. The purpose of this experiment was to evaluate the reconstitution process in a chick feeding trial.

Material and Methods

Sorghum grain was reconstituted by addition of water to bring the grain moisture content to 30 percent. A commercial mold inhibitor product[a] was added with the water to inhibit fungi growth. The grain and water mixture

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were combined in a rotary mixer until all water was absorbed, placed in polyethylene air tight bags and incubated at 32°C for 1, 2, 4 and 8 days.

Normal and 4-day reconstituted sorghum grain was added to the corn based ration (Table 1) by substitution for corn on a weight basis. Laboratory analysis indicated that the sorghum and corn grain had similar protein levels and served as a basis to consider them nutritional equivalents. Ninety-six 3-day old commercial broiler chicks were randomly assigned to the three treatment groups such that there were four replicates per treatment with eight chicks per replicate. During the ensuing four-week experimental period, all chicks received feed and water ad libitum. Random fecal grab samples were taken every two days and composited for ration and starch digestibility estimates determined by chromium ratio.

Table 1. Ration composition

Ingredients	Corn	High-tannin Sorghum	Reconstituted Sorghum
	%	%	%
Corn, ground	53.15	—	—
Sorghum (high-tannin)	—	53.15	—
Sorghum (reconstituted)	—	—	53.15
Soybean meal (44%)	35.95	35.95	35.95
Meat + bone meal (55%)	5.00	5.00	5.00
Alfalfa meal (17%)	3.00	3.00	3.00
Dicalcium phosphate	1.00	1.00	1.00
Calcium carbonate	0.90	0.90	0.90
Vitamin mix	0.40	0.40	0.40
Salt	0.30	0.30	0.30
DL-methionine	0.10	0.10	0.10
Trace minerals	0.10	0.10	0.10
Chromic oxide	0.10	0.10	0.10

Results and Discussion

Reconstituting sorghum grain reduced tannin content (Figure 1) by 85 percent after 8 days incubation with the bulk of the reduction occurring after just 1 day. However, reconstitution of sorghum grain had no effect ($P > .10$) on body weight gain (Table 2) indicating that both rations satisfied chick protein requirements. The sorghum ration used in this experiment contained about 25.2 percent protein which is approximately 9.6 higher than the NRC protein requirement for this class of poultry when expressed per unit metabolizable energy. The excess dietary protein would tend to neutralize any tannin toxicity as excess protein would bind to tannin without precipitating a protein deficiency. Such rations are not representative of least cost rations where protein level is held nearer to the requirement and would thus be more sensitive to tannin content.

Feed intake (Table 2) was 8.6 percent higher for the high-tannin sorghum compared to the basal corn diet and reflects the lower metabolizable energy content of sorghum. However, reconstituting sorghum reduced feed intake by

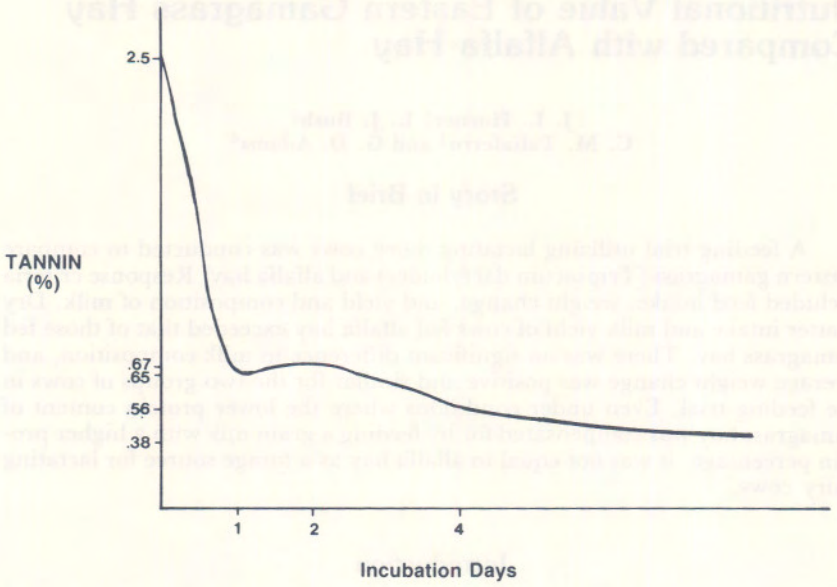

Figure 1. Reconstitution effect upon tannin content of sorghum grain.

Table 2. Results

Treatments	Tannin (Catechin eq./g)	Nutrition Parameters: Weight gain (g)	Feed Intake (g)	Feed/gain	Digestibility Ration (%)
Basal (Corn-soy)	—	896.0	11743	1.70	66
High-Tannin Sorghum	2.5	891.0	12758	1.80	63
Reconstituted Sorghum	0.56	891.0	11314	1.60	62

13 percent when compared to high-tannin sorghum and 3.7 percent below the corn ration. This suggests that reconstituting sorghum grain may increase energy availability as body weight gains were similar across treatments and feed efficiency increased 8.6% upon the reconstitution. However, ration and starch digestibility estimates did not account for the enhanced feed efficiency. Whether the increased feed efficiency observed in this study was due to chance on increased energy availability from dietary constituent other then starch is not certain. Nonetheless, reconstituting sorghum grain reduces chemically detectable tannins and may provide a mean for detoxifying sorghum tannin. Additional studies are underway.