Pak. j. sci. ind. res., vol.40, nos.5-12, May-December 1997

USE OF FILTER CAKE, AS A SUBSTITUTE FOR CEREALS IN POULTRY FEED

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(Received April 27, 1995; revised April 8, 1997)

Filter cake, a by-product of sugar cane industry, was tested for incorporating as a new energy source in poultry feed, in place of cereals. Sun dried filter cake was used progressively at 5, 10 & 15 % for replacing rice and formulating economical and efficient rations. Substitution of filter cake up to 27 % showed no abnormal mortality but the growth (weight gain) was reduced when filter cake was given more than 15 %. The weight gain (% of initial weight) with feed containing 15 % filter cake was 278 % as compared to 258 % by feed containing zero percent filter cake. Feed conversion ratio was also better with feed containing filter cake. The conversion value of feed containing 15 % filter cake was 2.25 compared with value 2.79 of feed without filter cake.

Key words: Poultry feed, Filter cake, Cereal substitute.

Introduction

Cereal grains and their products are the main energy source in the poultry feed. Thus poultry directly competes with human population for energy sources. Consequently, high prices of the cereals and their products make the poultry feed expensive. This situation demands introduction of new energy sources in poultry feed. Gupta [1] assessed the availability of major by-products and wastes from agriculture and allied industries in South Asia. He also discussed the nutritive values of these feeds and their incorporation at maximum levels with and without special treatment and additives for better response in feeding systems for pigs and poultry. Mena [2] suggested that molasses and sugar-cane juice preparations can completely replace cereals in poultry feed.

Sugar industry generates a considerable amount of by product as filter cake. This material contains sufficient quantity of soluble sugars, minerals (Ca, P, Mg, Cu, Mn, Fe), proteins and carotenoid pigments [1-6]. In Cuba, Ibanez and Gonzalez [7] tested diets containing 0, 12.5, 25, 37.5 and 50% of filter cake for broiler chicken from 1 to 56 days. Encouraged by their preliminary results, this study was planned to test the usefulness of filter cake for replacing rice in the broiler diets.

Materials and Methods

At initial stage, two experiments were conducted and feeds were prepared by replacing the control feed (commercial feed available in market) with filter cake up to 27% gradually (Table 1 and 2). These two preliminary experiments were non-replicated having 10 cockerel chicks in each treatment. In these two experiments, the individual bird was assumed as a single replication to analyse the data statistically. The final experiment was replicated 3 times using 10 broiler chicks in each treatment.

In this experiment only rice ingredient of the conventional feed was replaced by the filter cake upto 15 % (Table 3 A). The objective of replacing the rice with filtercake was to maintain feed protein approximately of the same quality in each treatment. Feeds used in the final experiment were analysed for their chemical composition (Table 3 B).

Filter cake. Fresh filter cake from Crescent Sugar Mill, Faisalabad was collected, dried in sun and stored in bags at about 4 % moisture. Rations were prepared by using this dried filter cake. Chemical analysis of feeds and filter cake was performed for crude protein [8], ash (muffle furnace at 550°C) and minerals P, K, Cu, Zn, Fe and Mn by wet digestion [9], followed by determination of P by colorimetric method, K by flame photometer and trace elements by atomic absorption spectrophotometer.

One day old chicks were initially fed uniformly on starter feed for 28 days. The 28-day old chicks were weighed and grouped, keeping the total weight equal in all the treatments. From 29th to 56th day chicks were fed the test rations containing different levels of filter cake. The final weight gain was recorded and percentage of weight gain over initial weight were calculated as under:

Percent weight gain = (final weight - initial weight) x 100/ initial weight.

Data were statistically analysed using complete randomized design.

Results and Discussion

The results of first preliminary trial where feed was replaced by filter cake (FC) in graded amounts upto 27 %, showed that in general weight increased significantly by re-

placing commercial ration with FC upto 3 % (Table 1), while all other higher levels of FC decreased the weight gain significantly as compared with 3 % replacement.

In the second non-replicated experiment where FC was mixed in commercial feed upto 16 % with the increments of 2 % (Table 2), again compared to the control, weight gain increased in the treatments containing upto 8 % FC but increase was non-significant ($P > 0.05$). Treatments having higher percentage of FC showed decrease in weight gain (Table 2).

It was further observed that mortality in the treatments was random regardless of FC concentration in the feed. These results compare favorably with the data of Ibanez and Gonzalez (7) who found higher mortality rate in feeds having FC ranging from (37.5 to 50 %) and reduced growth rate when more than 12.5 % FC was given.

TABLE 1. EFFECT OF FILTER CAKE IN FEED ON WEIGHT GAIN IN COCKERELS.

Filter cake in feed (%)	Initial weight*	Final weight	Weight gain	Increase over initial weight
	kg			(%)
0	2.49	11.34	8.85	355
3	3.52	18.61	15.09	429
6	3.34	14.42	11.08	331
9	3.13	11.09	7.96	254
12	4.02	13.85	9.83	244
15	3.57	15.22	11.65	326
18	3.51	11.23	7.72	220
21	3.56	11.94	8.38	235
24	3.88	12.43	8.55	220
27	3.53	12.54	9.01	255

*Weight of 10 birds.

TABLE 2. EFFECT OF FILTER CAKE IN FEED ON WEIGHT GAIN IN COCKERELS.

Filter cake in feed (%)	Initial weight*	Final weight	Weight gain	Increase over initial weight
	kg			(%)
0	2.21	7.52	5.31	240 N.S
1	2.16	8.18	6.02	278
2	2.29	7.79	5.50	241
4	2.30	7.76	5.45	237
6	2.25	7.45	5.20	231
8	2.35	8.46	6.01	255
10	2.60	8.03	5.43	209
12	2.05	6.82	4.77	233
14	2.58	7.72	5.14	199
16	2.25	7.21	4.96	220

*Weight of 10 birds, N.S = Non-significant.

Feed formulation and feed chemical composition used in final experiment is given in Table 3A and 3B.

In the final experiment, total and percentage weight gain increased when FC replaced rice upto 15 % of the rations (Table 4). Replacement of rice by FC increased the weight but the increase was non- significant.

The rationale of the beneficial effects of FC on weight may be that: (1) it has readily metabolizable energy source (sugar), (2) it supplies nutrients (N, Ca, P, K, Na, Mg, S, Fe, Mn, Cu, Zn etc) essential for growth.

Economics play an important role in every commercial venture. To find out the economics of different treatments, feed conversion to chicks-live weight ratios were calculated for 4 weeks when the birds were fed FC containing test diets (Table 5). The feed conversion ratio parameter explained the quantity of feed consumed to produce one unit of live

TABLE 3A. COMPOSITION OF POULTRY FEEDS.

Ingredients (grams)	Composition			
	Feed-1	Feed-2	Feed-3	Feed-4
Rice	15	10	5	0
Filter cake	0	5	10	15
Maize	15	15	15	15
Rice polishing	5	5	5	5
Wheat	20	20	20	20
Wheat bran	5	5	5	5
Cotton seed meal	7	7	7	7
Sesame meal	8	8	8	8
Corn gluten 60 %	10	10	10	10
Fish meal	10	10	10	10
Bone meal	1	1	1	1
Meat meal	1	1	1	1
Molasses	3	3	3	3
Total weight (g)	100	100	100	100

TABLE 3B. CHEMICAL ANALYSIS OF FEED.

Chemical composition	Feed-1	Feed-2	Feed-3	Feed-4
Crude protein (%)	24.1	21.87	21.87	21.87
Crude fat (%)	5.21	5.80	6.20	6.0
Crude fiber (%)	26.37	28.30	29.15	29.80
Ash (%)	16.87	22.12	21.46	23.50
Phosphorus (%)	0.42	0.45	0.54	0.59
Potassium (%)	0.5	0.49	0.59	0.59
Copper ($\mu g^{-1}g$)	9.4	11.2	12.2	18.2
Zinc ($\mu g^{-1}g$)	32.2	39.2	42.8	57.2
Iron ($\mu g^{-1}g$)	423.4	740.4	769.0	1142.0
Manganese ($\mu g^{-1}g$)	31.2	38.6	39.2	57.6
Metabolizable Energy (k.Cal kg^{-1})	2938	2920	2908	2894

TABLE 4. EFFECT OF FILTER CAKE IN POULTRY FEED ON COMMERCIAL BROILERS.

Treatments		Initial	Final	Weight	Increase over
FC	Rice	weight*	weight	gain	initial weight
(%)	(%)		kg		(%)
0	15	4.15	14.89	10.74	258 N.S
5	10	4.07	15.55	11.48	282
10	5	4.21	15.88	11.68	278
15	0	4.54	17.18	12.64	278

* Weight of 10 birds, NS = Non-significant.

TABLE 5. GROWTH, FEED CONSUMPTION AND FEED CONVERSION.

Feed		Final	Initial	Weight	Feed	Feed
FC	Rice	weight after 8	weight at 4th	gain during 4	consumed during 4	conversin rations
(%)	(%)	weeks	week	weeks	weeks	
			kg			
0	15	14.89	4.15	10.74	30.00	2.79
5	10	15.55	4.07	11.48	29.00	2.54
10	5	15.88	4.21	11.68	28.00	2.40
15	0	17.18	4.54	12.64	28.40	2.25

$$\text{Feed conversion ratios} = \frac{\text{Feed consumed}}{\text{weight gain}}$$

weight. This parameter better explained the commercial feasibility of the feed which was found efficient for poultry production. The results showed that as FC increased in the feed, less feed was required to produce per unit live weight (Table 5).

The feed conversion ratio was reduced from 2. 79 for 0 % FC diet to 2.25 for the 15 % FC diet. These feed conversion ratios were close to that published in USA (2.2 cumulative) for broilers fed on higher energy diet [10]. It may be noted that feed consumption was also better than that suggested by Khan *et al.*[11].

The use of an ingredient which is cheaper and effective than main feed or a cereal of common human consumption, could be an incentive to the poultry growers and more economical. FC is much cheaper than poultry feed or rice and available in abundance. Based on our results, mixing of FC in poultry feed upto 15 % is recommended. FC should be collected fresh, dried immediately and then stored to avoid sugar decomposition and fungal growth which could have some ill effects on birds.

References

1. S. E. Allen, H. M. Grimshaw and A. P. Rawland, *Chemical Analysis.* In: *Methods in Plant Ecology*, P. D. Moore and S. B. Chapman, (Editors) (Blackwell Scientific Publication, Oxford, 1986), pp.304-306.
2. J. M. Bremner and C. S. Mulvangey, *Nitrogen Total.* In: Methods of Soil Analysis. Part 2. (A. L. Page (ed.). Agronomy. **9,** 595-622 (1982).
3. D. H. Bushman, Efficient formulation of Poultry Diets to Help Combat Heat Stress. (American Soybean Association, Singapore, 1982), pp.7.
4. A. P. Gupta, R. S. Antil and Jagan Nath, Indian J. Agric., Res., **21** (1), 43 (1987).
5. R. S. Ibanez and C. T. Gonzalez, Cuban J. Agric. Sci., **13** (2), 163 (1979).
6. J. R. Kaushal, V. K. Kakkar, N. S. Malik and G. S. Makkar, Indian J. Dairy Sci., **34** (4), 458 (1981).
7. M. A. Khan, S. I. H. Gillani and A. R. Burq, *Poultry Farming* (Idara Matboaat-e-Sulimani, Urdu Bazar, Lahore, 1984). pp.104.
8. D. Lall and T. Prasad, Animal Feed Sci. Tech., **23** (4), 343 (1989).
9. A. Mena, The utilization of Sugar Cane By-products as Substitute for Cereal in Animal Feed. Proc. F. A. O.expert, Consultation on the substitution of imported concentrate feeds in animal production systems in developing countries, (1986) pp. 91-108.
10. O. Monroy, F. Torres and G. Viniegra. Tropical Animal Production, **5** (2), (1980).
11. V. Rodriguez and S. Gonzalez 1973. Cuban J. Agric. Sci., **7** (1), 29 (1973).