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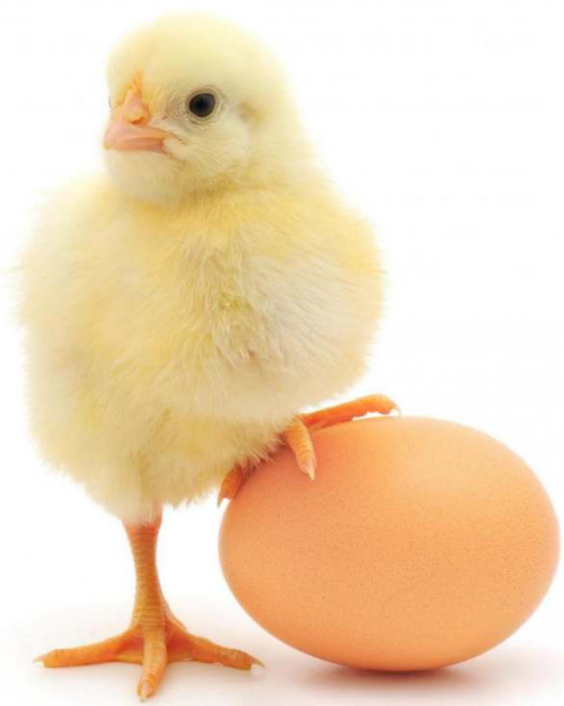

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Effect of Protein on Growth and Carcass Yield of Emu

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Abstract: Seventy-two emu of mixed sex (mean age 107 d) were randomly distributed among six pens (4.2 x 24.2 m) with 12 birds/pen. Two pens each were fed either a 14, 16, or 18% protein (2860 kcal/kg) corn-soybean meal diet from 0 - 176 d on test. From 176 - 248 d on test, a 14% protein finisher diet containing either 2860 kcal/kg or 3080 kcal/kg was fed to each of two pens fed the same protein level prior to day 176. Body weights were obtained at 0, 15, 30, 43, 79, 108, 135, 176 and 248 d on test for each bird, while *ad libitum* feed consumption was measured for each pen. At 273 d, five birds were selected for slaughter from each pen based on mean body weight and carcass, fat, neck, bone, fan and fillet muscle, second muscle and ground meat weights were obtained. Body weight gain was less ($P<0.01$) in birds fed the 14% protein diet during the 176 day experimental period and was not affected by energy level during the finishing period. Cumulative feed efficiency (kg feed/kg gain) for the 248 d period for birds fed 14, 16, or 18% protein was 12.08, 11.05 and 10.92, respectively ($P>0.05$). Carcass weights and yields were unaffected by treatment. Carcass weights for females were greater ($P<0.05$) than for males (23.17 vs. 21.57 kg). Average amounts of fat, bone, neck, fan and fillet muscles, second muscles and ground meat as a percentage of carcass yield remained unaffected by treatment ($P>0.05$) (although values for females were numerically greater than for males) and averaged 18.9, 18.2, 3.8, 8.6, 18.8 and 27.5%, respectively. Results indicate that emu fed a low protein diet exhibit the ability to compensate for growth and carcass yield.

Key words: Emu, nutrition, growth, protein, yield

Introduction

Raising of emu for commercial production of meat, leather, oil and feathers in the United States has stabilized as an agricultural enterprise. The once lucrative breeder market has been yielding to a commercial slaughter market. As a result, the developing slaughter market has prompted a focused interest in reducing commercial production costs. In order for emu raising to compete with other agricultural enterprises on a commercial scale, feeding costs must be reduced to a level competitive with other livestock enterprises.

Formulation of balanced, nutrient adequate diets is fundamental to commercial production of emu and this process depends on knowledge of their nutrient requirements. However, scientifically based knowledge about nutrient requirements of the bird is limited (Blake, 1996; O'Malley, 1996). Typical criteria used for establishing nutrient requirements include growth, reproduction, feed efficiency and where possible, bird health and quality of the processed products - i.e. meat, leather, oil and feathers. As the raising of emu commercially gains momentum, there exists a need for additional efforts focused on defining their nutrient requirements. The purpose of this study was to assess changes in dietary protein and energy for growing emu and to determine the potential carcass yield of emu.

Materials and Methods

Seventy-two emu of mixed sex (mean age 107 d) were randomly distributed among six pens (4.2 x 24.2 m) with 12 birds/pen. Two pens each were fed either a 14, 16, or 18% protein (2860 kcal ME/kg) corn-soybean meal grower diet from 0 - 176 d on test (Table 1). From 176 - 248 d on test, a 14% protein finisher diet containing either 2860 or 3080 kcal ME/kg was fed to one of each of the two pens fed the same protein level prior to day 176 (Table 1).

Grower diets were fed until birds achieved an average weight of 29.5 kg at 176 days. Finishing diets were fed from 176 days through slaughter on day 273. Body weights were obtained at 0, 15, 30, 43, 79, 108, 135, 176 and 248 d on test for each bird, while *ad libitum* feed consumption was measured for each pen. At 273 d, five birds were selected from each pen based on mean body weight obtained on day 248 and were transported for slaughter. Carcass, fat, neck, bone, fan and fillet muscle, second muscle and ground meat weights were obtained at slaughter (Anonymous, 1993).

Results were statistically analyzed using Analysis of Variance (ANOVA) procedure of SAS (1991). Data were analyzed separately for each age. No significant interactions for the variables sex, protein, or energy occurred. As a result, data were pooled and analyzed based on level of protein for the entire experimental period. Where P levels of less than 0.05 occurred,

Table 1: Composition and calculated analysis of experimental diets

	0-176 days on test Protein Level (%)			176-273 days on test ME (kcal/kg)	
Ingredient	14	16	18	2860	3080
Ground yellow corn	55.77	51.41	45.20	55.71	61.28
Soybean meal (48%)	4.76	10.14	15.35	4.60	6.20
Wheat middlings	25.00	25.00	25.00	25.00	17.60
Alfalfa meal (17%)	6.25	5.00	5.00	6.85	5.00
Propack[1]	5.00	5.00	5.00	5.00	5.00
Poultry fat	1.00	1.39	2.44	1.00	3.11
Dicalcium phosphate (18.5% P, 24.1% Ca)	0.38	0.35	0.31	0.21	0.30
Ground limestone (38% Ca)	1.18	1.09	1.09	1.00	0.89
Sodium chloride	0.30	0.30	0.30	0.30	0.30
DL-methionine	0.06	0.02	0.01	0.03	0.02
Vitamin premix[2]	0.25	0.25	0.25	0.25	0.25
Trace mineral premix[3]	0.05	0.05	0.05	0.05	0.05
Total	100.00	100.00	100.00	100.00	100.00
Calculated Analysis					
Crude protein (%)	14.00	16.00	18.00	14.00	14.00
ME (kcal/kg)	2860.00	2860.00	2860.00	2860.00	3080.00
Crude fat (%)	4.50	4.80	5.60	4.50	6.60
Crude fiber (%)	5.10	4.90	4.90	5.20	4.40
Methionine (%)	0.32	0.32	0.32	0.28	0.28
Methionine + Cystine (%)	0.58	0.60	0.65	0.55	0.55
Lysine (%)	0.65	0.81	0.96	0.65	0.65
Calcium (%)	0.90	0.90	0.90	0.80	0.80
Non-phytate phosphorus (%)	0.35	0.35	0.35	0.32	0.32

[1]Propack contains 60% crude protein, 8.0% fat, 2,833.0 kcal/kg ME, 6.75% calcium, 3.12% phosphorus, 2.55% methionine + cystine and 3.85% lysine.

[2]Supplied per kg of diet: vitamin A, 11,025 IU; vitamin D_3, 3,308 ICU; vitamin E, 33 IU; vitamin K, 1.65 mg; Thiamine, 2.2 mg; Riboflavin, 5.5 mg; niacin, 44.1 mg; pyridoxine, 4.4 mg; pantothenic acid, 11.03 mg; folic acid, 2.2 mg; choline, 551 mg; vitamin B_{12}, 16.54 ug; biotin, 110.25 ug; ascorbic acid, 110.3 mg.

[3]Supplied per kg of diet: Fe, 77.18 mg; Cu, 6.62 mg; Zn, 66.20 mg; Mn, 55.13 mg; I, 0.33 mg; Co, 22.1 ug; Se, 300 ug.

means were separated using Tukey's Studentized Range Test.

Results and Discussion

Final body weight for birds receiving the 14% diet were lower ($P<0.05$) as compared to the 16% diet, with the 18% diet being intermediate ($P>0.05$) (Table 2). Body weight gain ($P>0.05$) was lowest for birds fed the 14% diet (25.09 kg) versus the 16 and 18% protein diet, which were 26.59 and 26.05 kg, respectively. Cumulative feed efficiency (feed:gain) for birds fed 14, 16, or 18% protein was 7.75, 7.63 and 7.36, respectively ($P>0.05$) for the 248 d test period. Total feed consumption per bird for the 248 d test period was 194.5, 203.0 and 191.6 kg for the 14, 16 and 18% protein diets, respectively. As compared to the 18% protein diet, feed efficiency from a performance perspective was 3.5 and 5.0% less for birds fed the 16 and 14% protein diets, respectively. Results indicate that the 14% protein diet failed to support maximum growth. However, evidence indicates that the birds fed the 14% protein diet exhibited compensatory growth as indicated by the greatest body weight gain (4.44 kg) during the 135 - 176 d period.

Carcass weights and yields were unaffected by treatment (Table 3). Carcass weights for females were greater ($P<0.05$) than for males (23.17 vs. 21.57 kg). There were no significant differences in yield of fat and meat between males and females; however, numerically females tended to have a higher yield. Average amounts of fat, bone, neck, fan and fillet muscles, second muscles and ground meat as a percentage of carcass yield remained unaffected by treatment and averaged 18.9, 18.2, 3.8, 4.2, 18.8 and 27.5%, respectively. Although, part yields were not significantly increased due to dietary protein level, a high degree of individual variation between birds may have contributed to the lack

Table 2: Body weight gain, feed consumption and feed efficiency for emu fed varying levels of protein[1]

Measurement	Dietary protein level (%)	Day of experimental period 15[2]	30	43	79	108	135	176	248
Body weight (kg)[3]	14	12.04	13.77	15.03	18.24	21.77	24.04[a]	28.37	35.23[a]
	16	12.56	14.42	16.06	19.82	23.72	26.42[b]	30.52	38.08[b]
	18	12.34	14.25	15.88	19.65	23.11	25.85[ab]	29.12	36.29[ab]
	SEM[4]	0.565	0.544	0.552	0.599	0.618	0.667	0.682	0.814
Body weight gain (kg) for period									
	14	1.95	1.73	1.27[a]	3.21	3.36	2.27	4.44	6.86
	16	2.06	1.86	1.64[b]	3.76	3.54	2.70	3.67	7.36
	18	2.11	1.91	1.62[b]	3.77	3.46	2.75	3.26	7.17
	SEM	0.074	0.092	0.076	0.197	0.168	0.161	0.375	0.404
Feed consumption (kg)[5] for period									
	14	5.48	7.98	6.90	17.40	23.08	18.75	33.14	81.81
	16	6.07	8.45	7.86	18.64	22.86	21.41	36.74	80.95
	18	5.86	8.48	7.17	17.99	22.61	18.10	33.16	78.25
	SEM	0.226	0.236	0.131	0.324	0.995	0.724	2.618	2.011
Cumulative feed efficiency (Feed:Gain)									
	14	2.81	3.66	4.11	4.63	5.28	5.77	6.18	7.75
	16	2.95	3.70	4.03	4.40	4.97	5.48	6.34	7.63
	18	2.78	3.57	3.81	4.20	4.83	5.14	6.00	7.36
	SEM	0.074	0.135	0.280	0.390	0.562	0.446	1.075	0.732

[1]Seventy-two emu (mean age 107 d) were randomly distributed among six pens (4.2 x 24.2 m) with 12 birds/pen. Two pens each were fed either a 14, 16, or 18% protein (2860 kcal/kg ME) corn-soybean meal diet from 0 - 176d on test. From 176 - 273d on test, a 14% protein finisher diet containing either 2860 kcal/kg or 3080 kcal/kg was fed to each of two pens fed the same protein level prior to day 176. Body weights were obtained at 0, 15, 30, 43, 79, 108, 135, 176 and 248d on test for each bird.

[2]Different superscripts in a column are significantly different ($P<0.05$).

[3]Initial body weights at the initiation of the test period were 10.08, 10.49 and 10.23 kgs (SEM = 0.561), respectively, for birds assigned the 14, 16 and 18% diet.

[4]Standard Error of the Mean. [5]Value represents an average of two pens.

Table 3: Carcass yield characteristics of emu fed varying levels of protein

Measurement[1]		Dietary protein level (%) 14	16	18	Average	SEM[2]
Carcass	(kg)	22.37	23.29	21.45	22.37	0.693
Fat	(kg)	4.03	4.79	3.84	4.22	0.365
	(%)	18.05	20.75	17.91	18.90	0.758
Neck	(kg)	0.80	0.88	0.85	0.84	0.034
	(%)	3.58	3.81	3.95	3.78	0.555
Bone	(kg)	4.10	3.99	4.08	4.05	0.111
	(%)	18.42	17.20	19.04	18.22	0.233
Fan and fillet muscle	(kg)	1.86	2.04	1.84	1.91	0.071
	(%)	8.33	8.75	8.60	8.56	0.097
Second muscle	(kg)	4.11	4.36	4.12	4.20	0.222
	(%)	18.46	18.49	19.21	18.84	0.436
Ground muscle	(kg)	6.11	6.48	5.84	6.14	0.275
	(%)	27.30	27.97	27.22	27.50	0.484
By sex		Male	Female	Average	SEM	
Carcass	(kg)[3]	21.57[a]	23.17[b]	22.37	0.550	
Fat	(kg)	4.10	4.34	4.22	0.311	
	(%)	19.00	18.81	18.90	1.385	
Neck	(kg)	0.84	0.84	0.84	0.028	
	(%)	3.89	3.67	3.78	0.102	
Bone	(kg)	3.97	4.14	4.05	0.090	
	(%)	18.49	17.95	18.22	0.453	
Fan and fillet muscle	(kg)	1.85	1.98	1.91	0.059	
	(%)	8.59	8.59	8.56	0.118	
Second muscle	(kg)	4.03	4.37	4.20	0.175	
	(%)	18.76	18.91	18.84	0.776	
Ground muscle	(kg)	6.02	6.26	6.14	0.229	
	(%)	27.96	27.04	27.50	0.852	

[1]Values represent an average of ten birds. [2]Standard Error of the Mean.

[3]Different superscripts in a row are significantly different ($P<0.05$).

of detection of statistical differences between dietary treatments or sex of the bird.

Nutrient recommendations presented here are meager, but provide some insight into developing nutritional recommendations for the emu of the future. Results indicate that a 14% protein diet may be marginal in supporting optimal growth or carcass yield of emu.

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