

Reduction Of Feed Costs Through Use Of The Missouri Ideal Turkey Protein

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Duration: 21 wk floor pen trial

Objectives

To modify and repeat a test of the Missouri Ideal Turkey Protein

Introduction

Feed is the major cost of live production of turkeys. When feed is broken down into nutrient provision costs, protein/AA and energy are the major portion of the costs with phosphorus third. Provision of the above nutrients by ingredients will result in the provision of many of the vitamin and mineral needs, thus reducing their cost of inclusion into the diet. Therefore, reducing costs of protein and energy should have the greatest impact on feed costs. Formulation of diets based on digestible amino acids and our Ideal Ratio has been researched at Missouri on an individual amino acid basis for many years. These data were recently compiled and used to produce and test diets based on these data. Brief results of this initial test are noted below and a complete report on this work can be found in the 2006 Arkansas Nutrition Conference.

Body weight gain of turkeys fed industry standard versus ideal protein rations (lbs)

	3 wk wt	6 wk wt	9 wk wt	12 wk wt	15 wk wt	18 wk wt
Industry	1.43 ^a	5.67 ^a	11.47 ^a	19.84 ^a	27.51 ^a	35.33 ^a
Ideal Ratio	1.34 ^b	5.45 ^a	11.11 ^a	19.26 ^a	26.79 ^a	33.70 ^b
Ideal +5%	1.40 ^{ab}	5.79 ^a	11.57 ^a	19.97 ^a	27.41 ^a	34.82 ^{ab}
Ideal +10%	1.43 ^a	5.76 ^a	11.47 ^a	19.46 ^a	27.16 ^a	34.28 ^{ab}
SE	.02	.10	.15	.20	.33	.32

Feed:gain adjusted for mortality of turkeys fed industry standard versus ideal protein rations

	3 wk fg	6 wk fg	9 wk fg	12 wk fg	15 wk fg	18 wk fg
Industry	1.34 ^a	1.66 ^a	1.87 ^a	2.09 ^{ab}	2.28 ^a	2.43 ^a
Ideal Ratio	1.30 ^{ab}	1.59 ^b	1.74 ^b	2.03 ^a	2.22 ^a	2.43 ^a
Ideal +5%	1.32 ^a	1.59 ^b	1.79 ^b	2.09 ^{ab}	2.28 ^a	2.44 ^a
Ideal +10%	1.27 ^b	1.60 ^b	1.81 ^{ab}	2.14 ^b	2.30 ^a	2.49 ^a
SE	.02	.01	.02	.02	.02	.03

Costs per ton of feed for turkeys fed industry standard versus ideal protein rations

	0-3 wk	3-6 wk	6-9 wk	9-12 wk	12-15 wk	15-18 wk
Industry	196.87	193.59	182.13	178.47	171.63	158.68
Ideal Ratio	184.44	175.32	166.57	159.52	151.81	144.46
Ideal +5%	186.23	179.59	170.05	163.52	154.60	147.01
Ideal +10%	193.54	183.34	173.96	167.56	157.85	148.87

Average feed cost savings for the ideal +5% diets versus the industry standard (Agristats based) were approximately \$13/ton of feed with similar growth and breast yield. This has the potential to save the turkey industry up to \$100 million/year in feed costs as well as reduce nitrogen excretion. While the initial study was effective, we would like to do some slight adjustments to the ratio, carry the study to 21 weeks of age and repeat the data to provide a stronger case for the formula changes the data would suggest. The cost benefit ratio is obviously excellent for this research.

Procedures

A floor pen trial with 4 treatments and replicate pens of 25 toms will be conducted. Standard husbandry practices will be followed and all procedures will be performed in accordance with our Standard Operating Procedures (available on request). Facilities are a 2 stage curtain sided barn with brooder and finisher areas. Birds will be fed one 4 treatments as outlined below. All diets will be computer formulated based on our ideal ratio and digestible amino acid requirements. Diets will be changed at 3 week intervals with bird weight and feed intake monitored at these times. Processing yield will be performed on 3 birds per pen at 18 and 21 weeks of age.

Dietary Treatments

- A: Control (Agristats average)
- B: Ideal ratio
- C: Ideal + 5% safety factor
- D: Ideal + 10% safety factor

Statistical design:

The trials will be set up as a randomized block design with each treatment allocated to 8 blocks of 4 pens such that each treatment is randomly allotted to each block one time.

Diet descriptions: All diets will be computer formulated to meet or all nutrient requirements. Diets are made by producing a premix with micro-ingredients followed by mixing at the University feedmill. Diets will be pelleted and crumbles will be fed during the first phase.

Randomization procedures:

All treatments will be randomized within each block as per above. A random number table will be used to randomize treatments within blocks.

Animal Type: Commercial Nicholas toms or similar.

Housing and management:

Birds will be housed in curtain-sided pen facility at the Rocheford Farm. Birds will be checked daily and standard animal husbandry practices will be followed. All procedures will be based on our Standard Operating Procedures (available upon request). Dr Firman worked in the commercial turkey industry in the late 70's and has conducted research on turkeys for the past 20 years.

Experimental timeframe

<u>Day</u>	<u>Duty</u>
-30	Diets formulated, feedstuff delivered, all animal protocols approved
0	Deliver poults and assign to treatments
21	Weigh feed, poults, change diets
42	Weigh feed, poults, change diets
63	Weigh feed, poults, change diets
84	Weigh feed, poults, change diets
105	Weigh feed, poults, change diets
126	Weigh feed, poults, change diets
127	Processing, cut-up
147	Weigh feed, poults, change diets
148	Processing, cut-up
149+	Analysis of data, report

Statistical analyses

Data collected:

- Cumulative body weight gain
- Cumulative feed:gain
- Adjusted feed:gain
- Mortality
- Parts yield: Carcass, fat pad, leg, thigh, wing, breast (major, minor)

Experimental units:

The pen will be the experimental unit throughout the study.

Statistical tests:

Data will be analyzed by analysis of variance (ANOVA) with a one-way design using the general linear model. Generally block effects are not significant and this portion of the variance will be added into the error mean square. Following ANOVA, means will be separated where appropriate. All data will be analyzed with the JMP version of SAS. The level of significance will be set at .05.

Literature Review

The majority of published research on amino acid (AA) digestibility and digestible formulation of turkey diets has been performed by Dr Firman's group over the past 15 years. A number of experiments were conducted during the starter period for a variety of AAs and for lysine and sulfur AA to market weight on toms and lysine in hens. An ideal protein was estimated and recently a test of these data was made. These data

have been published in proceedings (Arkansas Nutrition). A list of publications related to this topic are attached in an appendix.

Results and Discussion

In a previous trial, the Missouri Ideal Turkey Protein was fed in comparison with an Agristats industry average diet. Minor depressions in growth were noted in the Ideal ratio diet, that were overcome with 5-10% amino acid additions in that trial. Based on these data, this trial was performed similarly, but with minor changes in amino acid levels to reflect Dr Firman's best estimate of which amino acids were deficient in the original trial. Results for this trial are found in Tables 1-4. As can be noted below, there are no significant differences in performance between any of the treatments, indicating that the changes made overcame any minor inaccuracies in our Ideal Ratio for Turkeys. Growth rates are perhaps a bit behind due to very hot weather near the end of the trial. Significant cost savings are seen with these diets that range from 7-10% for the Ideal diet (Table 2). Carcass yield data are shown in Tables 3-4. No differences were seen in any measures at 18 weeks. At 21 weeks there were no significant differences noted, but numerically lower pectoralis major values were seen in the ideal and ideal +10% diets. This was not seen in a previous trial and is not believed to be significant. A full article summarizing this work will be submitted for the Gobblers publication.

Table 1. Body weight gain and feed efficiency from 3 to 21 weeks of age.

<i>Trt</i>	Gain (kg)							FE (kg:kg)						
	3	6	9	12	15	18	21	3	6	9	12	15	18	21
1	.36	1.86	4.51	7.52	11.35	14.18	19.39	2.15	1.66	1.83	2.07	2.34	2.60	2.70
2	.36	1.86	4.47	7.45	11.26	14.07	19.18	1.95	1.70	1.84	2.12	2.32	2.62	2.70
3	.35	1.83	4.40	7.34	11.08	14.44	19.22	1.97	1.64	1.82	2.08	2.34	2.59	2.68
4	.36	1.87	4.52	7.52	11.23	14.56	19.42	2.06	1.67	1.82	2.08	2.29	2.68	2.75
SE	.03	.006	.09	.16	.21	.28	.24	.07	.02	.01	.02	.03	.08	.06
P value	>.05	>.05	>.05	>.05	>.05	>.05	>.05	>.05	>.05	>.05	>.05	>.05	>.05	>.05

Different letters indicate significantly different means

Table 2. Feed cost comparison between diets fed from 0-21 weeks of age (Prices per US ton)

Treatment	Time period fed (wks)						
	0-3	3-6	6-9	9-12	12-15	15-18	18-21
Agristats	311.76	308.12	289.05	278.26	266.59	249.96	240.55
Ideal diet	291.98	283.36	270.63	258.15	243.18	236.25	227.51
Ideal +5%	298.54	289.92	276.30	262.89	247.70	240.51	231.33
Ideal +10%	305.40	295.44	282.06	264.97	251.00	243.86	234.76

Table 3. Percentage Hot Carcass Yield, Legs, Thighs, Wings, Pectoralis and Fat pad at 18 weeks of age of Tom Turkeys.

<i>Trt</i>	Live weight (kg)	(% BW)						Fat pad
		Carcass yield	Legs	Thighs	Wings	Pectoralis Major	Pectoralis Minor	
1	14.18	77.84	10.02	11.13	9.80	16.38	4.31	.73
2	14.07	77.26	10.30	11.19	10.11	16.20	4.28	.92
3	14.44	77.61	10.32	11.23	9.74	16.07	4.06	.95
4	14.56	77.51	10.25	11.05	10.05	15.81	4.03	.73
SE	.28	.42	.14	.14	.19	.39	.09	.08
P value	>.05	>.05	>.05	>.05	>.05	>.05	>.05	>.05

Different letters indicate significantly different means

Table 4. Percentage Hot Carcass Yield, Legs, Thighs, Wings, Pectoralis and Fat pad at 21 weeks of age of Tom Turkeys.

<i>Trt</i>	Live weight (kg)	(% BW)						Fat pad
		Carcass yield	Legs	Thighs	Wings	Pectoralis Major	Pectoralis Minor	
1	19.39	81.50	10.08	11.45	8.44 ^b	20.86	4.38	.73
2	19.18	80.25	10.61	11.28	9.39 ^a	19.44	4.37	.81
3	19.22	81.19	10.27	10.93	9.00 ^{ab}	20.65	4.21	.72
4	19.42	81.39	10.46	11.94	9.35 ^{ab}	19.80	4.31	.70
SE	.24	.58	.19	.28	.16	.51	.12	.04
P value	>.05	>.05	<.05	>.05	<.05	>.05	>.05	>.06

Different letters indicate significantly different means