Effect of Feeding Chitin on Poultry

K.G.Ramachandran Nair, P.T.Mathew,
P.Madhavan and P.V.Prabhu
Central Institute of Fisheries Technology, Cochin - 682029, India.

Chitin in 0.25 and 0.5% level incorporated in a commercial poultry feed (control) was fed to broiler chicks and the weight gain was studied in comparison with control feed. The birds fed on diet containing 0.5% chitin showed significant increase in weight and decrease in feed conversion ratio. Analysis of the data showed that addition of 0.5% chitin in the commercial diet resulted in doubling the profit of the farmer. Weight gain with feed containing 0.25% chitin was not significant and also not economically beneficial compared to control. Similar studies conducted on white leghorn layers showed a drop in egg production in birds fed on diets containing 0.5% chitin compared to control diet.

The exoskelton of crustaceans, mainly shrimps and crabs, is the main commercial source of chitin, a natural carbohydrate polymer. Chitin and its derivatives have been reported to have versatile applications ranging from textiles to pharmaceuticals. In spite of these developments, commercial exploitation of this material has not been started yet. Zikakis *et al.* (1982) have reported the efficiency of chitin in the digestion of whey in broiler chicken. Ramachandran Nair *et al.* (1987) have shown the possibility of using chitin as a growth promoter in broiler chicken.

In the present study chitin in two different concentrations *viz.* 0.25 and 0.5% were incorporated in commercial broiler diet and fed to broiler chicks, and the weight gain was studied. Similarly the effect of addition of 0.5% chitin in commercial layer mash on egg production was also investigated. The results of these studies are reported in this paper.

Materials and Methods

Chitin prepared from prawn head and shell following the method of Madhavan & Ramachandran Nair (1974) was used for these studies after pulverising in an ultracentrifugal mill to a particle size of 0.5 to 1 mm. Three samples of experimental feeds were prepared incorporating chitin at the level of 0.5% (sample I) and 0.25% (sample II) in a commercial feed for broiler chicken (control I) and the third at 0.5% chitin level (sample III) in a layer mash (control II). The birds used for feeding experiments were one day old cobb broiler and 6 months old white leghorn. The experimental feeding was conducted in a local commercial polutry farm under strict supervision.

In the first two sets of experiments 600 one day old broiler chicks after having all vaccinations were brought to the farm and divided into two batches of 300 each and reared in deep litter system with lighting and drinking water facilities. In the first set one batch was fed on the commercial diet (control I) whereas the second batch was fed on the commercial diet after adding 5 g chitin/1 kg feed (sample I). Representative birds (5 male & 6 female) were weighed every week and the data on feed consumption and live weight were recorded. This procedure continued for 53 days and at the end the average dressed weight of the birds was determined. Weekly data on average weight of the birds, average feed consumption, feed efficiency ratio, average live weight, average dressed weight and wastage on dressing were deter-

mined. Data on the economic aspects of chitin added feed in comparison with the commercial diet were analysed.

In the second set of experiments, two batches of 300 birds each were subjected to similar studies with experimental feed (sample II) and commercial diet (control I). The experimental feeding continued for 8 weeks and similar data as in the previous experiments were collected.

In the third set of experiments 500 white leghorn female birds of 6 months old were divided into two batches. One batch was fed on the commercial layer mash (control II) whereas the other batch was fed with the experimental feed (sample III.) The data on egg production was collected for 27 days from the 15th day onwards.

Results and Discussion

The broiler chicks fed on diets containing 0.5% chitin (sample I) showed significant additional weight gain even from the first week in comparison with the control batch (Table 1). This trend continued till the end resulting in significant weight gain over the control ($t = 54.77$, $df = 16$, $p < 0.01$).

Table 1. *Effect of chitin at 0.5% level in the diet on the growth of broiler chicken*

Age in weeks	Weight of birds, g	
	Control I (commercial feed)	Sample I (commercial feed + 0.5% chitin)
0	40	40
1	93	100
2	150	198
3	325	380
4	550	620
5	824	900
6	1100	1255
7	1420	1490
7.5	1487	1587

Table 2. *Economics of feeding 0.5% chitin incorporated feeds to broiler chicken*

	Commercial feed (control I)	Commercial feed + 0.5% Chitin (sample 1)
Average feed consumption per bird, kg	3.786	3.714
Feed conversion	2.545	2.375
Average live weight	1.487	1.563
Average dressed weight	1.085	1.214
Average wastage	0.402	0.394
Average production cost per bird	Rs. 18.07	Rs. 18.58
Average selling cost per bird	Rs. 19.53	Rs. 21.85
Profit per bird	Rs. 1.46	Rs. 3.27
Extra profit due to chitin diet	Rs. 1.81	

In the second set of experiments (Table 3) eventhough there was slight increase in the live weight of birds fed on 0.25% chitin diet (sample II) in comparison with the control, it was not significant ($t = 1.34$, $df = 14$). Analysis of the data presented in Table 1 and 3 shows that addition of 0.5% chitin in the diet of broiler chicks gives significant weight gain while with 0.25% chitin in the diet the weight gain is not significant. Another observation was the decrease in wastage during dressing in the case of birds fed on 0.5% chitin diet. There was no difference in the general health of birds and also in the texture and flavour of the meat in all experimental birds. The data also shows decrease in feed consumption and feed efficiency ratio with 0.5% chitin (Table 2).

Analysis of the results on economic aspects (Table 2) shows that even after taking the cost of chitin into consideration, the profit has almost doubled in 0.5% chitin fed group compared to control.

Table 3. *Effect of chitin at 0.25% level in the diet on the growth of broiler chicken*

Age of birds, Weeks	Average weight of bird, g	
	Control I	Sample II (0.25% Chitin)
0	40	40
1	90	100
2	200	210
3	330	326
4	526	570
5	770	800
6	1000	1040
7	1400	1320
8	1556	1519
Average feed consumption per bird, kg	3.918	3.833
Feed conversion	2.517	2.523
Average live weight, kg	1.556	1.519
Average dressed weight, kg	1.255	1.219
Average wastage during dressing, kg	0.301	0.300

The results of the feeding experiments on white leghorn layer (Table 4) showed that egg laying in the control batch was 88.4% on the 17th day of experimental feeding (the third day of recording the egg production data) whereas it was only 46.2% in the chitin fed batch. Table 4 shows significant difference ($t = 9.70$, $df = 50$, $p < 0.01$) in the egg production between the experimental feed fed birds and the commercial feed fed birds showing that chitin in the feed of layers adversely affects egg production. The experimental feeding of layers was therefore discontinued after 27 days.

The efficiency of chitin in growth promotion can be attributed to the effect of chitin on the intestinal microflora, mainly *Lactobacillus bifidus* as reported by Spreen *et al.* (1984) and Gyorgy *et al.* (1954). The ad-

Table 4. *Effect of chitin in the diet on egg production in white leghorn layers*

Days*	No. of eggs/100 birds	
	Control II (commercial feed)	Sample III (commercial feed + 0.5% chitin)
1st	81.9	46.2
2nd	71.5	49.2
3rd	88.4	46.2
4th	82.0	55.4
5th	65.5	52.3
6th	81.9	55.4
7th	71.0	49.1
8th	65.5	46.1
9th	65.5	55.1
10th	82.0	55.4
11th	71.0	50.8
12th	74.2	55.4
13th	82.0	64.6
14th	82.1	64.0
15th	82.0	64.6
16th	65.5	55.4
17th	65.6	64.6
18th	65.5	64.6
19th	65.6	65.5
20th	81.9	69.7
21st	65.6	55.8
22nd	65.0	55.0
23rd	65.0	56.0
24th	55.0	54.0
25th	51.0	46.0
26th	51.8	47.0
27th	50.1	46.2

* Days counted from the 15th day of starting the experimental feeding

verse effect on egg production needs further investigation.

The studies of broiler chicken showed that 0.5% chitin in the feed can cause significant weight gain and thereby increase the profit of the farmer considerably. The observations on the egg production in white leghorns throw open an important field for detailed investigation to find out the reason for the drop in egg production when the layers are fed on 0.5% chitin in the feed.

The authors are thankful to Shri M.R Nair, Director and Dr.K. Gopakumar, Head of Division and Joint Director, Central Institute of Fisheries Technology, Cochin, for the interest shown and encouragement given during this work. The authors are also thankful to M/s Beeyem Poultry Farm and Ex-servicemen's Poultry Farm, Cochin, for providing all facilities and co-operation for conducting this work.

References

Gyorgy,P., Norris, R.F. & Rose, C.S. (1954) *Arch. Biochem. Biophys.* **48**, 193

Madhavan, P. & Ramachandran Nair, K.G. (1974) *Fish. Technol.* **11**, 50

Ramachandran Nair, K.G., Mathew, P.T., Madhavan, P. & Prabhu, P.V. (1987) *Indian J. Poult. Sci.* **22**, 40

Spreen, K.A., Zikakis, J.P. & Austin, P.R. (1984) in *Chitin, Chitosan and Related Enzymes.* (Zikakis, J.P., Ed), p.54, Academic Press, Orlando

Zikakis, J.P., Saylor, W.W. & Austin, P.R.(1982) in *Proceedings of the Second International Conference on Chitin and Chitosan*, p.233, Sapparo, Japan