EFFECT OF FEEDING CLOMIPHENE CITRATE ON CARCASS COMPOSITION OF BROILER

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Summary

Four seasonal trials were conducted to study the effect of feeding clomiphene citrate on carcass composition of broilers. It was fed at 5, 10, 15 mg levels per kg feed for a period of two weeks, 3-4 weeks (S_1), 4-5 weeks (S_2) and 5-6 weeks (S_3) of age. Total carcasses were analysed for moisture, ether extract and protein. Clomiphene citrate significantly decreased the moisture with concomitant increase in ether extract content of the carcasses at all the ages and seasons. Carcass protein was significantly decreased at all the ages and seasons. The responses in the different level of clomiphene citrate is dose dependent. The carcass moisture decreased with age while protein and ether extract contents increased in all seasons. The females had more ether extract and less moisture contents than male. The carcass ether extract was higher in summer and rainy seasons followed by spring and winter seasons, and the differences were significant. A concomitant significant decrease of carcass moisture was observed. The effect of seasons on carcass protein varied at different ages but there appeared to be a trend towards decreasing carcass protein in summer and rainy seasons than winter and spring seasons.
(Key Words: Clomiphene Citrate, Age, Season, Sex, Carcass Composition)

Introduction

Clomiphene citrate 2-[P-(2-diphenyl vinyl) phenoxy] triethyl amine dihydrogen citrate is a synthetic nonsteroidal compound (Palopoli et al., 1961). It has oestrogenic as well as antioestrogenic actions (Holtkamp et al., 1960; Roy et al., 1964). In the rate it has proved to be an antifertility agent as revealed by its gonadotropin, suppressing, antiovulatory, antizygotic and antifecundity effects (Holtkamp et al., 1960; Segal and Nelson, 1961; Segal and Davidson, 1962), but in the human it is capable of inducing ovulation in an ovulatory and oligoovulatory women (Greenblatt and Mahesh, 1970). Most of the work with clomiphene has been concerned with the physiology of reproduction in the laboratory animal and the human. The present investigation was, therefore, undertaken to study the effect of feeding clomiphene citrate on the carcass composition of broiler.

Materials and Methods

Four seasonal trials were carried out with two-week old Shaver Starbro chicks. Clomiphene citrate was fed in the diet at 5, 10 and 15 mg per kg feed levels for a period of two weeks at three different ages, i.e., 3-4 weeks (S_1), 4-5 weeks (S_2) and 5-6 weeks (S_3). One was kept as control. The chicks were distributed in the treatments on equal number, weight and sex basis. The treatment was replicated twice. The chicks were reared in thermostatically controlled electrically heated battery brooders. The starter mash was fed during the experimental period. The ratio composition is shown in table 1. Housing temperature recorded in different seasons were 28.5 ± 0.91, 33.58 ± 0.67, 35.95 ± 0.51 and 37.62 ± 0.33°C in summer, 36.27 ± 0.68, 33.14 ± 0.89, 34.25 ± 0.67 and 34.09 ± 0.76°C in rainy, 17.62 ± 0.87, 17.74 + 0.24, 17.82 ± 0.32 and 16.43 ± 0.50°C in winter and 21.79 ± 0.40, 24.13 ± 0.49, 23.33 ± 0.56 and 21.15 ± 0.72°C in spring during 3rd, 4th, 5th and 6th week of the experimental period.

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TABLE 1. COMPOSITION OF THE RATION

Ingredients	%
Maize	52.0
Ground nut cake	30.0
Fish meal	14.0
Dicalcium phosphate	3.2
Vitamin & mineral mixture[1]	0.8
Estimated chemical composition:	
ME (kcal/kg)	2294.00
Crude protein (%)	23.07
Ether extract (%)	4.74
Crude fibre (%)	6.16

[1] *Supplied per kg diet:*
NaCl, 5g; $MnSO_4$, 0.33g; $MgSO_4$, 1.15g; KI, 3 mg; $FeSO_4$ $7H_2O$, 0.28g; $CuSO_4$ $5H_2O$, 8mg; ZnO, 97mg; Vit. A, 12,375 I.U.; Vit. D_3, 1,800 I.C.U.; Vit. E. 40 I. U., Vit. K, 1.5mg; Vit. B_1, 4mg; Vit. B_2, 7mg; Vit. B_6, 8mg; Vit. B_{12}, 0.004mg; Niacin, 6mg; Calcium pantothenate, 4g.

Four males and four females were randomly taken at the end of feeding period from each treatment and were kept without feed for 12 hr. Water was supplied ad-libitum. The birds were then sacrified by cervical dislocation. The weight of the birds was recorded (table 2). The birds were then dried to a constant weight in a hot air oven at 110 °C. The weight loss during drying was considered as the moisture content of the carcass. The carcasses were then ground in a meat grinder. After mixing thoroughly, duplicate samples were subjected to ether extraction and nitrogen analysis by macro-kjeldahl procedure (AOAC, 1965). Data collected were analyzed using the analysis of variance (Steel and Torrie, 1980) and the significant differences between the treatments were identified by critical difference.

Results and Discussion

Carcass moisture:

It is evident that feeding of clomiphene citrate in the diet significantly reduced ($p < 0.01$) the moisture content of the carcasses at all the ages and seasons (table 3). The responses to the different levels of clomiphene citrate were dose dependent. Clomiphene citrate significantly reduced ($p < 0.01$) the moisture content of the whole carcasses in both the sexes. The responses to the different levels of clomiphene citrate appeared to be similar in both the males and females. This indicates that clomiphene citrate has oestrogenic properties in both the sexes and is similar with the findings of Andrews and Bohren (1947) and Detwiller et al. (1950) who observed that stillbestrol treatment reduced the moisture content of the edible carcasses of cockerels.

The moisture content of the carcasses decreases with age in all the seasons. The results are in agreement with Combs (1968) and Kubena et al. (1972) who observed decreased moisture content with the increase in age. The moisture content was more in male than female. This might be due to sex differences.

The seasonal variation of environmental temperature influenced the moisture content of the carcasses at all the ages. The moisture content of the carcasses was significantly greater ($p < 0.01$) in winter and spring seasons than summer and rainy seasons at all the ages (table 5). The results are in agreement with Kubena et al. (1972), Olson et al. (1972) and Swain and Farrell (1975) who

TABLE 2. THE BODY WEIGHT OF CHICKS AT SLAUGHTER AGE IN DIFFERENT TREATMENTS AND SEASONS (g)

Treatments	Summer			Rainy			Winter			Spring		
	4th week (S_1)	5th week (S_2)	6th week (S_3)	4th week (S_1)	5th week (S_2)	6th week (S_3)	4th week (S_1)	5th week (S_2)	6th week (S_3)	4th week (S_1)	5th week (S_2)	6th week (S_3)
Control	563	690	881	545	650	807	720	907	1158	635	850	1071
5 mg	512	605	787	525	611	755	690	882	1122	602	819	1018
10 mg	530	625	801	532	630	774	680	890	1131	612	821	1037
15 mg	502	595	774	517	601	748	670	871	1128	590	802	1010

observed an increased moisture content of the carcasses at lower environmental temperature.

Carcass ether extract:

Clomiphene citrate feeding significantly increased ($p < 0.01$) the carcass ether extract content at all the ages and seasons (table 3). The responses in the different level of clomiphene citrate appeared to be dose dependent. The increase carcass ether extract due to feeding of clomiphene citrate might be due to the oestrogenic properties of the compound as has been observed by Holtkamp (1966), Roy et al. (1964) and Lee (1974). It is evident from table 4 that clomiphene citrate feeding significantly ($p < 0.01$) improved the carcass fat in both the male and female, indicating that in both the sexes clomiphene citrate act in a similar manner. The carcass fat was increased with age in both the sexes. The results are in agreement with Combs (1968), Kubena et al. (1972) and Plavink and Hurwitz (1983) who also observed increase carcass fat with the increase in age. The females have more carcass fat than male. The results are in agreement with Edwards et al. (1973). The carcass fat was higher in warmer seasons (summer and rainy) followed by spring and winter seasons (table 5) and the differences were highly significant ($p < 0.01$). The similar trend was also observed by Olson et al. (1972) and Swain and Farrell (1975).

Carcass protein:

Clomiphene citrate feeding significantly reduced ($p < 0.01$) the carcass protein at all the ages. The carcass protein seems to be inversely related to the level of clomiphene citrate. This might be due to the oestrogenic properties of the compound. The results are in agreement with Andrews and Bohren (1947) and Detwiller et al. (1950), who observed reduced carcass protein in stilbestrol treated chicks. In both the sexes clomiphene citrate decreased the carcass protein in a similar manner. This indicates that in both the sexes clomiphene citrate acts in a similar way.

The carcass protein was found to increase with age in all the seasons and is obviously related to the well-documented age dependent decrease in carcass water. The results corroborate with the

TABLE 3. EFFECT OF FEEDING CLOMIPHENE CITRATE ON BODY COMPOSITION OF MIXED-SEX BROILER AT DIFFERENT AGES AND SEASONS (%)

Treatment	Summer			Rainy			Winter			Spring		
	4th wk.	5th wk.	6th wk.	4th wk.	5th wk.	6th wk.	4th wk.	5th wk.	6th wk.	4th wk.	5th wk.	6th wk.
Moisture												
Control	69.0^{c}	68.7^{c}	68.4^{c}	69.0^{c}	68.8^{b}	68.8^{b}	72.3^{b}	71.8^{b}	72.2^{c}	71.5^{c}	71.1^{b}	70.6^{c}
5 mg	68.2^{b}	68.0^{b}	67.8^{b}	68.2^{b}	67.7^{a}	67.5^{a}	71.7^{a}	71.2^{a}	70.8^{bc}	71.2^{b}	70.7^{a}	70.3^{b}
10 mg	67.8^{a}	67.5^{a}	67.2^{a}	67.7^{a}	67.5^{a}	67.3^{a}	71.3^{a}	70.8^{a}	70.2^{a}	70.8^{a}	70.4^{a}	69.9^{a}
15 mg	68.0^{ab}	67.7^{ab}	67.2^{a}	67.9^{ab}	67.7^{a}	67.4^{a}	71.4^{a}	71.0^{a}	70.4^{ab}	70.9^{ab}	70.5^{a}	70.1^{ab}
Ether extract												
Control	8.6^{a}	8.8^{a}	9.3^{a}	8.5^{a}	8.7^{a}	9.2^{a}	5.8^{a}	7.0^{a}	7.9^{a}	7.4^{a}	8.2^{a}	8.5^{a}
5 mg	8.9^{b}	9.1^{ab}	9.9^{ab}	9.2^{b}	9.3^{b}	10.0^{b}	6.7^{b}	7.4^{b}	8.9^{b}	7.7^{b}	8.7^{b}	9.2^{b}
10 mg	9.5^{c}	9.8^{b}	10.8^{b}	9.3^{b}	9.7^{b}	10.2^{c}	7.1^{b}	8.2^{c}	9.5^{c}	8.0^{c}	8.9^{c}	9.4^{b}
15 mg	9.2^{b}	9.7^{b}	10.4^{b}	9.1^{b}	9.5^{b}	10.3^{c}	6.9^{b}	7.6^{b}	9.2^{bc}	7.8^{bc}	8.8^{bc}	9.2^{b}
Crude protein												
Control	17.7^{b}	17.8^{b}	18.0^{c}	17.3^{b}	17.9^{c}	18.2^{c}	17.7^{b}	18.0	18.2^{b}	17.8^{b}	17.9^{c}	18.2^{b}
5 mg	16.9^{a}	17.1^{a}	17.5^{ab}	16.8^{a}	17.5^{b}	17.8^{b}	17.4^{a}	17.3	17.9^{a}	17.3^{a}	17.6^{bc}	17.9^{ab}
10 mg	17.3^{ab}	17.5^{b}	17.6^{bc}	16.8^{a}	17.6^{b}	17.9^{ab}	17.5^{ab}	17.6	18.1^{ab}	17.5^{ab}	17.4^{ab}	17.7^{a}
15 mg	16.6^{a}	16.9^{a}	17.3^{a}	16.7^{a}	17.1^{a}	17.6^{a}	17.3^{a}	17.3	17.9^{a}	17.1^{a}	17.2^{a}	17.4^{a}

Within each criterion, figures superscribed with the same letters in the column do not differ significantly from each other ($p < 0.05$).

TABLE 4. EFFECT OF FEEDING CLOMIPHENE CITRATE ON BODY COMPOSITION IN MALE AND FEMALE BROILERS AT DIFFERENT AGES (POOLED DATA OF ALL THE SEASONS) (%)

Treatments	Male			Female		
	4th wk.	5th wk.	6th wk.	4th wk.	5th wk.	6th wk.
Moisture						
Control	70.8^{b}	70.5^{b}	70.1^{c}	70.0^{c}	69.7^{c}	69.2^{c}
5 mg	70.1^{a}	69.7^{a}	69.6^{b}	69.5^{b}	69.0^{b}	68.6^{b}
10 mg	69.9^{a}	69.5^{a}	69.1^{a}	68.9^{a}	68.6^{a}	68.2^{a}
15 mg	70.0^{a}	69.7^{a}	69.3^{a}	69.0^{a}	68.8^{ab}	68.3^{a}
Ether extract						
Control	7.1^{a}	7.6^{a}	8.1^{a}	8.1^{a}	8.8^{a}	9.4^{a}
5 mg	7.9^{b}	8.1^{ab}	8.0^{b}	8.4^{ab}	9.2^{b}	10.1^{b}
10 mg	8.3^{c}	8.7^{b}	9.4^{c}	8.7^{b}	9.9^{bc}	10.5^{c}
15 mg	7.8^{b}	8.4^{b}	9.2^{bc}	8.4^{ab}	9.4^{b}	10.2^{b}
Crude protein						
Control	17.9^{c}	18.1^{c}	18.4^{c}	17.4^{b}	17.6^{c}	17.9^{c}
5 mg	17.3^{bc}	17.6^{ab}	18.0^{b}	16.9^{a}	17.2^{a}	17.5^{b}
10 mg	17.5^{b}	17.7^{b}	18.1^{b}	17.0^{a}	17.3^{bc}	17.6^{b}
15 mg	17.0^{a}	17.3^{a}	17.7^{a}	16.7^{a}	17.0^{a}	17.3^{a}

Figures superscribed with the same letters in the colum do not differ significantly from each other ($p < 0.05$).

TABLE 5. EFFECT OF SEASON AND AGE ON CARCASS COMPOSITION OF BROILERS (%)

Age	4th week			5th week			6th week		
Seasons	Moisture	Ether extract	Protein	Moisture	Ether extract	Protein	Moisture	Ether extract	Protein
Summer	68.3^{a}	9.1^{c}	17.1^{a}	68.0^{a}	9.4^{c}	17.3^{a}	67.7^{a}	10.1^{b}	17.6^{a}
Rainy	68.2^{a}	9.0^{c}	19.9^{a}	67.9^{a}	9.3^{c}	17.5^{b}	67.7^{a}	9.9^{b}	17.9^{b}
Winter	71.7^{c}	6.6^{a}	17.5^{b}	71.2^{c}	7.6^{a}	17.6^{b}	70.7^{c}	8.9^{a}	18.0^{b}
Spring	71.1^{b}	7.7^{b}	17.4^{b}	70.7^{b}	8.7^{b}	17.5^{b}	70.2^{b}	9.1^{c}	17.8^{b}

Figures superscribed with the same letters in the column do not differ significantly from each other ($p < 0.05$).

findings of Kubena et al. (1972), Edwards and Denman (1975) and Plavnik and Hurwitz (1983) who observed increase carcass protein with increase in age. No consistant significant differences in protein content at different ages between the four seasons were observed, although there were a trend towards and increase in carcass protein in winter and spring seasons than summer and rainy seasons (table 5). A similar trend was also observed by Kubena et al. (1972).

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