The Effect of Payzone on Growth Rate and Feed Efficiency of Broiler Chicks

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SUMMARY

Including Payzone at 10ppm in the ration of broiler chicks produced highly significant increases in both average body weight ($P<0.05$) and total gains ($P<0.05$). Average gains were also significantly higher ($P<0.05$) for the Payzone-treated birds. Feed efficiency, carcass weights, liver and pectoral muscle weights were also increased, but not signicantly by Payzone feeding. There was no significant difference in either carcass characteristics or quality, but mortality was 10.5% higher in the control than the Payzone-treated group.

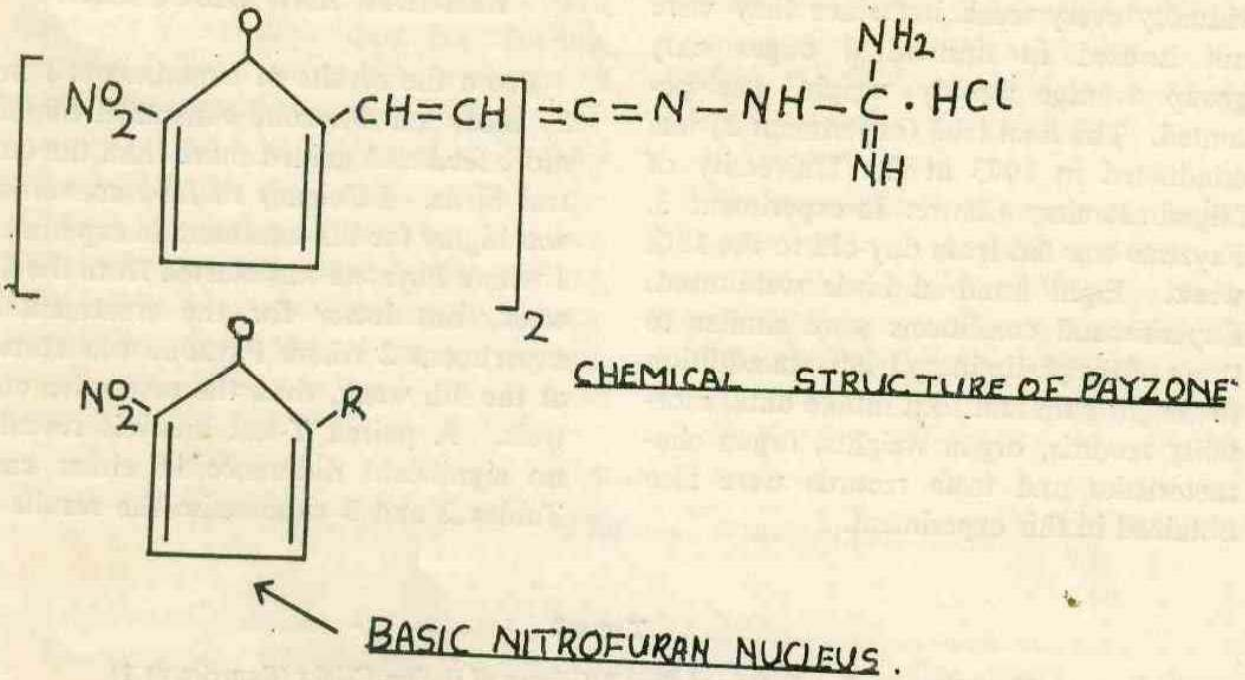
When Payzone was fed from eight weeks, there was a detectable increase in feed consumption, feed conversion efficiency and total gain — all in in favour of the treatment. On the other hand when Payzone was fed from nine weeks, efficiency of feed conversion was slightly lower, on the average, for the treatment. Significant differences were obtained only when Payzone feeding was started from day-old. These results tend to indicate that the optimum effectiveness of Payzone in broiler feeds would lie in the starter stage — a stage when it would seem logical that its bacteriostatic effect on the growing chick would be most efficacious and beneficial.

INTRODUCTION

GROWTH stimulating substances have been widely used in Animal Feeding Industry to stretch production output beyond the maximum capability of the phenotype. Nitrofurans fed to various classes of livestock as chemotherapeutic agents have produced increases in growth rate and feed efficiency (Creek, Dendy and Hinners, 1959), egg production and egg-feed ratio (Dean and Stephenson, 1958; Obibuaku, Sunde and Bird, 1966). Nitrofurans have also been used to control subclinical and clinical diseases in swine (Guthrie and Briggs, 1956; Guthrie 1958, Mead, Hanson, Prouty and Teter, 1957; Felgate and Swann, 1956), poultry (Cover, Mellen and Gill, 1955; Smith 1955; De Blieck, Kraneveld, Hoogendoom and Zwiep, 1954) and calves (Jackson, 1961, Osborne, Mochrie and Batte, 1959). In addition to their established efficacy nitrofurans appear to have the least association with health hazards, of all the known growth-stimulating substances.

The exact nature of their mode of action is not certain, but the nitro-group in the 5-position of the basic nitrofuran nucleus is believed to possess anti-microbial activity which may interfere with some aspect of microbial reproduction (Cramer and Dodd, 1946; Johnson and Van Ryzin, 1960; Nelson and Stenberger, 1952), or constitute a metabolic inhibitor (Asnis, Glick, and Ftitz, 1957). Some reports indicate that this bacteriostatic role of the nitrofurans may have nutrient sparing effects. This feature is of special importance to developing countries where scarcity of feedstuffs and high production costs seriously limit livestock production.

Payzone is a relatively new synthetic compound with the basic nitrofuran nucleus. The molecular formula is 1, 5-bis (5-nitro -2-furyl) 1, 4-pentadien -3-one amidinohydrazone hydrochloride.
According to the American Cynamid Company it is virtually unabsorbed from the gastrointestinal tract, leaves no tissue residues and exhibits a wide margin of safety. Experiments by the same company established its acute toxicity level at 12,800 mg/kg from a single oral dose on chicks and 4,500 mg/kg for a single intraperitoneal dose. These levels are above



CHEMICAL STRUCTURE OF PAYZONE

the prescribed level of 10 ppm in mixed rations. Experiments by Cynamid of Great Britain reported significant increases in liveweight and feed-gain ratio at 3, 6 and 9 weeks for broilers. Average feed saved was 5%.

EXPERIMENTAL PROCEDURE

Two preliminary trials, (experiments 1 and 2) were carried out in 1972 at the Federal Agricultural Research and Training Station, Umudike and the University of Nigeria Poultry Centre, respectively. Each of the preliminary trials involved 200 ANAK broiler chicks, randomly grouped into four units of 50 birds each. Two units constituted the treatment while the other two units, the control. The treatment and the control were each replicated once. All chicks went on the experiment at the end of seven or eight weeks respectively for experiments 1 and 2, when the chick starter mash in each case was replaced by a growing/finishing mash

Payzone was mixed into the ration of the treated group at 10 ppm. The basal ration was a 20% protein commercial feed which was balanced for minerals and amino acids. Table 1 shows the proximate composition of the basal ration. All birds were housed in a deep litter broiler house with identical environmental conditions prevailing in all the pens. Feeding was *ad libitum* and the left-over feed was collected, weighed and recorded weekly. Watering was uniform and liberal. Birds were weighed indi-

TABLE 1

Proximate Composition of the Basal Ration

Proximate Fraction	*Broiler Starter* [a]	*Broiler Finisher* [b]
	%	%
Dry matter	89.70	84.40
Crude protein	18.38	17.38
Ether extract	3.50	3.00
Crude fiber	3.60	3.78
Ash	4.50	3.50
NFE	59.72	56.74

[a] Experiments 1,2 and 3; [b] Experiment 3.

vidually every week but since they were not housed in individual cages only group average weekly weights are pesented. The final trial (experiment 3) was conducted in 1973 at the University of Nigeria Poultry Centre. In experiment 3, Payzone was fed from day-old to the 13th week. Eight hundred birds were used. Experimental conditions were similar to those of the preliminary trials. In addition to weight gain and feed intake data, mortality records, organ weights, organ characteristics and taste records were also obtained in this experiment.

RESULTS AND DISCUSSION

From the results of experiments 1 and 2, birds on Payzone consumed Slightly more feed and gained more than the control birds. Efficiency of feed conversion was higher for the treatment in experiment 1 where Payzone was started from the 8th week, but lower for the treatment in experiment 2 where Payzone was started at the 9th week, than the respective controls. A paired T-test analysis revealed no significant difference in either case. Tables 2 and 3 summarise the results of

TABLE 2

Feed Consumption, Gains and Feed Efficiency of Broiler Chicks (Experiment 1)

Weeks	8	9	10	11	12	*Mean*
Feed consumed per week, kg.	T 54.22	60.67	74.48	78.09	83.29	70.14
	C 54.84	59.67	75.59	74.01	82.81	69.58
Total wt. of birds, kg.	T 91.48	115.59	139.72	160.30	191.29	139.68
	C 91.38	113.12	146.56	163.22	188.10	140.47
Total gain, kg.	T 23.27	24.11	24.13	20.58	30.99	24.61
	C 21.76	21.74	33.42	16.68	24.88	23.70
Kg feed/kg gain	T 2.33	2.51	3.08	3.79	2.69	2.88
	C 2.52	2.74	2.26	4.43	3.32	3.05

T — Treatment C — Control

TABLE 3

Feed Consumption, Gains and Feed Efficiency of Broiler Chicks. (Experiment 2)

Week	9	10	11	12	*Average*
Feed consumed per week, kg.	T 64.64	51.32	69.32	68.75	63.48
	C 64.10	46.52	65.28	68.15	61.01(NS)
Total wt. kg.	T 110.64	126.84	146.04	160.28	135.95
	C 108.80	120.00	139.76	156.84	131.35(NS)
Total gain, kg.	T 21.19	16.20	19.20	14.24	17.71
	C 20.74	11.20	19.76	17.08	17.19(NS)
Kg feed/kg gain	T 3.05	3.16	3.60	4.82	3.65
	C 3.09	4.15	3.30	4.00	3.63(NS)

NS = No significant difference. ($P < 0.05$)

experiments 1 and 2, respectively. It is apparent from these data that feeding Payzone from eight or nine weeks to 12 weeks does not have any significant advantage. Feed consumption and gains were higher for the treatments than the controls but these differences were just enough to neutralise each other, resulting in a nearly equal feed gain ratio in each experiment. From the preliminary studies, it was concluded that feeding Payzone as late as the 8th or 9th week did not signifiantly improve productivity or reduce feeding costs in broiler chicks.

In experiment 3, Payzone was included in the ration at day-old and continued until finishing age. Table 4 shows the feed consumption, gains and feed efficiency of the treated and control birds.

TABLE 4

Feed Consumption, Gains aad Feed Efficiency of Broiler Chicks (Experiment 3).

Week	*Average Feed Consumption, gm*		*Average Gain, gm*		*Feed / Gain*	
	T	*C*	*T*	*C*	*T*	*C*
1	143.76	136.96	34.8	26.5	4.12	5.17
2	192.86	170.13	64.6	51.8	2.98	3.28
3	191.36	186.30	52.2	64.2	3.66	2.88
4	268.44	234.43	85.0	70.8	3.16	3.31
5	287.13	294.10	75.6	75.9	3.79	3.87
6	481.16	380.56	170.9	142.5	2.81	2.67
7	517.71	467.89	226.9	205.0	2.37	2.28
8	506.52	523.89	127.1	152.5	3.98	3.41
9	692.13	537.90	270.0	212.7	2.56	2.53
10	773.57	671.70	234.7	162.6	3.30	4.13
11	781.44	718.628	180.0	154.8	4.34	4.64
12	839.66	846.35	495.9	292.6	1.69	2.89
13	865.78	936.56	374.7	284.6	2.31	3.06
Mean	503.19	469.64	184.0	146.0	3.16	3.39
S.E.	0.002		23.30*		0.23	

* Significant ($P < 0.05$)

From the data in table 4, birds on Payzone consumed more feed on the average than control birds. On the other hand, feed gain ratio was higher for the control group. Dean and Stephenson (1958) reported improved feed-egg ratio from feeding furazolidone. In a furadroxyl feeding experiment, Obibuaku *et al* (1966) also reported that more grams of protein were required to produce a given number of grams in the control layers. These results point to a possible nutrient-sparing role of the nitrofurans resulting in a more efficient feed utilization. According to Schaible *et al* (1956) positive response in the efficiency of nutrient utilization as a result of nitrofuran feeding was associated with the presence of a clinical or subclinical disease. In the study being presented, there was an outbreak of Salmonellosis in the 5th week which resulted in a total mortality of 152 birds, 70 % of which were in the control group. Differences in total live-weight gain and

average live-weight gain were significant ($P<0.05$), both in favour of Payzone-treated birds. The treated birds out gained the control group, on the average, by 494 gm or 26 %. On the basis of this performance, the control birds would have finished 23 days earlier.

In a 9-week study, Creek *et al* (1959) obtained significantly higher growth response from feeding furadroxyl at 10 or 25 g per ton to broiler chicks. They also noted a growth depression when nitrofurazone was fed at 50 g per ton. Berg, Hamilton and Bearse, (1956) observed an early growth depression due to nitrofurazone, but noted that this depression was overcome at market time. This observation was not confirmed in this study, but it can be seen from table 4 that differences between treatment and control average live-weight gain became progressively more pronounced towards the latter part of the finishing period.

Table 5 illustrates a similar trend in average body weight between the two groups. At finishing time average body weights were 2.4 kg and 1.9 kg for the Payzone-treated and control birds respectively. Gain: feed ratio reached a maximum value of 0.59 and 0.35 for the treatment and control groups, respectively at the 12th week.

Mortality was 10.50 % higher in the birds which did not receive Payzone than in the Payzone-treated birds. This difference was not statistically significant, but it confirms the bacteriostatic or bacteriocidal role of nitrofurans (Cramer and Dodd, 1946), or their coccidiostatic nature (Johnson and Van Ryzin, 1960).

At the end of the 12th and 13th weeks, 5 % of the birds in each of the two groups were randomly picked for carcass evaluation. These birds were used to obtain carcass (unplucked and plucked) weights, organ weights and characteristics and taste quality.

Tables 6 and 7 show the results of carcass evaluation at 12 and 13 weeks, respectively. From the results, carcass, liver and pectoral muscle weights were higher for the treatment than the control,

TABLE 5

Average Body Weight of Birds (Experiment 3)

Week	*Payzone* g	*Control* g
Initial weight	45.36	45.25
End of 1st week	80.24	71.74
2nd ,,	144.85	123.55
3rd ,,	197.08	188.23
4th ,,	282.09	259.06
5th ,,	357.69	334.96
6th ,,	528.64	477.48
7th ,,	755.54	682.57
8th ,,	882.67	836.06
9th ,,	1152.68	1048.80
10th ,,	1387.38	1211.43
11th ,,	1567.49	1366.25
12th ,,	2063.41	1658.82
13th ,,	2438.16	1943.48
Mean	913.94	788.10
S.E.	59.13**	

** Highly significant treatment differences, ($P<0.01$)

TABLE 6

Carcas, Organ Weights[a] and Taste Scores of Broiler Chicks at 12 Weeks (Experiments 3).

Carcass Weight	*Payzone*	*Control*
Unplucked, kg	2.64	2.22
Plucked, kg	2.36	2.06
Liver weight, gm	14.69	14.19
Pectoral muscle, gm	96.68	80.80
Taste score [b]		
Flavour	3.12	3.00
Juiciness	3.05	3.22
Tenderness	3.00	2.68
Colour	2.75	3.00

[a] Dry matter basis.
[b] Average of seven tests each comprising six panelists.
5 = highest score
0 = lowest score

TABLE 7

Carcass, Organ Weights -a/ and Taste Scores of Broiler Chicks at 13 Weeks

Carcass Weight	*Payzone*	*Control*
Unplucked, kg	2.43	2.07
Plucked, kg.	2.32	1.95
Liver wt. gm	14.82	12.42
Pectoral Muscle wt. gm.	95.24	76.41
Taste Score b/		
Flavour	3.00	3.00
Juiciness	3.05	3.22
Colour	2.42	3.57
Tenderness	2.75	3.00

a/ Dry matter basis.

b/ Average of seven tests each comprising six panelists.
5 = highest score
0 = lowest score

although not significantly. Payzone-treated birds were judged equal or better in tenderness and flavour but slightly inferior in juiceness and colour as compared with the control birds.

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