British Poultry Science (1992) **33**: 683–687

SHORT COMMUNICATION

EFFECTS OF DIFFERENT COPRA MEALS AND AMINO ACID SUPPLEMENTATION ON BROILER CHICK GROWTH

S. PANIGRAHI

Natural Resources Institute, Central Avenue, Chatham Maritime, Kent ME4 4TB, England

Received for publication 21st August 1991

Abstract 1. The effects of including copra meals from different sources in nutritionally-balanced broiler chick diets were compared. A meal screw press-expelled twice to contain 75 g residual lipid/kg produced a lower growth rate than a meal pressed once to contain 220 g lipid/kg.

2. Chicks fed copra meal at 400 g/kg diet had a higher growth rate on a diet formulated to contain 12·4 g lysine/kg and 8·3 g methionine+cystine/kg than on a diet containing 13·5 and 9·0 g/kg of the respective amino acids; however, in a second experiment performance of chicks was unaffected when the low amino acid, low-oil copra meal-based diet was supplemented with synthetic amino acids.

INTRODUCTION

The utilisation of copra meal by broiler chicks is limited by its food intake-restricting properties, including its nutrient density and high water absorbing capacity relative to the limited gut volume of young chicks (Panigrahi *et al.*, 1987; Panigrahi, 1991). Several experiments have, however, shown that copra meal can be included at concentrations of up to 400 g/kg diet without depressing growth (Thomas and Scott, 1962; Nagura, 1964). Despite these reports, compounders in developing countries have generally been reluctant to incorporate copra meal at high concentrations into poultry diets because commercial feeding trials have yielded variable results (Watson and Bennett, 1992).

The low lysine and sulphur-containing amino acid contents of copra (Creswell and Brooks, 1971) have necessitated supplementation of copra-based diets with these amino acids for optimal production (Momongan *et al.*, 1964). An important related factor in developing countries might be the widespread use of screw-press oil expellers which generate high temperatures that could reduce the bioavailability of the amino acids in the resultant meal.

The present study was undertaken to examine (a) whether copra meals from different sources vary in nutritive value, and (b) whether chick performance could be improved by supplementing copra-based diets with lysine and methionine.

MATERIALS AND METHODS

Two copra meals of different residual oil content were compared. The low-oil copra (obtained from BOCM, UK Ltd), was processed by double (low and high pressure) screw-press expelling, and contained 75 g lipid/kg; the high-oil copra meal was produced at this Institute by a single press (moderate pressure) in a Simon Rosedown Mini-40 screw-press expeller, and contained 220 g lipid/kg (high-oil copra). The compositions of the low- and high-oil copra meals (g/kg), respectively, were: moisture 104·3, 60·0; crude protein 205·0, 162·0; crude fat 75·0, 220·0; crude fibre 104·6, 118·0; ash 51·9, 52·0; calcium 0·7, 0·9; phosphorus 4·9; 4·4. The lysine and methionine+cystine contents of high-oil copra were 6·8 and 7·1 g/kg respectively. For effective comparison, coconut oil was added to the low-oil copra to make its nutritional composition similar to that of high-oil copra.

In experiment 1, broiler chicks were fed on diets containing 400 g/kg low- or high-oil copra in a 2×2 factorial design, that also examined the effects of amino acid supplementation. Two basal diets were formulated, one containing 12·4 and 8·3 g/kg of lysine and methionine+cystine, and the other 13·5 and 9·0 g/kg of these amino acids, respectively. The compositions of the diets are shown in Table 1. In experiment 2, the relationships between low-oil copra and dietary lysine and methionine were examined by supplementing the low amino acid basal diet of experiment 1 with 1·25 g methionine/kg and/or 1·66 g lysine/kg, to produce the following 4 diets: 12·4 lysine, 8·3 methionine+cystine (low lysine and sulphur-containing amino acids), 12·4 lysine, 9·5 methionine+cystine (low lysine and high sulphur-containing amino acids), 13·5 lysine, 8·3 methionine+cystine (high lysine and low sulphur-containing amino acids) and 12·4 lysine, 0·95 methionine+cystine (high lysine and sulphur-containing amino acids).

In each experiment, diets were fed for 3 weeks to 24, 1-day-old, Ross-1 broiler chicks, housed as groups of 6 (3 of each sex), in wire cages (4 replicates per treatment). The temperature of the room was maintained in accordance with that recommended by Ross Poultry. The food intakes and weights gained by the chicks were recorded. In experiment 1, dry matter (DM) retention was determined between 14 and 17 d as follows: DM retention=[DM intake−DM voided]/DM intake; excreta samples were oven-dried at 60°C. Diets and excreta were analysed for gross energy content using a Gallenkamp adiabatic oxygen bomb calorimeter, and for nitrogen content using a Kjeltec 1030 analyser. From the balance studies, the apparent metabolisable energy (AME) values and nitrogen retentions of the diets were calculated.

Experimental data were treated to factorial analysis of variance using the ANOVA programme of SPSS (1988).

RESULTS AND DISCUSSION

In experiment 1, the high-oil copra produced a significantly higher growth rate and efficiency of food utilisation than the low-oil copra (Table 2); nitrogen retention and AME were also slightly higher ($P=0{\cdot}089$) among birds fed on the

TABLE 1

Composition of the diets (g/kg)

Constituents	High amino acids	Low amino acids
Copra meal	400·00	400·00
Meat-and-bone meal	19·09	40·00
Soyabean meal	300·00	268·75
Maize	207·00	194·73
Wheatfeed	42·07	74·19
Dicalcium phosphate	15·65	9·92
Limestone	6·73	5·05
Vitamin/Mineral premix[1]	3·00	3·00
Salt	0·68	0·62
Lysine hydrochloride[2]	1·14	0·12
Methionine[3]	0·88	0·25
Maize oil	3·76	3·37
Calculated analyses:		
Moisture	96·3	93·7
ME (MJ/kg)	12·66	12·66
Crude protein	235·0	235·0
Crude fibre	71·5	73·5
Crude fat	109·1	110·0
Calcium	10·0	10·0
Phosphorus	7·5	7·5
Lysine	13·5	12·4
Methionine+cystine	9·0	8·3

Notes: [1] The vitamin premix provided the following nutrients per kg diet: retinol, 3·44 mg; cholecalciferol, 62·5 mg; α-tocopherol, 10 mg; menadione, 2·0 mg; thiamine, 0·50 mg; riboflavin, 6·00 mg; nicotinic acid, 2·0 g; pyridoxine, 0·1 g; pantothenic acid, 1·0 g; biotin, 8 mg; folic acid, 0·1 g; cyanocobalamin, 0·5 mg. Choline chloride was added at 1 g/kg. The mineral premix provided the following nutrients per kg diet: manganese, 80·01 mg; zinc, 60 mg; copper, 0·5 g; selenium, 10 mg; iodine, 0·1 g.

[2] Containing 78% by weight of lysine.

[3] Containing 98% by weight of methionine.

high-oil copra diet. These results demonstrate that copra meals from different sources can vary in nutritive value. The observed difference in chick performance may be a result of lower protein and energy digestibilities of the low-oil copra arising from processing, varietal or agronomic factors.

In experiment 1, the copra-based diets, formulated to contain lower concentrations of lysine and the sulphur-containing amino acids, produced higher food intakes and growth rates, with no significant interactions taking place between copra type and diet formula (Table 2). Although there were minor differences in the raw material compositions of the basal diets, the energy balance data indicate that energy deficit was not the cause of the lower growth rates of chicks in the high amino acid groups. However, in experiment 2, where the nature of any copra × amino acid interaction was explored by supplementing the low-oil copra-based diet with amino acids, the results were non-significant and inconclusive (Table 3).

These experimental results highlight the need for further research on copra meal to establish what factors affect broiler chick performance when the meal is included in the diet at high concentrations.

Table 2

Performance of chicks in experiment 1

	Low-oil copra		High-oil copra		Standard error of means	Main effects and interactions (P=)		
	Low amino acids	High amino acids	Low amino acids	High amino acids		copra	amino acids	copra × amino acids
Initial body weight (g)	35	35	35	35	0·2			
Weight gain (g)	441	386	486	441	11·0	0·001	0·001	0·660
Food intake (g)	737	680	772	712	21·2	0·139	0·016	0·947
Efficiency of food utilisation[1]	0·60	0·57	0·63	0·62	0·005	0·0001	0·003	0·083
Water intake: food intake (ml/g)	3·78	3·83	3·59	3·72	0·064	0·041	0·188	0·576
Dry matter retention	0·54	0·53	0·54	0·55	0·007	0·271	0·788	0·210
Nitrogen retention	0·54	0·52	0·55	0·56	0·012	0·089	0·730	0·418
AME (MJ/kg DM)	12·51	2·23	2·56	12·63	0·121	0·089	0·397	0·171

[1] ratio of weight gain: food intake.

Table 3

Performance of chicks in experiment 2

	Low lysine Low mc[1]	Low lysine High mc	High lysine Low mc	High lysine High mc	Standard error of means	Main effects and interactions (P=)		
						lysine	mc	lysine × mc
Initial body weight (g)	38	38	38	39	0·2			
Weight gain (g)	442	434	427	423	22·6	0·582	0·780	0·937
Food intake (g)	735	691	681	693	29·6	0·398	0·599	0·357
Efficiency of food utilisation[2]	0·60	0·63	0·63	0·61	0·01	0·626	0·603	0·045

[1] Methionine + cystine.
[2] Ratio of weight gain: food intake.

REFERENCES

CRESWELL, D.C. & BROOKS, C.C. (1971) Composition, apparent digestibility and energy evaluation of coconut oil and coconut meal. *Journal of Animal Science*, **33**: 366–369.

MOMONGAN, V.G., CASTILLO, L.S., GATAPIA, A.R. & RESURRECCION, R.S. (1964) High levels of copra meal in poultry and livestock rations. I. Methionine and lysine supplementation in broiler rations. *The Philippine Agriculturalist*, **48**: 163–180.

NAGURA, D. (1964) The use of coconut oil meal in chick diets. *Ceylon Veterinary Journal*, **12**: 40–42.

PANIGRAHI, S., MACHIN, D.H., PARR, W.H. & BAINTON, J. (1987) Responses of broiler chicks to dietary copra cake of high lipid content. *British Poultry Science*, **28**: 589–600.

PANIGRAHI, S. (1991) Metabolizable energy (ME) value of high residual lipid copra meal in formulating broiler chick diets. *Tropical Science*, **31**: 141–145.

SPSS (1988) *SPSS/PC+V20 Base Manual for IBM PC/XT/AT and PS2* (SPSS Inc., 444 North Michigan Avenue, Chicago, Illinois 60611, USA).

THOMAS, O.A. & SCOTT, M.L. (1962) Coconut oil meal as a protein supplement in practical poultry diets. *Poultry Science*, **41**: 477–485.

WATSON, I.G. & BENNETT, C.J. (1992) The market for non-ruminant feedstuffs and meat in the Phillipines. *Feed International* (in press).