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The effect of dietary energy and protein (amino acid) concentration on the performance of slaughter ostriches

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Abstract

A study was conducted to determine the effect of dietary energy and protein concentrations in a 3 x 5 factorial experimental design on the performance of growing and finishing ostriches. Energy concentrations amounted to 8.5, 10.5 and 12.5 MJ ME/kg feed during the grower phase and 7.5, 9.5 and 11.5 MJ ME/kg feed during the finisher phase. Protein concentrations were respectively 115, 135, 155, 175 and 195 g CP/kg feed during the grower phase and 80, 100, 120, 140 and 160 g CP/kg feed during the finisher phase. Lysine concentrations were respectively 5.8, 6.8, 7.8, 8.8 and 9.8, as well as 3.3, 4.1, 5.0, 5.8 and 6.6 g lysine/kg feed. The experiment was performed with 30 groups of ostriches of seven birds per group. Data were collected for both the grower (*ca.* 40 – 65 kg) and finisher (*ca.* 65 – 95 kg) phases. Feed intake increased with a reduction in dietary energy concentrations during both the grower and finisher phases. During the finisher phase, feed intake decreased linearly with an increase in protein concentrations. Feed conversion ratio deteriorated as both dietary energy and protein concentrations decreased.

Keywords: Growth, feed conversion, voluntary intake, nutrition, production
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Introduction

Feed cost normally contributes between 75 and 80% of the total costs of an intensive ostrich production unit (Brand *et al.*, 2003). It is therefore the most important cost item and the lowering of feed costs will have a major impact on the profitability of a commercial ostrich production unit (Farrel *et al.*, 2000). There seems to be consensus amongst nutritionists that information on ostrich nutrition is still lacking compared to other domesticated farm animals (O'Malley, 1995; Ulrey & Allen, 1996; Janssens *et al.*, 1997; Farrel *et al.*, 2000). It is well known that the Ostrich Industry went through a stage of rapid expansion during the mid 1990's. At this stage, breeding stock achieved exorbitant prices and the prices of ostrich products were correspondingly relatively high. The Industry could afford very expensive diets at that stage, and feed formulators and manufacturers used generous specifications based on chicken (Farrel *et al.*, 2000) or turkey (Ulrey & Allen, 1996) requirements. According to O'Malley (1995) most diets for ostriches have been formulated on limited data or by the extrapolation of values determined for poultry. This has resulted in the development of diets which have been in excess of the true nutritional requirements of ostriches. Janssens *et al.* (1997) for example pointed out the European recommendations concerning dietary protein concentrations varied from 146 – 229 g/kg for starter diets, 150 – 218 g/kg for grower diets, 120 – 178 g/kg for maintenance diets and 140 – 220 g/kg for breeder diets. Recommendations for the energy concentrations of commercial ostrich diets also varied between 7.9 MJ ME and 10.6 MJ ME/kg dry matter (DM).

Additional reliable scientific information on ostrich nutrition is therefore evidently needed. The economic importance of nutrition in commercial ostrich production as well as the importance of the ostrich industry to the South African economy is also recognized. This experiment was therefore performed to determine the effect of different dietary energy and protein (with specific amino acid profiles) concentrations on the voluntary intake, growth performance and feed conversion of groups of ostriches during both the grower and finisher phases.

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Materials and Methods

Fifteen feeds differing in energy and protein concentration were fed to 30 groups of seven ostriches each in a 3 x 5 factorial experimental design during the grower (45 – 64.5 kg) and finisher (64.5 – 98.2 kg) phases. The three dietary energy concentrations were respectively 8.5, 10.5 and 12.5 MJ ME/kg feed during the grower phase and 7.5, 9.5 and 11.5 MJ ME/kg feed during the finisher phase. Dietary protein concentrations were 115, 135, 155, 175 and 195 g/kg feed during the grower phase and 80, 100, 120, 140 and 160 g/kg feed during the finisher phase. Lysine concentrations were respectively 5.8, 6.8, 7.8, 8.8 and 9.8, as well as 3.3, 4.1, 5.0, 5.8 and 6.6 g lysine/kg feed during the two phases. Birds were slaughtered at approximately 12 months of age. Group means pertaining to voluntary intake, daily growth and feed conversion ratio were determined prior to slaughter, and used in the statistical analyses. Data were analysed statistically with multifactor analysis of variance with the three dietary energy concentrations and the five dietary protein concentrations as main effects (Snedecor & Cochran, 1980). Trends in production parameters that could be attributed to energy or protein concentrations were described by polynomial regressions.

Results and Discussion

No significant interaction between dietary energy and protein concentrations were found for any of the variables studied ($P > 0.05$). Results to demonstrate the effect of dietary energy and dietary protein concentrations on the production of ostriches during the growing and finishing phases are presented in Tables 1 and 2 respectively.

Table 1 The effect of dietary energy level on the production of growing (*ca.* 45 – 65 kg) and finishing (*ca.* 65 – 95 kg) ostriches

Growing phase	Dietary energy concentrations (MJ ME/kg feed)			s.e.
	8.5	10.5	12.5	
Intake (kg/day)	1.87[a]	1.64[b]	1.37[c]	0.08
Growth rate (g/day)	301.7[a]	326.9[a,b]	355.3[b]	14.52
Feed conversion ratio (g feed/g gain)	6.2[a]	5.0[b]	3.9[c]	0.21
Finishing phase	**Dietary energy concentrations (MJ ME/kg feed)**			**s.e.**
	7.5	9.5	11.5	
Intake (kg/day)	3.83[a]	3.31[b]	2.79[c]	0.04
Growth rate (g/day)	206.6[a]	251.1[b]	254.7[b]	7.95
Feed conversion ratio (g feed/ g gain)	18.7[a]	13.7[b]	11.7[c]	0.47

[a,b,c] Denote significant differences within rows ($P < 0.05$).

Table 2 The effect of dietary protein and amino acid level on the production of growing (*ca.* 45 – 65 kg) and finishing (*ca.* 65 – 95 kg) ostriches

Growing phase	Dietary protein (lysine) concentrations (g/kg feed)					s.e.
	115 (5.8)	135 (6.8)	155 (7.8)	175 (8.8)	195 (9.8)	
Intake (kg/day)	1.61	1.63	1.62	1.61	1.68	0.10
Growth rate (g/day)	309.1	325.0	349.6	326.6	329.4	18.74
Feed conversion ratio (g feed/g gain)	5.25	5.04	4.79	5.09	5.15	0.27
Finishing phase	**Dietary protein (lysine) concentrations (g/kg feed)**					**s.e.**
	80 (3.3)	100 (4.1)	120 (5.0)	140 (5.8)	160 (6.6)	
Intake (kg/day)	3.45[a]	3.36[ab]	3.32[abc]	3.20[bc]	3.20[c]	0.05
Growth rate (g/day)	228.6	236.1	243.7	240.6	243.7	10.27
Feed conversion ratio (g feed/g gain)	15.4	14.6	14.3	13.6	13.6	0.60

[a,b,c] Denote significant differences within rows ($P < 0.05$)

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Feed intake increased significantly ($P < 0.05$) with a reduction in dietary energy concentrations, both during the grower and finisher phases. This increased intake was accompanied by a significant increase in the quantity of feed consumed per kg weight gain ($P < 0.05$). Growth rate was significantly lower at the lowest dietary energy level compared to the two higher energy levels during both the grower and finisher phases ($P < 0.05$).

Most of the performance parameters measured during both the grower and finisher phases were unaffected by the dietary protein concentrations used in this study. However, during the finisher phase, feed intake and FCR decreased significantly linearly at rates of -33 (± 4.8) g and -0.23 (± 0.037) g/g with each increment increase in dietary protein percentage. Results obtained in this study support previous studies by Brand *et al.* (2000). The latter study reported that dietary energy concentrations of respectively 9.0; 10.5 and 12.0 MJ ME/kg feed, fed to grower/finisher ostriches from four up to 11 months of age (25 – 89 kg), resulted in significant differences in feed intake (respectively 2.90, 2.63 and 2.41 kg/d) and feed conversion ratio (respectively 8.81, 7.45 and 6.79 kg feed/kg weight gain). Feed utilization (in terms of voluntary intake, growth rate and feed conversion ratio) was similarly unaffected by dietary protein concentrations of respectively 130, 150 and 170 g/kg feed ($P > 0.05$; Brand *et al*., 2000).

Conclusions

Food intake and feed conversion ratio were both significantly linearly influenced by the energy and the protein concentrations of the feed, although protein concentrations had a significant effect only in the finisher phase. Body weight gain was linearly improved with increased dietary energy concentrations, while it was unaffected by dietary protein concentrations. Such responses are invaluable when optimising the feeding programme of growing animals (Gous, 2000). It is also useful when evaluating simulation models such as those being in the process of development by the authors for growing ostriches.

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