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Utilization of Poultry Whole Carcass Meal in Diets for Turkey Poults

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Abstract: This study was conducted on turkey poults from 0 to 56 days to assess the effect of replacement of the fish meal in diets with poultry whole carcass meal (PWCM) unit by unit. The poult performance was evaluated based on the eighth week body weight, feed conversion ratio and livability. 25, 50 and 75% of the crude protein contributed by the fishmeal in poult feed was substituted by crude protein from PWCM. The experimental rations were isonitrogenous and isocaloric. The study was conducted in cages from 0 to 56 days post hatch. Body weight and feed efficiency were determined on biweekly basis. Eighth week body weight was significantly ($P \leq 0.05$) higher in poults fed diets with 25% PWCM crude protein replacement; growth rate from 0 to 8 weeks and feed conversion ratio (FCR) were also better. In addition, the feed conversion ratio was better from 43 to 56 days. Hence, it is concluded from the present studies that the PWCM from commercial rendering plants can be utilized as a replacement of fishmeal in diets for turkey poults. Levels of PWCM replacing the crude protein from fishmeal up to 25% appear acceptable based upon eighth week body weight and feed efficiency. Higher inclusion rates generally reduced performance.

Key words: Fishmeal · Performance · Poultry whole carcass meal · Turkey poults

INTRODUCTION

Poultry sector in India is attaining steady growth when compared to other segments of meat industry. The returns from the poultry industry can still be improved by exploiting the by-products, wastes and dead birds which often go unutilized. Beyond the increasing costs concerned with the waste disposal, other factors such as environmental pollution also stress the need for the utilization of poultry industry wastes. The dead birds can successfully be converted into poultry carcass meal by rendering process. More than a means of disposal, the poultry carcass meal can serve as a highly digestible source of protein, fat and other nutrients, which can be effectively used as a feed ingredient for livestock and poultry. Though numerous studies had been carried out based on the production performance of poultry, information regarding the utilization of their inedible by-products are inadequate. The objective of the present study was to assess the effect of replacement of the fish meal in turkey poults' diets with poultry whole carcass meal (PWCM) on eighth week poult performance.

MATERIALS AND METHODS

The study was conducted at Poultry Research Station, Nandanam, with turkey poults of Nandanam I variety, which had been introduced by Tamil Nadu Veterinary and Animal Sciences University, Chennai, India, in the year 2006. The poults were obtained from the hatchery of this station. The experiment was carried out to study the effect of partial replacement of dry fish with poultry whole carcass meal in the diet of poults from 0 to 56th day. The poultry whole carcass meal (PWCM) was procured from the Department of Meat Science and Technology, Veterinary College and Research institute, Namakkal, TamilNadu.

Feed Formulation: The experimental feeds were prepared at Centralised Feed Technology Unit of this station. The control ration was formulated with yellow maize, soybean meal, dry fish, mineral mixture and dicalcium phosphate with a crude protein level of 28% (Table 1). The nutrient levels of PWCM and the other ingredients were previously analysed (Table 2). Three treatment rations

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Table 1:Composition of experimental rations

Ingredients	Control	25%	50%	75%
Yellow maize	44	44	44	44
PWCM	--	1.75	3.48	5.22
Soy bean meal	45	45	45	45
Dry fish	9.5	7.1	4.75	2.38
Mineral mixture	0.5	0.5	0.5	0.5
Calcite powder	--	0.8	0.95	1.05
Dicalcium Phosphate	1	0.4	0.65	1
Paddy Husk	--	0.45	0.67	0.85
Total	100	100	100	100
CP	28.04	28.03	28.03	28.04
ME	2804	2786	2768	2751
Lysine	1.72	1.69	1.65	1.62
Methionine	0.48	0.46	0.45	0.44
Calcium	1.27	1.26	1.26	1.26
Phosphorus	0.55	0.55	0.54	0.55
Crude Fibre	3.89	3.86	3.85	3.83

Table 2: Nutrient content of feed ingredients

Ingredients	CP (%)	ME (Kcal/ Kg)	Lys	Met	Ca	P	CF
Yellow maize	9	3366	0.22	0.18	0.03	0.085	2
PWCM	61.42	2336	3.3	1.04	3.84	1.99	0.24
Soy bean meal	44	2420	2.79	0.62	0.3	0.28	6.63
Dry fish	45	2460	3.89	1.23	8	2	0.26
Mineral mixture					28	5	
Calcite powder					36		
Dicalcium phosphate					22	17	

Table 3: Crude protein contribution of the ingredients in the diets

Ingredients	Control	25%	50%	75%
Yellow maize	3.96	3.96	3.96	3.96
PWCM	0.00	1.08	2.14	3.21
Soy bean meal	19.80	19.80	19.80	19.80
Dry Fish	4.28	3.20	2.14	1.07
Total	28.04	28.03	28.03	28.04

were formulated in which 25, 50 and 75% of the total crude protein contributed by the fish meal (4.275%) in the control feed was substituted by crude protein from PWCM (Table 3). The other ingredients' levels were unchanged. The experimental rations were isonitrogenous (28% Crude protein) and nearly isocaloric and were adjusted with calcite powder and dicalcium phosphate for nearly equal calcium and phosphorus levels. All the rations were supplemented uniformly with commercial vitamin preparations.

Experimental Design: The day-old straight run poults of Nandanam I variety were wing-banded and randomly allotted to one control and three treatment groups with three replicates each. Each replicate with ten birds was allocated in a single compartment. In the beginning of the experiment, on the first day, all the poults were individually weighed and allocated to pens so that each pen of poults had similar initial mean body weight. Subsequently, individual body weights of the poults of all the treatments were recorded on 14^{th}, 28^{th}, 42^{nd} and 56^{th} day. Feed consumption was determined biweekly from 0 day to 56^{th} day for individual pens. Mortality was checked daily. The dead birds were weighed and the weight was taken in to account to calculate feed conversion ratio (FCR).

Management: The experiment was conducted in brooder house with raised single tier cages. All the treatments were fed with their respective rations from 0-56 days. Feed and water were provided adlibitum for consumption. Light was provided 24 h daily throughout the study period. Equal floor space was provided and identical management conditions were followed for all the replicates.

Statistical Analyses: The statistical analyses were done as per the methods of Snedecor and Cochran [1]. All percentage data were transformed to arc sine prior to statistical analysis.

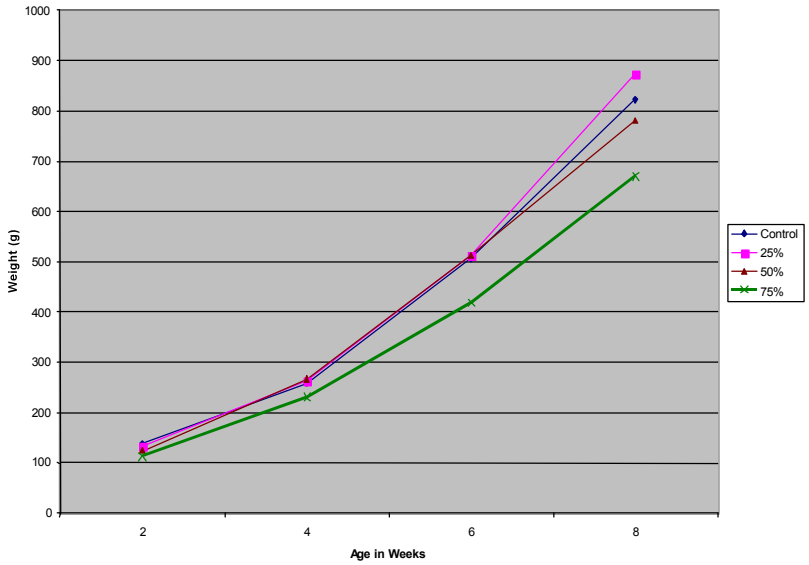

Fig. 1: Body weight in Nandanam turkey I from 0 to 56 days

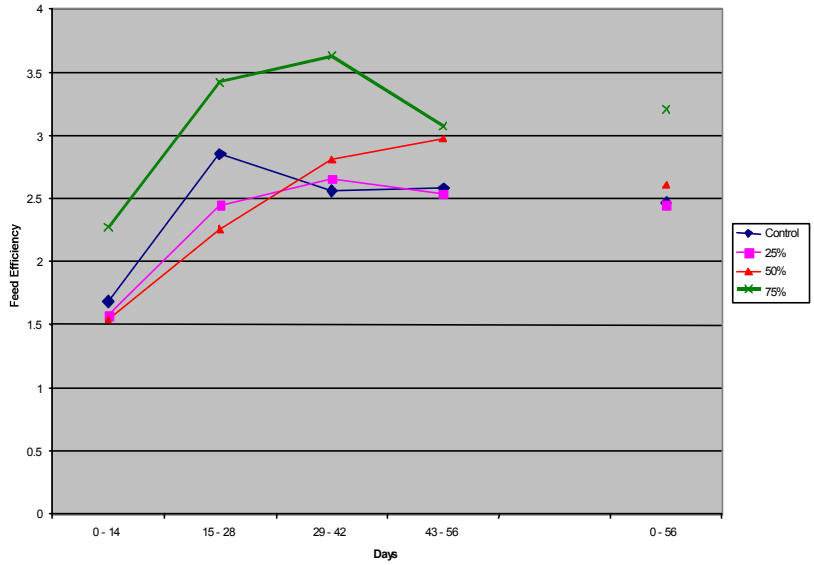

Fig. 2: Feed efficiency in Nandanam turkey I from 0 to 56 days

RESULTS

The influence of PWCM inclusion in feed was highly significant ($P \leq 0.05$) on eighth week body weight (Table 4). The overall mean bodyweight of eighth week female and pooled population of the treatment in which 25% of the fish meal protein was replaced with PWCM protein, were better than the control and the other treatments. However, as the inclusion level of PWCM increased, there was a decrease in body weight gain. The 75% replacement group had the least pooled eighth week body weight. Excluding the latter group, among the other three treatments, the growth rate was similar up to 6th week in all the three and was better in 25% replacement group from 6th to 8th week followed by the control group (Fig 1). The FCR of 50% replacement group was better than the other groups up to 28 days, after which it was poor. The overall FCR was better in 25% replacement group and control group (Table 5) (Fig. 2). The 75% replacement group was poorest in performance even from the first week and had the poorest FCR. It was higher than the other three groups. However, the total feed consumed by an individual poult from 0 to 56 days was almost comparable in all the groups. Livability did not differ among experimental treatments.

Table 4: Body weight and livability in Nandanam turkey I from 0 to 56 days

	Body Weight mean (g) (±SE)				
Treatments	2nd week**	4th week**	6th week**	8th week**	Livability (%)NS
Control	137.94a±3.41	257.78a±6.58	506.56a±13.84	823.67ab±15.24	80.00
25%	132.65ab±3.79	263.22a±10.01	512.71a±20.34	873.32a±36.11	85.00
50%	124.43b±4.06	267.33a±9.12	513.37a±18.78	781.43b±32.06	85.00
75%	112.73c±2.74	230.04b±9.67	418.72b±20.43	670.09c±29.62	75.00

* Means bearing different superscript within the column differ significantly (P=0.05)

** Means bearing different superscript within the column differ significantly (P=0.01)

NS - Not significant

Table 5: Feed conversion ratio and feed consumption in Nandanam turkey I from 0 to 56 days

	Feed conversion ratio					
	Days					
Treatment	0 - 14	15 - 28	29 - 42	43 - 56	0 - 56	Feed consumed per bird *
Control	1.69	2.85	2.56	2.58	2.46	1769.89
25%	1.58	2.45	2.66	2.54	2.45	1761.89
50%	1.54	2.26	2.81	2.98	2.61	1734.78
75%	2.27	3.42	3.63	3.08	3.21	1773.39

*Average feed consumed per bird from 0 to 56 days

DISCUSSION

Kersey and Waldroup [2] observed that levels of SHM produced in commercial rendering plants appeared acceptable in diets for broiler chickens up to 10% and higher inclusion rates generally reduced performance. Broilers fed diets with 5% SHM did not differ significantly from those fed 0% and had significantly better FCR than those fed diets with 10 or 15% SHM and therefore increasing the level of SHM in the diets for broiler chickens generally resulted in poorer FCR [2].

Few other studies are available that evaluate a commercially rendered spent hen product. Christmas *et al*. [3] utilized a SHM produced from frozen mortalities gathered during the laying cycle; this product was incorporated into broiler diets at levels of 0, 4, 8 and 12% in two experiments. In both experiments, the addition of SHM at any level resulted in body weight at 42 d that was equal or greater than obtained with control diets that contained no SHM. Douglas *et al*. [4] evaluated three SHM products produced in commercial rendering facilities. The three products were incorporated at either 7.5 or 15% on a total amino acid basis into diets for chicks fed 8 to 20 d posthatch. When substituted at 7.5%, growth of chicks was not adversely affected by two of the SHM but was depressed by the other product. At the 15% inclusion level, weight gain of all birds fed SHM was depressed as compared to that of the control group. Douglas *et al*. [4] concluded that the amino acid digestibility of SHM may need to be considered when using substantial levels of this ingredient in poultry diets. In broilers fed with spent hen meal (SHM) livability did not differ among experimental treatments [1, 5].

The present study indicated that the poultry whole carcass meal from commercial rendering facilities can be utilized in diets for turkey poults. Ration formulated in which 25% of the crude protein contributed by the fish meal in the control feed was substituted by crude protein from PWCM was found to be acceptable based upon the 8th week body weight gain and feed conversion ratio. It is obvious that PWCM is an excellent source of nutrients that are readily available for turkey poults, though cannot completely replace the protein sources of the ration. But practically, the nutrient quality, especially the amino acid digestibility which is an important factor in deciding the protein quality may differ considerably among the products from different rendering plants. Though regular and complete evaluation of the products to assess the nutrient quality is practically difficult under commercial conditions, considering the cost benefits of the PWCM, it has to be effectively utilized in turkey diets which need higher level of crude protein especially in the prebrooder and brooder period.

In conclusion, based on the results of this study and earlier reports it had been suggested that 10 to 25% of the crude protein contributed by the animal protein sources in turkey ration could be substituted by the crude proten from the poultry whole carcass meal obtained from the commercial rendering plants.

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