UK COOPERATIVE EXTENSION SERVICE
University of Kentucky – College of Agriculture
July-2006

Evaluation of Distillers Dried Grains with Solubles, Soybean Hulls and Whole Corn in Diets for Growing and Finishing Meat Goats

Terry Hutchens; UK, Charles Smith; Producer, John Johns; UK,
Kenneth Andries; KSU, Patty Scharko; UK

Test goats waiting for processing for a 14 day weight period.

Test goat eating from a hanging hay manger.

The Kentucky.. meat goat industry has grown dramatically within the past five-year period. For the year 2005, USDA estimates the number of breeding goats in Kentucky.. to be in excess of 63,500 on 2,500 farms. This population ranks Kentucky sixth nationally in goat numbers. Much of this growth has occurred on small to medium sized farms. Major issues for these producers are economical and easily managed feeds for the production of meat goats for slaughter. Grain-based commercial feeds and supplements may not be economical.

High-starch supplements reduce ruminal pH and fiber digestibility, thus reducing growth rate. Some by-product feeds contain highly digestible fiber, which could potentially provide an alternative without the management problems associated with high-starch (high-grain) diets. Therefore, this study was conducted to compare a commercially available 16% pelleted goat ration with two farm mixed- rations composed predominately of the by-product feeds, distillers dried grains with solubles (DDGS), and soybean hulls. This research was supported by the Distillers Grains Technology Council, University of Louisville, Lutz Hall, Room 435, Louisville KY. 40292

Procedures

Sixty weanling (104 to120 days old) Boer x Kiko kids were used in a 56-day,

Charles Smith, Glasgow, KY. is seen moving goats that are on the by-product feed trial.

Walk by hand-feeding system with 12 inches of bunk space per head.

feeding study. All were weaned two to four weeks prior to the beginning of the study and were readily consuming concentrate and grass hay. These kids were produced and raised on a single farm in south central Kentucky. Kids were born during two periods, September to October 2005 and October to November 2005. The test population consisted of 35 male and 25 female kids. Body weight was measured with a Gallagher®, SmartScale 200 digital scale. Animals were randomly and equally allocated to one of three treatments based on weight, age, and sex. Treatments consisted of: 1) a commercial ration 2) a farm mixed ration containing 20% DDGS, 40% soybean hulls, and 40% whole shelled corn or 3) a farm-mixed ration containing 30% DDGS, 30% soybean hulls and 40% whole shelled corn.

Feeds were weighed with a Rapala® 50 lb digital scale and rations mixed prior to each morning and evening feeding. Each test group was fed at a rate of 3% of the test group average body weight. Groups were weighed every 14 days with ration amounts increased accordingly. Orchardgrass hay was provided in an overhead manger for free choice consumption. Hay was weighed prior to placing in hanging mangers, but no attempt to measure hay wastage was made. Intake was considered to be the weight placed in the manger.

Samples of the commercial feed, DDGS and soybean hulls were sent to Dairy One Laboratory for nutrient analysis by NIR. Samples of the orchardgrass hay were sent to the Kentucky.. Department of Agriculture for analysis by NIR. Nutrient content is shown in Table 1. Nutrient values for corn were taken from the 2000 update of the NRC Nutrient Requirements for Beef Cattle. Nutrient content of rations (Table 2) was calculated based on the percentage of ingredients in the mixture, including hay consumed at 1.5 lbs per head daily. The rations containing 20 and 30% DDGS were balanced to be isocaloric and isonitrogenous. The commercial ration is slightly higher in Crude Protein and TDN than the two mixed rations, but nutrient values for all rations are within current recommendations for growing and finishing slaughter kids. Animals in each treatment group were provided ad libitum access to water and mineral. Barn space was provided at the rate of 25 ft^2 per head. Bunk space was 12 linear inches per kid. At the end of the 56-day test, all kids were consigned to and sold in a Kentucky.. Department of Agriculture sponsored graded goat sale in Bowling Green, Ky.

Statistical Analysis

Data were analyzed by the PROC GLM procedure of SAS (SAS Inst. Inc. Cary, N.C.) with dependent variables including diet, weight, age, and sex.

Results and Discussion

Body Weight and Performance of Kids

Period body weights, total pounds of gain, and overall ADG of kids on the three treatments are shown in Table 3. There was no significant ($P > .05$) effect of ration on body weight, gain or ADG for the entire trial. Kids consuming all three rations performed well. Treatment differences for ADG at different weigh periods did occur as shown in Table 4. Kids receiving the 30% DDGS gained significantly ($P = .05$) faster than kids on the 20% DDGS ration but not the control ration during the first 14 days of the trial. From day 14 to 28, kids receiving the 20% DDGS had a higher rate of gain than kids on either the control

Table 1.
Nutrient Content (DM basis) of the Commercial Feed and Other Ingredients.

Feed/Ingredient	Commercial	DDGS	Soybean Hulls	Hay
Dry Matter %	89.3	89.1	88.6	85.1
C. Protein %	17.8	30.2	11.0	10.3
ADF %	15.2	16.9	48.3	44.9
NDF %	31.5	30.2	72.1	69.8
NFC[a] %	45.7	29.1	13	8.6
TDN %	77	71	59	43.4

[a]Nonfiber carbohydrate calculated as 100 – (NDF + CP + EE + Ash)

Table 2.
Nutrient Content (DM Basis) of Rations (Hay and Concentrate).

Ration	Commercial	20% DDGS	30% DDGS
Dry Matter %	87.2	86.8	86.8
Crude Protein %	14.1	12.7	13.1
ADF %	30.1	38.6	37.0
NDF %	50.7	60.3	58.3
NFC %	27.2	18.8	19.6
fNDF[a] %	37.8	15.7	20.0
TDN %	60.2	58.2	58.8

[a]fNDF= NDF from hay

Table 3.
Performance of Kids Fed a Commercial or Commodity Based Ration.

	Commercial	20 % DDGS	30 % DDGS
Weight lbs, Day Zero	40.1[a]	41.2[a]	40.3[a]
Day 14	42.9[a]	43.0[a]	45.4[a]
Day 28	48.5[a]	52.4[b]	51.3[a]
Day 42	57.7[a]	59.3[a]	59.2[a]
Day 56	64.8[a]	66.0[a]	63.6[a]
Total Gain, lbs	24.7[a]	24.8[a]	23.3[a]
ADG, lbs	.44[a]	.44[a]	.41[a]

Least Square Means, means in the same row with differing superscripts differ significantly, P < .10

or 30% DDGS rations, (P < .001). From day 28 to 42, kids receiving the commercial ration gained more rapidly than kids receiving the 20% DDGS ration (P < .01) or the 30% DDGS ration (P < .10). No differences were observed from days 42 through 56 (P > .10). An explanation for this variability in period gain is not readily apparent because all kids were being limit fed the concentrate rations and all feed was readily consumed.

Fiber and starch components of the feeds

Goats have evolved as browsing ruminants. Rations high in starch containing grains may create an acidotic condition in the rumen, predisposing the goat to over-eating disease caused by Clostridium perfringens as well as other disorders associated with low rumen pH. In addition, fiber digestion may be decreased resulting in reduced animal performance as is seen in cattle.

While starch was not directly measured for the rations, NFC (non-fiber carbohydrates) is a reflection of the ration starch and rapidly fermentable sugar content. The commercial ration contained much greater levels of NFC than the two DDGS-based rations (Table 2). In theory, this level of starch fermentation in the rumen should have reduced fiber digestibility, thus total nutrient intake and performance of these kids. However, there was no effect of ration on gain (Table 3). Explanations for this finding exist. Starch fermentation in the rumen of the goat may not affect fiber digestibility as it does in cattle or fermentation of the DDGS rations was sufficiently rapid to produce total rumen VFA levels, thus pH similar to the commercial ration treatment. Any effect on fiber digestibility would be similar in the latter case. In addition, the DDGS-based rations also contained 40% corn. This is likely a high enough level to interfere with fiber digestion and, if it occurred, create a situation similar to the commercial ration. Additional research is needed to determine the true effect of starch on fiber digestibility in goats.

Weight gain of intact males vs. females:

Intact males gained more (P < .05) weight overall (Graph 1) than females and they had a greater (P < .05) average daily gain (Graph 2) than females. Differences in total weight gained began to narrow the last 14 days of the study, perhaps suggesting that intact males were fatter and more near their desired slaughter weight than the females. Likewise, average daily gain was not different (P > .1) from day 42 to 56, again most likely reflecting differences in body fat between the sexes. Furthermore, males were approaching 180 days of age and, therefore, at the onset of puberty. Furthermore, average weight differences, 12.7 lbs between males vs. females may have been less in a single sex feeding trial.

Age effect on gain

Birth group or age of animals had no effect (P > .10) on overall weight gain or average daily gain of the goats.

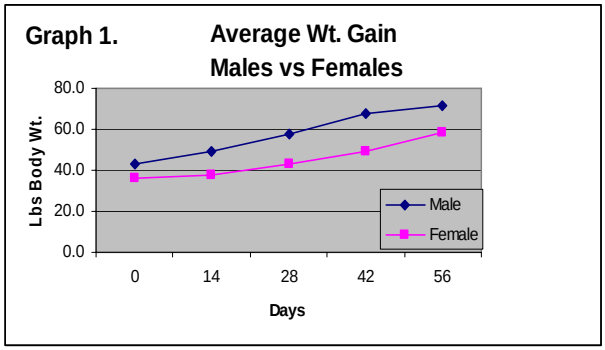
Charles Smith walks through meat goat processing and weighing facility.

Economic Impact of By-Product Feed

The economics of using by-product-based rations for growing goats are shown in Table 3. All animals averaged 110.8 lbs of concentrate intake for the trial. Cost per pound of the two by-product based rations was less than 50% of the commercial ration. Total cost per head including hay was $20.78 for the commercial ration and $10.3 7 and $10.70 for the 20% and 30% DDGS rations respectively.

This resulted in a total cost per pound of gain of $0.84 for the commercial ration and $0.42 for the 20% and $0.46 for the 30% DDGS ration. Goats consuming all three rations were profitable due to an average selling price of $1.51 per pound. Profitability is expressed as returns to capital, land, and management. Goats fed the two DDGS-based rations had increased returns compared to the commercial ration fed goats.

Goats fed either a commercial or DDGS-based by-product ration gained similarly during this 56-day trial. Because the by-product-based rations cost much less than the commercial ration, returns were increased by 15.8% and 10.7% for the 20% and 30% DDGS rations respectively compared to the commercial ration. Using by-product-based rations will increase producer profitability when feeding growing and finishing goat kids.



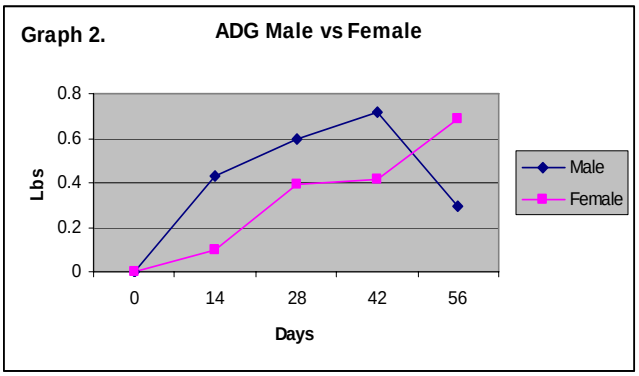


Table 4.
Period ADG, lbs of Kids Fed a Commercial or Commodity Based Ration.

Ration	Commercial	20 % DDGS	30 % DDGS
Period 1	.20[a]	.13[b]	.37[a]
Period 2	.40[c]	.67[d]	.42[c]
Period 3	.65[e]	.49[f,g]	.56[g]
Period 4	.51[h]	.48[h]	.31[h]

Least Square Means, means in the same row with differing superscripts differ significantly, [a,b]P = .05, [c,d]P < .001, [e,f]P < .01, [e,g]P < .10.

Table 5.
Economics of By – Product Based Rations for Growing Kids

Ration	Commercial	20% DDGS	30% DDGS
Lbs feed/head	110.8	110.8	110.8
Cost/lb, $	0.16	0.06	0.07
Cost/head, $	17.51	7.10	7.43
Hay cost/head, $	3.27	3.27	3.27
Total cost/head, $	20.78	10.37	10.70
Total lbs of gain	24.7	24.8	23.3
Cost/lb of gain, $	.84	.418	.459
Gross $/head	97.84	99.66	96.03
Return to Capital, Land & Manage-ment/head	$77.07	$89.29	$85.33

For additional information contact:
Terry K. Hutchens
Extension Associate Specialist,
Animal and Food Sciences,
University of Kentucky.
859-257-2465
859-323-1027
thutchen@uky.edu
www. uky.edu/Ag/AnimalSciences/goats/goat.html