INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
1560–8530/2000/02–4–346–347

Use of Cotton Seed Meal in Broiler Rations Formulated on the Basis of Total Versus Digestible Amino Acids Starter Phase

M.F. KHALID, M.Z. ALAM, F. AHMAD AND S. MAHMOOD
Departments of Animal Nutrition and Poultry Husbandry, University of Agriculture, Faisalabad-38040, Pakistan

ABSTRACT

The efficacy of ration formulated on the basis of total versus digestible amino acid containing 10 and 15% of cotton seed meal was evaluated in broiler chicks. Average total weight gain per chick fed on rations formulated on the basis of 10% total amino acids, 15% total amino acids, 10% digestible amino acids and 15% digestible amino acids, were 821, 900 and 1417 g; and average FCR were noted to be 1.76, 1.86, 1.57 and 1.58, respectively. The results of the study indicated that birds showed best performance on the rations formulated on the basis of digestible amino acids irrespective of levels of cotton seed meal used.

Key Words: Cotton seed meal; Broiler; Digestible amino acids

INTRODUCTION

Cotton seed meal (CSM) has been suggested as an attractive protein source for animal feeds. CSM is the lowest cost protein supplement in some regions. However, it has limitations like some anti-nutritional factors like gossypol, cyclopropane fatty acids and its low amino acid digestibility and deficient in lysine due to the binding of its epsilon amino group with gossypol during processing (Anderson & Watrnick, 1966; Phelps, 1966). The present study was planned to evaluate the comparative efficacy of broiler rations (0-4 weeks i.e. starter phase) formulated on the basis of total vs digestible amino acids and to determine the appropriate level of cotton seed meal in the broiler rations formulated on the basis of digestible amino acids.

MATERIALS AND METHODS

The experiment was conducted at Animal Nutrition Research Center, University of Agriculture, Faisalabad. Four rations A, B, C and D (Table I) containing two levels of CSM i.e. (10 and 15%) formulated on the basis of total (TAA) vs digestible amino acids (DAA) were fed to chicks. Nutrient composition of the rations is shown in Table II. The computer package used for the formulation of broiler starter rations was users friendly feed formulation program (Gene *et al.*, 1986). A performance trial using 120 day-old Hubbard broiler chicks were conducted for a period of four weeks. These chicks were randomly divided into 12 experimental units of 10 chicks each. The experimental units were allotted at random to these four rations, such that each ration was fed to three experimental units.

Table I. Composition of rations (%)

Ingredients	A*	B*	C**	D**
Corn	50.00	50.00	50.00	39.74
Wheat	0.00	0.00	3.92	12.42
Rice polishing	5.54	4.09	0.00	0.00
Fish meal	7.00	7.00	7.00	5.00
Poultry byproduct meal	5.00	5.00	5.00	4.40
Rapeseed meal	5.00	5.00	5.00	3.14
Soybean meal	6.53	2.81	10.87	10.07
Corn gluten meal (60%)	4.73	4.25	1.67	2.06
Cottonseed meal	10.00	15.00	10.00	15.00
Soya oil	1.42	2.02	1.67	2.78
Limestone	0.93	0.97	0.96	1.06
Dicalcium phosphate	0.78	0.72	0.82	1.11
Salt	0.32	0.33	0.33	0.34
Molasses	2.00	2.00	2.00	2.00
Lysine	0.16	0.21	0.14	0.23
Methionine	0.09	0.09	0.13	0.15
Vit-min premix	0.50	0.50	0.50	0.50
Total	100.00	100.00	100.00	100.00

Table II. Nutrients composition of rations

Ingredients	A*	B*	C**	D**
	Metabolizable energy (3000 Kcal/kg)			
Crude protein (%)	23.00	23.00	23.00	23.00
Crude fibre (%)	5.26	5.50	4.50	5.20
Available phosphorus (%)	0.45	0.45	0.45	0.45
Calcium (%)	1.00	1.00	1.00	1.00
Sodium (%)	0.20	0.20	0.20	0.20
Lysine (%)	1.15	1.15	0.97	0.97
Methionine (%)	0.53	0.53	0.49	0.49
Cystine (%)	0.50	0.50	0.28	0.28
Threonine (%)	0.84	0.82	0.67	0.64
Tryptophan (%)	0.22	0.22	0.19	0.19
Arginine (%)	1.47	1.53	1.35	1.42
Glycine (%)	1.11	1.10	0.86	0.80
Serine (%)	1.16	1.14	0.93	0.92
Histidine (%)	0.54	0.54	0.47	0.47
Iso-leucine (%)	0.93	0.90	0.79	0.76
Leucine (%)	2.06	1.99	1.68	1.62
Phenylalanine (%)	1.09	1.08	0.94	0.94
Tyrosine (%)	0.79	0.76	0.66	0.64
Valine (%)	1.14	1.13	0.92	0.91

*= Total amino acid basis; **= Digestible amino acid basis

The data on weight gain and feed consumption were recorded on weekly basis and feed conversion ration was calculated out. The data thus collected were

subjected to statistical analysis using analysis of variance technique and the treatment means were compared using DMR Test (Steel & Torrie, 1980)

RESULTS AND DISCUSSION

Weight gain. The results are presented in Table III.

Table III. Performance of broiler chicks fed on different experimental rations

Description	RATIONS			
	A*	B*	C**	D**
AIW / chick (g)	50	48	49	50
AWG / chick (g)	821b	753c	900a	891a
TFC / chick (g)	1448	1399	1416	1411
FCR	1.76	1.86	1.57	1.58

*= Total amino acid basis; **= Digestible amino acid basis; AIW= Average Initial weight; AWG= Average weight gain; TFC= Total feed consumption; FCR= Feed conversion ratio

The higher levels of CSM exerted significantly depressing effect on weight gain of chicks reared on TAA (i.e. A and B). The difference between rations formulated on DAA basis was non-significant (i.e. C and D). However, significant differences ($P<0.01$) were found when TAA and DAA based rations were compared. Birds fed on DAA based rations gained more weight as compared to birds fed on rations formulated on the basis of TAA. These results confirmed the findings of Rostagno and Pupa (1995) who found a depressed weight gain when ration was formulated on the basis of TAA compared to DAA based rations. Similarly, Sergio *et al.* (1995) found that soybean meal was successfully replaced by CSM when the diet was formulated on the basis of DAA. The results of this study also support those of Dalibard and Kiener (1993). They replaced soybean meal with rapeseed meal with only 11% reduction in weigh gain when rations were formulated on DAA basis, but when rations were formulated on TAA, the growth performance of birds was reduced upto 28%.

The results of the present study are also in accordance with those of Shahid (1997) who used various levels of crude protein and the rations were formulated on TAA and DAA basis. They observed better weight gain in chicks fed on rations formulated on DAA basis.

Feed consumption. The chicks fed on different experimental rations A, B, C and D, showed feed consumption of 1448, 1399, and 1411g, respectively (Table III). There were non-significant differences in feed consumption amongst chicks fed on different experimental rations which differed from each other on the basis of various levels of CSM. Similar results were also reported by Rostagno and Pupa (1995) and Sergio *et al.* (1995).

Feed conversion ratio. Feed conversion ratios (FCR) for rations A, B, C and D were 1.76, 1.86, 1.57 and 1.58, respectively (Table III). Non-significant differences among the FCR values on various levels of CSM but a significant difference ($P<0.05$) on TAA and DAA based ration was observed. It was found that significantly greater feed was consumed by chicks fed on ration B (10% CSM and formulated on TAA) to produce a unit weight gain as compared to chicks fed on rations A, C and D. Significantly lesser feed was consumed by chicks fed on ration C (10% CSM and formulated on DAA basis) to produce one unit weight gain, when compared with A, B and D rations. Similar findings have been reported by Rostagno and Pupa (1995), Sergio *et al.* (1995) and Shahid (1997).

CONCLUSION

Poultry rations should be formulated on the basis of DAA content of the feed ingredients to reduce the adverse effects of CSM.

REFERENCES

Anderson, J.O. and R.E. Warnick, 1966. Sequence in which essential amino acids become limiting for growth of chicks fed rations containing cotton seed meal. *Poult. Sci.,* 45: 84–9.

Dalibared, P. and T. Kiener, 1993. Determination of amino acids digestibility for poultry. *Tech. Bull. American Soybean Association,* 518/12/92.

Fernandez, S.R., Y. Zhang and C.M Parsons, 1994. Effect of overheating on the nutritional quality of cotton seed meal. *Poult. Sci.,* 73: 157–93.

Gene, M.P., B.R. Miller and R. Chamber, 1986. Users friendly feed formulation program. Univ. of Georgia. USA.

Phelps, R.A., 1996. Cotton seed meal for poultry. From research to practical application. *Wrld. Poult. Sci. J.,* 22: 86–112.

Rostagno, H.S. and J.M.R. Pupa, 1995. Diet formulation for broilers based on total vs. digestible amino acids. *J. Appl. Poult. Res.,* 4: 293–9.

Sergio, R.F., Y. Zhang and C.M. Persons, 1995. Dietary formulation with cotton seeds meal on a total amino acid versus a digestible amino acids basis. *Poult. Sci.,* 74: 1168–99.

Shahid, F., 1997. Digestible amino acids as a base for ration formulation. *M.Sc. Thesis,* University of Agriculture, Faisalabad.

Steel, R.G.D. and J.H. Torrie, 1980. *Principles and Procedures of Statistics,* 2nd Ed., McGraw Hill Book Co., Inc., New York, USA.

(Received 23 September 1999; Accepted 15 August 2000)