UTILISATION OF DRIED POULTRY MANURE IN BROILER RATIONS

By

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THESIS

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DECLARATION

I hereby declare that this thesis entitled "Utilisation of Dried Poultry Manure in Broiler Rations" is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship, or other similar title, of any other University or Society.

Place: Mannuthy

Date: 10.1.1978

Signature: Elizabeth 10/1/78

Name: V.K.ELIZABETH.

CERTIFICATE

Certified that this thesis, entitled "UTILISATION OF DRIED POULTRY MANURE IN BROILER RATIONS" is a record of research work done independently by Kum. V.K. Elizabeth under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship, or associateship to her.

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INTRODUCTION

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During the past couple of decades Indian poultry industry has made tremendous strides in all its different facets. This has resulted in quantitative and qualitative improvement in poultry production. Large units are replacing smaller ones in many parts of the country and there has been a radical change in the housing pattern from deep litter to cages. These factors coupled with concentration of poultry units in and around cosmopolitan cities and urban areas have resulted in problems of waste disposal.

Feeding poultry is a major factor in poultry production since feed cost alone accounts for over 60 percent of the total cost of production. Further, the fast growing poultry industry with its improved high producing germplasm directly competes with human population for high quality foods such as cereals and other feed ingredients which are already in short supply. This is further complicated by the ever-increasing prices of most of the feed ingredients boosting the cost of compounded feeds. If these conditions persist some of the basic ingredients forming important and major part of poultry rations may not be available at all for feeding chicken in the days to come. Anticipating such a contingency, it is very much necessary to reduce or if possible totally avoid feed materials that usually go as human foods and to introduce alternate feeds for poultry feeding which will not only ease the pressure on conventional feed stuffs, but also reduce the cost of poultry production as well.

These factors have prompted poultry nutritionists to try out the efficacy of utilising poultry wastes for feeding poultry. The recycling of wasted nutrients to produce high quality proteins - wealth from waste - is gaining momentum. Modern high quality poultry feeds are digested and metabolised to the extent of 70 to 80 percent only. Thus about 20 to 30 percent of undigested nutrients are wasted through voided droppings. On a comparison between the protein intake and the analysis of dropping, it appears that about 60 percent of the proteins the bird consumes daily is excreted. Coupled with this certain amount of spilt feed and quantities of B Vitamins available in the droppings as a result of microbial synthesis in the intestines make the poultry waste a source worth feeding back.

The quantity of droppings that could be got from cage is approximately 50 to 52 kg/bird/laying year. A layer farm of one thousand birds therefore can produce about 50 to 52 tonnes of droppings per laying year. Thus, if dried poultry manure (DPM) proves worth recycling it could emerge as a potential feed ingredient which is capable of lowering the feed cost, besides partly overcoming problems of waste disposal.

Though much work has been done in foreign countries, only scant information is available in India on the efficacy of feeding DPM to poultry. Taking cognisance of all these factors and the increasing trend of broiler raising in the country, an experiment was designed to ascertain the feeding value of DPM in broiler chicken.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Recently there has been considerable inquisitiveness among animal nutritionists on the use of poultry droppings as a livestock and poultry feed ingredient.

As early as 1946 Rubin <u>et al.</u> reported that the excreta of hens resembled cow manure and contained a factor which stimulated chick growth and that urine-free faeces stimulated growth more than a mixture of faeces and urine. The presence of an unidentified growth factor in poultry excreta was reported later by Elam <u>et al.</u> (1954). There is no evidence that recycling animal waste presents hazards to human health nor it has altered the taste of meat, milk and eggs (Fontenot and Webb, 1975).

Fookes (1972) fed dried poultry manure to chicks from four weeks to maturity at 5, 10 and 20 percent levels and observed no significant difference between control and treatments in respect of mature body weight. However, feed efficiency was poor in all the treatments.

Lee and Blair (1972) reported that chicks fed a crystalline amino acid diet with DPM gained more weight than those fed a diet with added amino acids.

Ahuja <u>et al.</u> (1974) indicated that the growing chicks could utilise DPM upto 20 percent in the ration without any adverse effect on growth. However, it was observed that the efficiency was depressed significantly with increasing levels of DPM.

Sinha et al.(1975) studied the effect of replacing cereal mixture with DPM in the ration of White Leghorn chicks and cross bred broiler chicks at 5, 10 and 15 percent levels. They observed that upto 15 percent level, the gain in body weight was significantly higher than the controls. The feed consumption at 10 and 15 percent levels was higher but feed efficiency did not show any statistically significant difference. These workers also concluded that DPM could be used in rations of starting layer type or cross bred broiler chicks upto 15 percent successfully.

Trakulchang and Balloun (1975 a) supplemented 10 percent DPW or 20 percent DPW with added amino acids in a low protein (15%) practical diet and observed that the incorporation of DPW did not significantly affect the weight gain and feed efficiency. They further observed that chicks from 2 to 4 weeks of age improved their nitrogen utilisation but after four weeks both nitrogen utilisation and nitrogen gain decreased.

Trakulchang and Balloun (1975 b) studied the effects of replacing dried poultry waste on young chicks. Three experimental diets containing 0, 10 and 20 percent recycled dried poultry waste were formulated isocaloric (2950 kcal per kg) and equivalent in percentage of true protein (16%), calcium and phosphorus. Each experimental diet was fed to four replicate groups. Excreta from each group was collected weekly, dried, ground and mixed with the diet to be fed. DPW recycling, at both 10 and 20 percent dietary levels, significantly depressed weight gain of four to eight week-old, but feed efficiency was depressed only by 20 percent level of incorporation. As the number of recyclings increased calcium and magnesium contents of the excreta decreased linearly. Potassium and zinc tended to increase and other minerals remained constant.

Flegal and Zindel (1970) fed chicks on rations containing upto 20 percent dried manure and reported that feed efficiency was lowered as the level of manure was increased. The depression in weight gain with 20 percent level of manure in the diet could be prevented by the addition of 4 percent fat.

Biely et al. (1972) observed that incorporation of DPM at 5 percent and 10 percent levels in feed resulted in significantly poor growth and feed efficiency compared to control. Sloan and Harms (1973) added graded levels of air-dried hen faeces to the diet of young chicks to determine its effect on growth and feed efficiency. Results of two experiments demonstrated that increase in the level of manure resulted in a decrease in growth and feed utilisation. Feed consumption was not influenced by the inclusion of the manure in the diet. The data indicated that the hen manure contained some factor which prevented chicks from eating to meet their energy requirement, thereby depressing body weight gain.

Biely and Stapleton (1976) recycled dried poultry manure in chick starter diets. Three hundred, one day old chicks were fed on basal diet for 3 weeks and droppings were collected. The weekly collections were dried at a temperature of 45°C for several days and then ground into fine powder which contained less than 10 percent moisture. When wheat was replaced by 15 or 20 percent DPM, average body weight and efficiency of feed utilisation decreased and feed consumption was reduced. But efficiency of feed utilisation improved slightly from 2nd to 4th recycling. The amount of manure voided increased with increased DPM in the diet.

Prawirokusumo and Bray (1975) determined the factors affecting the utilisation of poultry manure crude protein by chicks. Female chicks were fed a 9 percent protein corn-soya diet from 8 to 21 days to which 1.5, 3 and 4.5 percent protein from soyabean meal (SM), fresh dried poultry manure (FM) fermented dried poultry manure inoculated with fly larvae during fermentation (LFtm) were added replacing corn starch. The essential amino acids and uric acid disappearence during fermentation shifted the growth response from negative to positive.

Fuller (1956) fed hydrolysed poultry manure to broilers and found the same to be as effective as fish meal in commercial broiler rations when fed along with poultry by-product meal and feather meal.

Wehunt et al. (1960) conducted trials using hydrolysed broiler litter and autoclaved hen and broiler manure as sources of protein and unidentified growth factors. They observed that improvement in growth rate was optimum by addition of these products only when the diet was suboptimal in protein or lacking in other sources of unidentified growth factors. Feed efficiency was not improved correspondingly. They further observed that autoclaved manure gave better results than non autoclaved manure. When manure was used to supplement diets which were suboptimal in proteins, the crude protein of the manure was utilised somewhat less efficiently than soyabean oil meal.

Mc Nab et al. (1972) used a chick diet substituted upto 20 percent poultry manure with an adjustment on the energy content of the ration. This diet had only sub-optimal level of amino acids. They observed that the growth of chicks on experimental ration was comparable to those fed a standard broiler diet.

Lee and Blair (1973) found that incorporation of 5 and 10 percent dried poultry manure to broiler starter and finisher diets respectively did not affect the growth rate.

Bhargava and O'Neil (1975) studied the nutritive value of dehydrated manure obtained from broilers raised in cages. This manure was fed to broiler chicken and it was observed that inclusion of DPM at 10 percent level depressed growth rate while higher levels of incorporation at 15 or 20 percent did not bring about further depression. They also concluded that incorporation of DPW at 20 percent level produced no adverse effect on growth characteristics or carcass quality when the diet was isonitrogenous and isocaloric.

Cunningham and Lillich (1975) investigated the influence of feeding dehydrated poultry waste (DPW) on broiler growth and composition and flavour of meat. Effects of feeding three levels (9.6, 19.1 and 38.2 percent) of dehydrated poultry waste to broilers were studied. The performance of the group receiving 38.2 percent DPW was the poorest as evidenced by lower average live weight and poorer feed conversion. Flavour differences were studied using triangle taste tests. Analysis of responses revealed that panel members could not accurately detect flavour differences between the two extreme treatments (receiving 0 percent and 38.2 percent DPW). Carcass composition changes were ascertained by analysis of dark meat for protein, ether extract, calcium, phosphorus and TBA value. No significant differences in composition were noted among treatments from the analysis.

Under conditions of this study, dehydrated poultry waste had no noticeable effect on carcass quality though growth was somewhat depressed at the highest level. These workers concluded that DPW could be fed at a level below 20 percent without serious consequences.

Flegal and Zindel (1970) observed that broiler chicks could tolerate 5 percent of dehydrated poultry waste with only a slight effect on feed conversion. Growth was decreased significantly when the level of DPW was increased to 10 or 20 percent. Feed conversion was directly affected in proportion to the level of DPW in the diet. The adverse effect of feeding 10 percent and 20 percent DPW to broiler chicks appeared to have been caused by the low energy content of poultry waste since feed conversion was improved by adding 4.5 percent fat to the diet containing 20 percent DPW.

Biely <u>et al</u>. (1972) reported that both body weight and feed efficiency of female broiler chicks progressively decreased as the amount of DPW was increased from 5 to 20 percent.

Rinehart <u>et al</u>. (1973) fed 20 percent DPM to seven, 28 day old broilers. They observed an increase in the feed consumption and a depression in feed conversion. The broiler faecal volume was found to increase in direct relation with the DPW present in the feed consumed, suggesting a simple lack of nutrient utilisation. These authors concluded that DPM had no value for broilers and explained that the possible limiting factor could be the high calcium content in the DPM.

MATERIALS AND METHODS

MATERIALS AND METHODS

A feeding trial of 8 weeks duration was carried out at the Department of Poultry Science, College of Veterinary and Animal Sciences, Mannuthy, to evaluate the feeding worth of Dried Poultry manure (DPM) for broiler chicks. One hundred and sixty, one-day-old commercial broiler chicks were used for the study.

The birds were wing banded, weighed and randomly allotted to eight groups of twenty chicks each. Two groups formed one dietary treatment. Thus in all, four dietary treatments were employed. The chicks were housed in the four tiers of a battery brooder separated in the middle, thus making eight compartments. The allotment of groups to different tiers in the battery was also made at random. The battery brooder was placed in a well ventilated and well lighted room.

Poultry manure from caged layers fed a standard farm ration was collected, sun dried and analysed for proximate composition (Table 1). The experimental diets were computed according to ISI, 1967 (Table 2 and 3). Diet I formed the control while diets II, III and IV contained 10, 20 and 30 percent of dried poultry manure. Broiler starter diets were fed upto 6 weeks of age and thereafter broiler finisher diets were given.

Feed and water were provided *ad libitum* throughout the experimental period. Care was taken to keep the feed wastage minimum, by keeping the feed troughs always half full. Normal managemental practices were followed for the whole period of study.

Table 1. Proximate composition of the DPM used in the experiment

Nutrient	Percent
Moisture	3.96
Crude protein (Nx6.25)	27.40
Crude fibre	16.87
Ether extract	3.32
Nitrogen free extract	27.75
Total ash	24.66
Acid insoluble ash	8.40
Calcium	4.34
Phosphorus	2.30

Birds were weighed weekly and weekly feed consumption figures were recorded. This data was used to calculate feed efficiency. The trial was run for 8 weeks at the close of which final body weights were recorded and six birds from each treatment were randomly selected and subjected to slaughter studies. Birds were fasted for six hours prior to slaughter. Water was provided *ad libitum* during the fasting period. The birds were slaughtered by the outer-cut method described by Kotula and Helbacka (1965). A bleeding time of one minute was allowed after killing the birds in a bleeding funnel and the weight of the drained blood was recorded.

The birds were then scalded at a temperature of 56°C for approximately 75 seconds. The defeathering was done on a mechanical feather plucker and finished off by hand. The defeathered birds were examined for pin feathers and the same were removed with a pinning knife. The birds were weighed at this stage to calculate dressing losses. The carcasses were washed thoroughly prior to evisceration.

Head was cut off with a cleaver. The shanks were removed by cutting through the hock joints. The skin on the back of the neck was cut from the point where the head was severed, to a point in line with the base of the neck and the skin was then pulled down to the shoulder. The gullet, crop and wind pipe were removed by pulling them away from the neck skin and then cut off at the point nearest to the entrance to the body cavity. The neck was cut from the body at the beginning of the back. The oil-gland was removed by cutting under the sac to the back bone and up towards the tail. An incision was made below the end of the breast bone down to and around the vent. The gizzard was pulled through the opening together with the liver, heart and intestinal tract. The lungs were then removed. The carcass was washed inside and outside, drained and weighed.

The gizzard, liver and heart were then removed from the viscera. The gizzard was split lengthwise through the thick muscle. The lining and contents were carefully peeled out. The gall bladder was carefully removed from the liver. The heart was trimmed and washed free of blood. The giblets (gizzard, heart and liver) from individual birds were washed, drained and weighed along with the carcass to calculate the ready to cook yield.

Data pertaining to feed efficiency, body weight gains at 8 weeks, dressing losses, and carcass yields were subjected to statistical analysis (Snedecor and Cochran, 1967).

Table 2. Composition of Experimental broiler starter ration

Ingredients (Parts/100 kg)	Diet I	Diet II	Diet III	Diet IV
Ground nut cake	26	22	20	16
Gingelly oil cake	5	5	5	5
Maize	32	36	38	28
Dried Poultry manure	—	10	20	30
Wheat bran	10	3	—	—
Rice polish	15	10	—	—
Dried fish	10	10	10	10
Starmin PS[1]	2	2	2	2
Lard	—	2	5	9
Total	100	100	100	100
Added per 100 kg of diet				
Vitablend[2] A, B_2 and D_3	25 g	25 g	25 g	25 g
Bifuran[3]	50 g	50 g	50 g	50 g

1. Starmin PS (Shaw Wallace), the mineral mixture contained 28% Calcium, 7% Phosphorus, 0.5% iron, 0.008% iodine, 0.013% manganese, 0.005% cobalt, 17% sodium chloride and 0.25% flourine.
2. Vitablend A, B_2 and D_3 (Glaxo Laboratories (India)Ltd.) contained 40,000 I.U. of Vitamin A, 25 mg of Vitamin B_2 and 6000 I.U. of Vitamin D_3 per g respectively.
3. Bifuran (Smith, Kline and French, India, Ltd.) contained Veterinary Nitro furazone B.Vet.C.25% W/W, Veterinary Furazolidone B.Vet.C. 3.6% W/W.

Table 3. Composition of Experimental Broiler finisher ration

Nutrients (Parts/100 kg)	Diet I	Diet II	Diet III	Diet IV
Ground nut cake	19	17	13	9
Gingely oil cake	5	5	5	5
Maize	43.5	43	43.5	33.5
Dried Poultry manure	--	10	20	30
Dried fish	10	10	10	10
Wheat bran	5	--	--	--
Rice polish	15	10	--	--
Starmin PS[1]	2	2	2	2
Lard	0.5	3	6.5	10.5
Total	100	100	100	100
Added per 100 kg of diet				
Vitablend[2] A, B_2 & D_3	25 g	25 g	25 g	25 g

1. Starmin PS (Shaw Wallace), the mineral mixture contained 28% Calcium, 7% Phosphorus, 0.5% iron, 0.008% iodine, 0.013% manganese, 0.005% cobalt, 17% sodium chloride and 0.25% flourine.
2. Vitablend A, B_2 and D_3 (Glaxo Laboratories (India) Ltd.) contained 40,000 I.U. of vitamin A, 25 mg of Vitamin B_2 and 6000 I.U. of Vitamin D_3 per g respectively.

RESULTS

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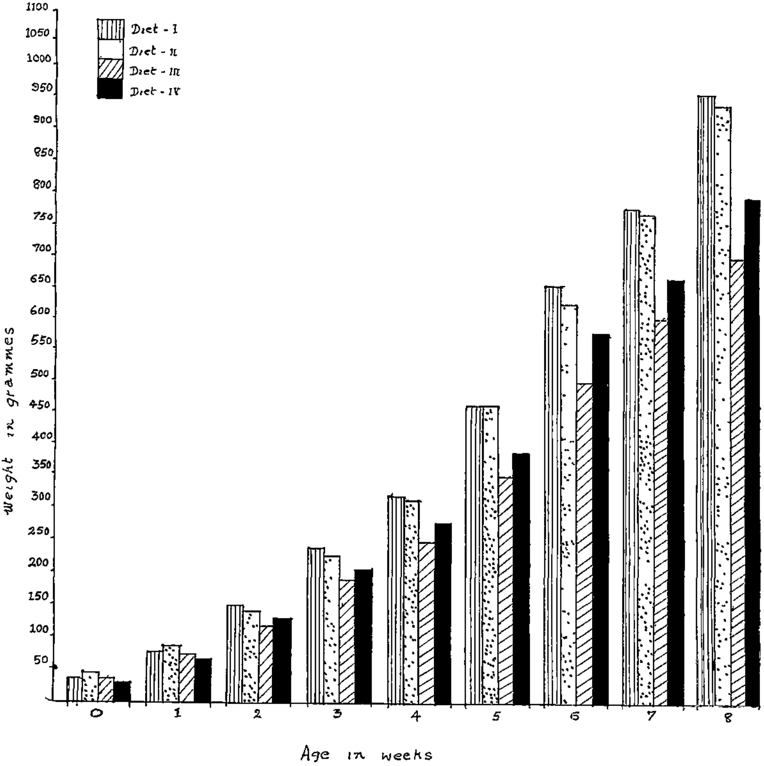
Growth

The mean weekly body weights, treatmentwise and replicatewise are presented in table 4. The data pertaining to the weekly body weight gains is presented in table 5. The mean body weight gain at 8 weeks of age (table 6) was subjected to statistical analysis the results of which are set out in table 7.

The mean final body weights at 8 weeks of age for diet I, II, III and IV were 983.4, 962.7, 741.5 and 816.3 grammes respectively. The mean body weights at 6 weeks of age were 670.8, 649.4, 514.6 and 591.2 grammes for dietary treatments I to IV respectively. The weekly body weight gains revealed that the maximum gain was made during the 6th week of age irrespective of the dietary treatment. Analysis of weekly body weight gains did not show any significant difference between treatments (table 7). The body weight gains made during the eight weeks period by birds fed diet I, II, III and IV were 944.47, 922.81, 703.60 and 778.87 grammes respectively. Analysis of the data on body weight gains at 8 weeks of age showed significant differences due to dietary treatments. Further, the differences between replicates within treatments were not statistically significant. The mean weekly body weights of broilers from 0 to 8 weeks of age as influenced by the four dietary treatments is represented graphically as well. (Fig.1).

Fig 1 Weekly body weights of broilers fed different levels of DPM



Feed consumption

It could be seen from table 8 that the total feed consumed during 6 weeks of age were 1.649, 1.712, 1.713 and 1.862 Kilogrammes respectively for the dietary treatments I to IV. The feed consumption for 8 weeks amounted to 3.024, 3.010, 2.923 and 3.050 kilogrammes respectively for the treatment groups I to IV.

Feed efficiency (Feed consumed/Body weight gains)

The feed efficiency at 6 and 8 weeks of age as influenced by dietary treatments are presented in Table 8. The pattern of influence at both these ages was similar. Diet I showed the best efficiency followed by Diet II, IV and III. The weekly feed efficiency recorded by the different dietary treatments are presented in table 9. The statistical analysis of the data is set out in table 7.

Mean carcass yields and losses

The slaughter data pertaining to the replicates of different dietary treatments are given in table 10 and the statistical analysis of this data in table 11.

Shrinkage

The mean fasting shrinkage of 3.60, 3.58, 3.43 and 3.73 percentage were recorded for dietary treatment I, II, III and IV respectively. The differences either among treatments or between replicates within treatments were not statistically significant.

Dressed yield

The mean percentage dressed yield for the four dietary treatments were 90.05, 90.32, 90.24 and 89.69 respectively and the differences among the treatments and between replicates were not statistically significant.

Eviscerated yield

The percentage eviscerated yield among the dietary treatments failed to show any difference of significance statistically. The mean value for the different dietary treatments relating to the above trait were 66.44, 67.09, 66.27 and 64.55 percent respectively.

Ready to cook yield

A ready to cook yield percentage of 71.62 was recorded for diet I while the corresponding figures for diet II through IV were 72.14, 71.52 and 70.16 respectively. However, neither the differences among the treatments nor replicates within treatments showed any statistically significant variation.

Dressing and Drawing losses

The dressing losses (due to blood and feathers) for the different treatments were 9.93, 9.64, 9.63 and 10.30 percent for dietary treatments I to IV respectively (table 12). The treatment IV showed the maximum dressing loss. Overall mean for dressing losses was 9.88 percent.

The drawing losses (loss due to legs, head and viscera) were 18.45, 18.40, 18.62 and 19.19 percent for dietary treatments I to IV respectively (table 12). The overall mean drawing loss recorded was 18.76 percent.

The dressing and drawing losses for the different treatments were 28.38, 28.05, 28.26 and 29.49 percent respectively for dietary treatments I to IV with an overall mean of 28.64 percent.

Yields of inedible parts

The mean percent yields of inedible parts recorded at processing are presented in table 13.

Blood

The percentage yield of blood from various treatments were 4.11, 4.10, 4.35 and 4.29 respectively for I to IV dietary treatments. The overall mean was 4.21 percent. On statistical analysis it was observed that the four dietary treatments did not differ significantly (Table 11).

Feathers

The percentage of feathers obtained were 5.83, 5.55, 5.28 and 6.01 for the dietary treatments I to IV respectively. The overall mean was 5.67 percent. Statistical analysis showed that the four dietary treatments did not differ significantly (Table 11).

Head

The percentage weight of head obtained from birds of the four dietary treatments were 5.04, 4.34, 4.54 and 4.86 respectively. The overall mean was 4.70 percent.

Viscera

The percentage weight of the viscera for dietary treatments I to IV recorded were 6.55, 7.36, 7.32 and 7.90 respectively with an overall mean of 7.35.

Legs

The percentage weight of the legs obtained from birds belonging to dietary treatments I to IV were 6.85, 6.70, 6.86 and 6.42 respectively. The overall mean was 6.71 percent.

Mortality

Two birds died during the experimental period. One belonged to diet II and the other to diet III. The autopsy records of the birds died did not reveal any cause attributable to the dietary treatments.

Table 4. Mean weekly body weights (in gms) of Broilers fed different levels of DPM

Diets	Replications	Initial weight	Weeks							
			1	2	3	4	5	6	7	8
I	Rep. 1	38.70	72.15	145.85	224.30	297.66	414.75	601.05	712.90	880.78
	Rep. 2	39.15	78.85	161.80	266.50	363.05	526.60	740.55	886.75	1086.00
	Mean	38.92	75.50	153.85	245.40	330.32	470.67	670.80	799.82	983.39
II	Rep. 1	39.55	77.40	147.75	229.10	329.55	461.35	608.45	763.45	887.35
	Rep. 2	40.20	78.75	150.45	242.35	323.90	480.95	690.32	828.10	1038.00
	Mean	39.87	78.07	149.10	235.72	326.72	471.15	649.38	795.77	962.68
III	Rep. 1	37.90	70.40	121.25	180.80	242.30	334.60	475.00	573.50	684.60
	Rep. 2	37.80	70.50	125.35	205.15	275.45	394.79	554.11	659.31	798.31
	Mean	37.85	70.45	123.30	192.97	258.87	364.69	514.55	616.40	741.45
IV	Rep. 1	37.50	72.90	132.60	208.95	275.00	395.45	569.90	615.80	756.35
	Rep. 2	37.30	73.90	131.10	218.60	301.00	402.55	612.50	752.10	876.20
	Mean	37.40	73.40	131.85	213.77	288.05	399.00	591.20	683.95	816.27
	Overall Mean	38.51	74.35	131.52	221.96	300.99	426.37	606.48	723.98	875.94

Table 5. Mean weekly body weight gain (in gms) of broilers fed different levels of DPM

Diets	Replications	Initial weight	Weeks 1	2	3	4	5	6	7	8
	Rep. 1	38.70	33.45	73.70	78.50	73.30	117.00	186.50	111.50	168.00
I	Rep. 2	39.15	39.70	83.00	104.70	96.62	163.50	213.95	213.95	199.50
	Mean	38.93	36.58	78.35	91.60	84.96	140.25	200.23	128.75	183.75
	Rep. 1	39.55	37.85	70.35	81.50	100.45	131.80	154.90	155.00	128.26
II	Rep. 2	40.20	38.55	71.70	92.00	81.60	139.95	213.37	137.89	210.53
	Mean	39.87	38.20	71.03	86.75	91.03	135.83	184.13	146.45	169.39
	Rep. 1	37.90	32.50	50.85	59.50	61.50	92.30	140.50	98.50	125.32
III	Rep. 2	37.80	32.70	54.85	80.00	70.30	104.84	159.32	105.26	138.97
	Mean	37.85	32.60	52.85	69.75	65.90	98.57	149.91	101.88	132.14
	Rep. 1	37.50	35.40	59.70	76.00	66.10	120.40	174.45	46.00	140.50
IV	Rep. 2	37.30	36.60	56.20	88.50	82.50	101.45	209.95	139.50	124.48
	Mean	37.40	36.00	57.95	82.25	74.30	110.93	192.20	92.75	132.49
	Overall Mean	38.51	35.84	65.04	82.58	79.03	121.39	181.61	117.45	154.47

Table 6. Mean body weight gain (in gms) to 8 weeks of broilers fed different levels of DPM

Diets	Replica-tions	Initial weight	Final weight	Weight gain
	Rep. 1	38.70	880.78	842.08
I	Rep. 2	39.15	1086.00	1046.85
	Mean	38.92	983.39	944.47[a]
	Rep. 1	39.55	887.35	847.80
II	Rep. 2	40.20	1038.00	997.80
	Mean	39.87	962.68	922.81[a]
	Rep. 1	37.90	684.60	646.70
III	Rep. 2	37.80	798.31	760.51
	Mean	37.85	741.45	703.60[b]
	Rep. 1	37.50	756.35	718.80
IV	Rep. 2	37.30	876.20	838.90
	Mean	37.40	816.27	778.87[b]
	Overall Mean	38.51	875.94	837.43

Means carrying at least one similar superscript did not differ significantly.

C.D. = 89.24

Table 7. Analysis of variance for the various growth characteristics of broilers studied

Factor	Source	df	SS	MSS	F
1. Total body weight gain for 8 weeks	Between diets	3	1585137.50	528379.16	25.64**
	Between replications within diets	4	82438.96	20609.74	1.00^{ns}
	Error	150	3082960.54	20553.07	
	Total	157	4750537.00		
2. Weekly body weight gain	Between diets	3	10022.85	3340.95	2.94^{ns}
	Between replications within diets	4	4533.80	1133.45	0.41^{ns}
	Errors	56	151701.25	2708.95	
	Total	63	166257.90		
3. Weekly feed efficiency	Between diets	3	14.68	4.89	27.16*
	Between replications within diets	4	0.74	0.18	0.10^{ns}
	Error	56	92.83	1.65	
	Total	63	108.25		

* Significant at 5% level

** Significant at 1% level

ns non significant

Table 8. Feed conversion Efficiency of Broiler chicks at 6 and 8 weeks of age as influenced by dietary treatments

Diets	Replications	Initial body weight (g)	At six weeks: Body weight (g)	At six weeks: Total feed consumed (kg)	At six weeks: F.E.	At eight weeks: Body weight (g)	At eight weeks: Total feed consumed (kg)	At eight weeks: F.E.
I	Rep. 1	38.70	601.05	1.512	2.69	880.75	2.712	3.22
	Rep. 2	39.15	740.55	1.787	2.55	1086.00	3.337	3.19
	Mean	38.92	670.27	1.649	2.61	983.37	3.024	3.20
II	Rep. 1	39.55	608.45	1.612	2.83	887.35	2.710	3.20
	Rep. 2	40.20	690.32	1.812	2.79	1038.00	3.310	3.32
	Mean	39.87	649.36	1.712	2.81	962.67	3.010	3.26
III	Rep. 1	37.90	475.00	1.642	3.76	684.60	2.667	4.12
	Rep. 2	37.80	554.11	1.785	3.46	798.31	3.180	4.18
	Mean	37.85	514.55	1.713	3.60	741.45	2.923	4.16
IV	Rep. 1	37.50	569.90	1.775	3.34	756.35	2.750	3.82
	Rep. 2	37.30	612.50	1.950	3.39	876.20	3.350	3.99
	Mean	37.40	591.20	1.862	3.36	816.27	3.050	3.91
	Overall Mean	38.51	606.34	1.734	3.10	870.95	3.001	3.63

Table 9. Weekly Feed Efficiency of broilers fed different levels of DPM

Diets	Replications	Weeks 1	2	3	4	5	6	7	8	Means for treatments
I	Rep. 1	2.42	2.60	2.44	4.23	2.97	2.09	5.15	3.72	
	Rep. 2	1.81	2.27	2.80	3.19	2.60	2.33	4.28	4.63	
	Mean	2.12	2.44	2.62	3.71	2.78	2.21	4.71	4.12	3.09[a]
II	Rep. 1	2.06	2.73	3.04	3.18	2.73	2.82	3.38	4.63	
	Rep. 2	2.15	2.42	2.82	3.61	3.01	2.76	4.38	4.25	
	Mean	2.11	2.57	2.93	3.39	2.87	2.79	3.88	4.44	3.12[a]
III	Rep. 1	2.09	3.91	3.51	5.15	4.33	3.20	5.07	4.73	
	Rep. 2	2.35	3.52	3.12	4.52	3.77	3.47	6.00	5.49	
	Mean	2.22	3.71	3.31	4.83	4.05	3.33	5.53	5.11	4.01[b]
IV	Rep. 1	2.40	3.35	3.80	5.31	3.53	2.44	9.78	3.74	
	Rep. 2	2.43	3.74	3.52	3.79	4.58	2.67	4.30	6.45	
	Mean	2.41	3.54	3.66	4.55	4.04	2.55	7.04	5.09	4.11[b]
	Mean for weeks	2.22	3.06	3.13	4.12	3.44	2.72	5.29	4.69	

Means carrying at least one similar superscript did not differ significantly.
C.D. for treatments 0.40

Table 10. Mean slaughter data at 8 weeks of age of broilers fed different levels of DPM

Diets	Replications	Body wt. before fasting (g)	Fasting Shrinkage (g)	Fasting Shrinkage (%)	Dressed yield (g)	Dressed yield (%)	Eviscerated yield (g)	Eviscerated yield (%)	Giblet yield (g)	Giblet yield (%)	R to C yield (g)	R to C yield (%)
	Rep. 1	915.00	25.33	2.75	805.00	90.51	593.33	66.64	46.00	5.18	639.33	71.82
I	Rep. 2	1084.00	49.66	4.46	927.66	89.60	687.33	66.23	53.66	5.20	741.00	71.43
	Mean	999.50	37.49	3.60	866.33	90.05	640.33	66.44	49.83	5.19	690.16	71.62
	Rep. 1	1087.00	33.66	3.55	950.00	90.62	717.33	68.43	54.33	5.18	771.67	73.59
II	Rep. 2	1070.00	39.00	3.62	929.00	90.03	646.66	65.74	50.33	4.86	730.33	70.69
	Mean	1078.00	38.83	3.58	939.50	90.32	681.99	67.09	52.33	5.02	751.00	72.14
	Rep. 1	873.66	25.66	2.94	772.00	91.05	572.66	67.55	43.66	5.15	616.33	72.69
III	Rep. 2	899.33	35.33	3.93	775.66	89.44	563.33	64.98	46.66	5.37	610.00	70.35
	Mean	886.50	30.49	3.43	773.83	90.24	567.99	66.27	45.16	5.26	613.17	71.52
	Rep. 1	837.00	30.33	3.62	719.66	89.20	529.33	65.61	46.33	5.74	575.66	71.34
IV	Rep. 2	999.67	38.66	3.83	867.66	90.19	610.66	63.48	53.00	5.51	599.66	68.99
	Mean	918.34	34.49	3.73	793.66	89.69	569.99	64.55	49.66	5.62	587.66	70.16
	Overall Mean	970.58	35.32	3.58	843.33	90.07	615.07	66.09	49.25	5.27	660.50	71.36

Table 11. Analysis of variance table of slaughter data

Sl. No.	Factors	Source of variation	df	SS	MSS	F
1.	Shrinkage	Between diets	3	0.44	0.15	0.04 ns
		Between replications within diets	4	14.76	3.69	1.23 ns
		Error	16	52.97	3.10	
		Total	23	68.17		
2.	Dressed yield	Between diets	3	1.15	0.38	0.23 ns
		Between replications within diets	4	6.81	1.70	1.35 ns
		Error	16	20.08	1.26	
		Total	23	28.04		
3.	Ready to cook yield	Between diets	3	2.85	0.95	0.08 ns
		Between replications within diets	4	48.79	12.20	2.42 ns
		Error	16	80.66	5.04	
		Total	23	132.30		
4.	Blood	Between diets	3	0.45	0.15	0.18 ns
		Between replications within diets	4	3.33	0.83	1.00 ns
		Error	16	13.42	0.83	
		Total	23	17.20		
5.	Feathers	Between diets	3	3.06	1.02	0.53 ns
		Between replications within diets	4	7.60	1.90	0.81 ns
		Error	16	37.10	2.32	
		Total	23	47.76		

ns : non-significant

Table 12. Dressing and Drawing Losses among broilers fed different levels of DPM

Diets	Replications	Dressing losses (g)	Dressing losses (%)	Drawing losses (g)	Drawing losses (%)	Dressing and drawing losses (g)	Dressing and drawing losses (%)
I	Rep. 1	84.32	9.48	166.33	18.72	250.65	28.20
	Rep. 2	107.32	10.39	186.67	18.17	293.99	28.56
	Mean	95.82	9.93	176.50	18.45	272.32	28.38
II	Rep. 1	98.32	9.38	178.33	17.03	276.65	26.41
	Rep. 2	102.66	9.91	202.33	19.77	304.99	29.68
	Mean	100.49	9.64	190.33	18.40	290.82	28.05
III	Rep. 1	73.99	8.71	155.67	18.17	229.66	26.88
	Rep. 2	91.66	10.56	165.67	19.08	257.33	29.64
	Mean	82.82	9.63	160.67	18.62	243.50	28.26
IV	Rep. 1	86.99	10.79	138.67	17.18	225.66	27.97
	Rep. 2	104.11	9.81	204.00	21.19	308.11	31.00
	Mean	95.55	10.30	171.34	19.19	266.88	29.99
	Overall Mean	93.67	9.88	174.71	18.76	268.38	28.64

Table 13. Yields of inedible parts from broilers fed different levels of DPM

Diets	Replications	Blood (g)	Blood (%)	Feathers (g)	Feathers (%)	Head (g)	Head (%)	Viscera (g)	Viscera (%)	Legs (g)	Legs (%)
I	Rep. 1	38.66	4.35	45.66	5.13	44.00	4.95	61.33	6.90	61.00	6.86
	Rep. 2	39.66	3.86	67.66	6.53	52.33	5.13	63.67	6.20	70.66	6.84
	Mean	39.16	4.11	56.66	5.83	48.16	5.04	62.50	6.55	65.83	6.85
II	Rep. 1	41.66	3.98	56.66	5.40	43.33	4.15	60.67	5.80	74.33	7.08
	Rep. 2	43.33	4.21	59.33	5.70	46.66	4.53	90.33	8.91	65.33	6.32
	Mean	42.49	4.10	57.99	5.55	44.99	4.34	75.50	7.36	69.83	6.70
III	Rep. 1	33.33	3.93	40.66	4.78	38.33	4.52	56.67	6.68	60.66	7.15
	Rep. 2	41.33	4.77	50.33	5.79	39.66	4.56	69.00	7.95	57.00	6.57
	Mean	37.33	4.35	45.49	5.28	38.99	4.54	62.84	7.32	38.83	6.86
IV	Rep. 1	36.33	4.50	50.66	6.29	41.00	5.07	46.33	5.95	51.33	6.34
	Rep. 2	38.66	4.08	54.66	5.73	44.66	4.65	97.00	10.65	62.33	6.50
	Mean	37.49	4.29	52.66	6.01	42.83	4.86	71.66	7.90	56.83	6.42
	Overall Mean	39.12	4.21	53.20	5.67	43.74	4.70	68.13	7.35	62.83	6.71

DISCUSSION

DISCUSSION

Growth

It may be seen from the results that the group of broilers fed control diet showed better growth as evidenced by higher average final body weight, while treatment groups fed diets containing 10, 20 and 30 percent DPM had comparatively lower weights. Among the DPM fed groups the one that received 20 percent DPM in the diet showed lowest final body weight. The trend of the results was more or less similar when comparison of weekly body weights was made. However, no possible explanation can be offered for the apparently poor body weights of the treatment group that received 20 percent DPM in the diet over the 30 percent DPM fed group.

The data on body weight gain at 8 weeks of age when subjected to statistical analysis revealed that the variations observed among the four dietary treatments were highly significant ($P < 0.01$) suggesting that the level of DPM in the diets greatly influenced the body weight gains. When the means were compared using critical difference, it further revealed that the difference in the mean weight gain between diets I and II was not significant statistically, so also the difference between dietary treatments III and IV. Nevertheless, the influence of dietary treatment I and II was significantly different ($P < 0.01$) from dietary treatments III and IV. Thus the results of the present study tended to suggest that incorporation of DPM at a level of 10 percent in broiler ration did not adversely affect the weight gain of broiler chicks. With 10 percent DPM in the diet the growth of broiler chicks was almost similar to those fed control diet and hence favoured the use of DPM in broiler rations at this level. The significant depression in growth with 20 and 30 percent DPM in the diets might possibly be due to the effect of either a higher concentration of NPN compounds or due to larger proportion of undigestible protein fractions. This needs further investigation to explore the possibility of adopting suitable processing techniques or to make nutrient adjustments to enable higher levels of incorporation in broiler diets.

Analysis of weekly body weight gains of the broiler chicks in the different dietary treatments showed that the maximum gain in weight was achieved in their sixth week of age uniformly in all the groups. Different levels of DPM in the diets did not affect this trend of results. Incidentally, this finding suggests that production of light weight broilers for special markets like tandoori chicken is more economic than raising them to heavy weights.

The growth responses obtained in this study is in agreement with those reported by Flegal and Zindel (1970) who found that both weight gain and feed efficiency were depressed in chicks fed 20 percent DPM in their diet. Report of Lee and Blair (1973) that broilers could tolerate only 5 percent DPW and that levels of 10 or 20 percent depressed growth significantly, partially agrees with the findings in this study. However, the present results are in contrast to those obtained by Bhargava and O'Neil (1975) who opined that incorporation of DPM even at 20 percent level did not bring about any adverse effect on growth characteristics when the diet was isocaloric and isonitrogenous.

Feed efficiency

It was revealed from the study that the feed efficiency was better at 6th week than at 8th week of age among all the groups irrespective of the dietary treatments. Nevertheless, the efficiency was the best for the group that received no DPM in the diet and least for the one that received 20 percent DPM in their diet. The analysis of the weekly feed efficiency data showed that the differences observed among treatment groups were statistically significant. When the mean weekly feed efficiency data was subjected to finer comparison using critical difference it was revealed that dietary treatments I and II had comparable feed efficiency and these were statistically different from groups fed diets III and IV, the latter two groups recording equally poorer feed efficiency.

It could be seen from table 8 that the birds receiving 20 and 30 percent DPM in their diets had consumed more or less similar quantities of feed as those of dietary treatments I and II, but, failed to show similar magnitude in respect of body weights, thereby suggesting that feed conversion efficiency lowered with higher levels of DPM in the diet. Fuller (1956) observed similar results with autoclaved hen and broiler manure and suggested that the crude protein of manure was utilised some what less efficiently than soyabean oil meal. Likewise, Flegal and Zindel (1970) reported that feed conversion was directly affected in proportion to the level of DPW in the diet. However, their contention that the adverse effect was due to low energy content of poultry waste cannot be fully accepted, since diets containing DPM had been supplemented with varying levels of fat with a view to equalise energy, in the present study. Rinehart *et al.*(1973) also observed a depression in feed conversion when 20 percent DPM was fed to broiler chicks. Decreased feed conversion has been reported by Cunningham and Lillich (1975) with higher levels of DPM. All these reports and observation made in the present study indicate a possible lack of nutrient utilisation with increasing levels of DPM in the diet.

The linear increase in feed consumption reported by Rinehart *et al.*(1973) with DPW in the diet did not appear to be true in the present study. In fact, feed intake was much lesser with 20 percent DPM in the diet while with other levels, there was no appreciable change in the quantum of feed consumed.

Mean carcass yields and losses

Shrinkage

The percent fasting shrinkage among the different dietary treatments were more or less similar. However, the average shrinkage observed in the study was much lower than those reported by Ranganathan et al. (1967) and Prabhakaran and Ranganathan (1971). The discrepancy between the results obtained in the present study and those reported by the above authors is possibly due to breed differences and/or the variation in the fasting period employed in these studies. In general, the values obtained in this study are within normal range as suggested by Mountney (1966).

Dressed yield

The percent dressed yield among the four dietary treatments varied from 89.69 to 90.32 with an overall mean of 90.07. The differences among dietary treatments in respect of this trait were not statistically significant. The range of percent dressed yield reported in the present study agrees well with those reported by Mathur and Ahmed (1968), Jull (1951) and Nair (1976).

Eviscerated yield

The percentage eviscerated yield for the four different dietary treatments were in the range of 64.54 to 67.08. These values are within the normal limits hitherto reported for broilers. The closeness of the value among the different dietary treatments suggested that incorporation of DPM had no influence on this parameter.

The percentage giblet yield for the four dietary treatment groups were more or less similar and within the normal range.

Ready to cook yield

The overall mean ready to cook yield percent of 71.34 observed in the present study is in close agreement with the values reported by Jull (1951) Mountney (1966), and Mathur and Ahmed (1968). The values for the four dietary treatments varied from 70.16 to 72.10 percent. However, when the data was subjected to statistical analysis it was observed that incorporation of DPM even at a higher level of 30 percent did not materially affect the ready to cook yield of broilers.

Yield of inedible parts

Blood

The absence of any significant difference among the dietary treatments for the percentage of blood yield suggested that this parameter was not affected by the dietary treatments. The overall mean value of 4.21 percent with a range of 4.10 to 4.35 is within normal limits recorded earlier (Jull, 1951., Card and Nesheim, 1972).

Feathers

Incorporation of DPM in the diet had no influence on the percentage feather yield in broilers. The mean feather yield observed in this study is well within the normal range reported by Jull (1951) and Prabhakaran (1968).

Head

The percentage weight of head obtained from the birds of the four dietary treatments were generally similar. The overall mean of 4.7 percent appeared to be slightly higher than those reported by Mountney (1966) but is fairly in agreement with those reported by Prabhakaran (1968)

Viscera

The absence of any striking difference among the values in respect of percentage viscera for the four different dietary treatments suggested that incorporation of DPM in the ration had no influence on the weight of viscera. The overall mean value obtained in this study was slightly lower than those reported by Prabhakaran (1968). This difference might possibly be due to the differences in fasting period and the breed of chicken employed in these studies.

Legs

The percentage yield of legs among the four dietary treatments are fairly close. The overall mean value is slightly higher than those reported by Prabhakaran (1968). The higher values obtained in the present study may be due to the fact that the growth of long bones in the broilers tested in the present study is more than the White Leghorns and Rhode island red birds used by the above author.

Mortality

The mortality observed in this study can be considered negligible. The absence of any pathological lesions, in the two birds died during the course of the experiment, that could be ascribed to feeding of DPM clearly indicated that incorporation of DPM even at higher levels (30 percent) did not produce any harmful effect. Further, it also revealed that the sun dried DPM employed in this study was devoid of any pathogen and that autoclaving need be resorted to only when the manure is suspected to contain harmful micro-organisms.

SUMMARY

SUMMARY

A feeding trial to evaluate the nutritive value of dried poultry manure for broilers was conducted and the results are presented in this thesis.

One hundred and sixty commercial broiler chicks, one-day-old, were subjected to four dietary treatments, viz. 0, 10, 20 and 30 percent DPM. Each treatment group had two replicates with twenty chicks each. They were raised in battery.

Data on weekly body weight, feed consumption and feed efficiency ratio were recorded. Six birds from each treatment were randomly selected and were subjected to slaughter studies using conventional techniques. Data on yields and losses were computed.

The following conclusions were drawn based on the present study.

Dried poultry manure can be used in broiler ration upto 10 percent without adversely affecting body weight gains and that higher levels of incorporation (20 or 30 percent) resulted in significantly poor gain in weight. Further work encompassing processing techniques and balancing finer nutrients is suggested to overcome the growth depressing effect at higher levels of incorporation.

The maximum weight gain was achieved at the sixth week of age irrespective of the diets.

The feed efficiency was better at 6 weeks of age than at 8 weeks irrespective of the dietary treatments. The

maximum feed efficiency was recorded by the control group while the poorest feed efficiency by birds fed 20 percent DPM irrespective of the age.

The slaughter data in general were within normal range and were not influenced by dietary treatments.

Based on the above results it appears reasonable to conclude that DPM can be exploited as a poultry feed ingredient and that it can be used upto 10 percent in rations meant for broilers to economise broiler production.

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ABSTRACT

UTILISATION OF DRIED POULTRY MANURE IN BROILER RATIONS

BY

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ABSTRACT OF A THESIS

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ABSTRACT

An experiment was designed to study the effects of feeding three levels of dried poultry manure on broiler traits. One hundred and sixty commercial broiler chicks were divided randomly into eight groups of twenty chicks each to form four treatments of two replicates. The four dietary treatments were 0, 10, 20 and 30 percent DPM in the diet. The diets were isocaloric and isonitrogenous.

Weekly body weights, weekly feed consumption and feed conversion efficiency were recorded. At eight weeks of age, six birds from each treatment were subjected to slaughter studies. The results of the study indicated that DPM can be used as a poultry feed ingredient without deleterious effect only upto 10 percent in broiler ration to economise broiler production. It further revealed that incorporation at higher levels (20 and 30 percent) significantly depressed growth. The feed efficiency was almost comparable among the treatment groups. Analysis of slaughter data revealed no significant difference among dietary treatments.

Based on the above results, it appears reasonable to conclude that DPM can be exploited as a poultry feed ingredient and that it can be used upto 10 percent in the rations meant for broilers to economise broiler production.