

APPLICATION OF COMMERCIAL SANITIZERS IN CHICKEN HOUSES

PART I. GROWTH AND MEAT QUALITY

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Four disinfectants employed as sanitizer in the chicken houses were TH4, Prophyl, Beloran and Fourtedes. This phased study was completed in 45 days. The stimulating effect showed considerable variability in all the four disinfectants. The mean values of feed conversion ratios of the experimental groups were better than the control group. Gross pathological study of trachea, lungs and liver was also carried out. Application of all the four sanitizers was found to be safe as no toxic effects were recorded. Chemical analysis of meat derived from these chickens showed non significant variations within a narrow range. Except for the fat and moisture content the parameters other tested showed nonsignificant differences ($P>0.05$).

Key words: Broiler, Sanitizers, Growth, Meat.

Introduction

Poultry production remains the most efficient method of procuring high quality dietary proteins. Present day intensive poultry farming is confronted with different stress factors like extreme environment, poor hygiene and diseases. To overcome the poor hygienic conditions and as a precautionary measures against spread of diseases, periodic sprays of different types of sanitizers are undertaken. Some disinfectants can be used and considered safe even in the presence of birds.

The quarternary ammonium compounds are powerful germicidal compounds and one of the most useful antibacterial weapons applied in those industries where sterilization is of paramount importance. These are mostly effective at high dilutions and are relatively non-toxic, non irritating and inexpensive. Their marked surface active properties increase their general utilization (Adelson and Sunshine 1952). These compounds are recommended especially for disinfection of eggs and for general use around hatcheries (Calneck 1991). Balloun (1955) presented data to show that on testing 4-alkyl quaternary ammonium derivatives consistently improved efficiency of feed utilization. Similarly another commercial detergent, sodium alkyl aryl sulphonate was studied by Almquest and Merrit (1955). It was found that in a turkey growing mash, it had very slight effect on growth but improved the efficiency of feed utilization in all comparisons.

Other researchers who have contributed notable work in this area are Dhillon *et al* (1982), Ruiter (1985), Deichmann (1994)

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and Einstein *et al* (1994). Some other detergents used in the poultry industry include benzalkonium chloride and phenolic compounds. The former has strong antibacterial activity for skin sterilization, mucous membrane and deep wounds whereas the commercial phenolic compounds find still wide use, being cost effective bacteriostatic preservatives (Brander *et al* 1991).

In Pakistan, poultry farmers and practitioners are confronted with the major problem of controlling outbreaks of infectious diseases due to contaminated surroundings of the flock in spite of the use of high doses of antibiotics.

For complete sanitization of poultry sheds in the presence of birds, highly effective and harmless disinfectants are needed. At present a number of sanitizers are in use. The present study was undertaken to collect data on safety and efficacy of four of the common sanitizers used in the presence of birds - namely, TH₄ of Sogvel of France, Fourtedes of Alveton GmbH of Germany, Prophyl of Merial Labs, France & Beloran of Ciba Geigy, Switzerland. The results provide a sound basis for selecting a good sanitizer for the poultry industry.

Materials and Methods

This study was conducted during January to February 1996 to determine the pathological effects of four commercially available disinfectants in broiler chickens. Details of the sanitizers used in this study are given in Table 1.

Experimental chicken design. One hundred and twenty five broiler chicks procured from local market were divided equally into 5 groups, named A, B, C, D and E as given in

Table 1
Disinfectants and chicken groups

Name of Product	Company	Composition	Dosage	Groups of chickens
TH ₄	Sogvel, France	Didecyldimethyl ammonium chloride Alkyl dimethyl, benzyl ammonium chloride Dioctyldimethyl ammonium chloride Glutarialdehyde Pine Oil Terpeneol	5 ml l ⁻¹ 11 10m ⁻²	A
Prophyl	Merial Laboratories, France	Chloro 4 methyl 3 Phenol 2 Benzyl 4 Chloro Phenol	4 ml l ⁻¹ 11 4m ⁻²	B
Beloran	Ciba Giegy, Switzerland	Benzalkonium chloride	2 ml l ⁻¹ 11 10m ⁻²	C
Fourtedes	Alvetor, Germany	Alkyl-dimethyl-dichloro benzyl ammonium chloride	2 ml l ⁻¹ 11 10m ⁻²	D
Control	-	-	-	E

All groups were reared in different sheds to avoid the cross contamination by another disinfectant. These sheds were, however, adjacently located in the same area. The area of each shed was such that each bird was allowed an area of one square foot. Disinfectants were sprayed on a weekly basis in the sheds of experimental groups in the presence of birds from 1st week to 5th week of the experiment according to the doses recommended by their manufacturing companies.

Table 2
Vaccination Schedule

Age	Vaccine	Company	Route	Dose
7th Day	LaSota	Biotek, Italy	Eye drop	1 vial per 1000 birds
12th Day	Gumboro D-78	Intervet, Holland	Drinking water	1 vial per 1000 birds
17th Day	Hydropericardium	Bio. Vet Lab., Pakistan	S/c injection	1 vial per 500 birds
21st Day	LaSota	Biotek, Italy	Drinking Water	1 vial per 1000 birds
28th Day	Gumboro D-78	Intervet, Holland	Drinking water	1 vial per 1000 birds

table 3. They were reared under normal conditions of management and fed on balanced ration *ad-libitum*. The birds were vaccinated according to the schedule given in table 2.

Parameter determinations. The following parameters were studied / measured after slaughter of the chicken under normal commercial practice.

1. Weight gain by birds

2. Feed intake
3. Feed conversion ratio (FCR)
4. Gross carcass examination
5. Proximate analysis of meat

Gross carcass examination (GCE). The birds were slaughtered on the 45th day of the experiment and trachea, lungs, liver and kidneys from all birds were eviscerated. The following parameters of the organs were thoroughly observed for any gross pathological manifestation:

- i. Size (normal, hypertrophy, atrophy).
- ii. Colour (normal, discolouration/concentrated or diffused, pale).
- iii. Texture (normal, soft, hard).
- iv. Any unusual growth.
- v. Deposition/covering of any material (fibrin/ urates/pigments) etc.

Statistical analysis. The data of all groups was compared by analysis of variance and statistical difference among means of various treatment were determined using Least Significant Difference (LSD) test at 5% level of probability as described by Steel and Torrie (1980).

Sensory evaluation. A ten member consumer panel was constituted to evaluate meat derived from birds of each group. The panel comprised food technologists. Familiar dish of chicken curry was prepared from breast meat of birds of each group. These samples were served in a randomized manner to the panelists along with plain water, standard wheat flour chapati and condiments. The panelists were instructed to use them according to their routine eating habits.

They were asked to indicate as to what extent they liked or disliked each product on a nine (9) point Hedonic scale. The parameters tested were colour, flavour, juiciness, tenderness and over-all acceptability. The first two characteristics were judged by comparing with normal domestic preparation of meat in chicken curry of excellent quality. For tenderness and juiciness the panelists were advised to record their comments after 12 chews of each piece of meat.

Score Scale

Dislike, extreme.....1
Like, extreme.....9

Results and Discussion

The results of the experimental work are summarised in Tables 3-7.

The study on the use of four different disinfectants, in the presence of birds, revealed all the carcasses to be normal; no cuts or bruises were observed. There was sufficient fat on the

breasts and legs to prevent a distinct appearance of flesh through the skin. All the carcasses were well fleshed. Bones were normal and not disjointed or broken. Fat deposits on the heart crowns were normal. The examination of frozen carcasses revealed that there were no freezing defects in the birds of any group.

The primary concern in the 45 days study was effect of some commercial disinfectants/ sanitizers on the growth rate. The mean values of weight gained by the birds of the treated groups as shown in Table 1 were more than the mean values of control ones. Statistical analysis shows that, except for the group A birds, the mean values of weight gain vary with the type of disinfectant used. Synthetic sanitizers can also stimulate growth, (Ely and Schott 1952). Lillie *et al* (1958) further singled out blends of quaternary ammonium compounds (QAC) as growth improvers. Whitehill *et al* (1950) and Mariakuladai (1952) have opined that antibiotics improve growth rates of chickens possibly by increasing the intestinal absorption of vitamins. According to Almquist and Merrit (1955) the detergents improve the efficiency of feed utilization. The results of the present study are in line with the findings of the above workers.

Increase in the weight gain of the treated birds can be ascribed to two reasons: Firstly the disinfectants sprayed in the chicken houses during this study may have stimulatory effect on the hormonal balance and the metabolic reactions in broiler chicken; secondly, improvement in the quality of the environment acts as a conducive factor for the better growth. The considerable variability, observed, in stimulating effect of four disinfectants, is perhaps due to different percentages and types of the active ingredients in them.

The mean values of FCR (Feed Conversion Ratio) measured at the end of the 45 days study were more for the experimental groups of birds than for the control ones (Table 5). However, the poorest values amongst the experimental birds were shown by group A birds. Statistical analysis (Table 5) of the mean FCR values show that the values of groups B, C and D were significantly different ($P < 0.05$) from the experimental group A and the control group E.

Experimental group C chickens were best performers in terms of weight gain and feed consumption. During early growth period, upto 30 days of age, Beloran treatment (C group) was more effective for promotion of growth. However, at the last stage of growth period (30-45 days), group B exhibited some sort of compensatory effect and FCR value of chickens of the group came out to be slightly better (Table 6) at the end of the study.

Table 3
Average weight gain

Group	Treatment	Grams (Mean \pm SD)		
		15 Days	30 Days	45 Days
A	TH ₄	283.4 \pm 16.13 ^{bc}	958 \pm 55.06 ^{NS}	1761.2 \pm 57.07 ^c
B	Prophyl	293.6 \pm 21.03 ^{bc}	938 \pm 73.00 ^{NS}	1839.8 \pm 61.52 ^{bc}
C	Beloran	305.8 \pm 11.0 ^{ab}	1002.2 \pm 27.31 ^{NS}	1957.6 \pm 68.54 ^a
D	Fourtedes	319.8 \pm 16.81 ^a	977.6 \pm 87.62 ^{NS}	1910 \pm 93.00 ^{ab}
E	Control	280.2 \pm 14.87 ^c	895 \pm 56.86 ^{NS}	1753 \pm 89.41 ^c

SD : Standard Deviation;
abc : Any two means carrying the same superscripts in a column are non significant between each other and that carrying the different superscripts are significant between each other at 5% level using LSD;
NS : Non-significant.

Table 4
Feed consumption

Groups	Treatment	Grams (Mean \pm SD)		
		15 Days	30 Days	45 Days
A	TH ₄	408 \pm 5.83 ^{NS}	1688 \pm 28.63 ^{bc}	3939 \pm 121.26 ^b
B	Prophyl	414 \pm 22.74 ^{NS}	1683 \pm 42.63 ^{bc}	3963.6 \pm 119.98 ^b
C	Beloran	426 \pm 23.02 ^{NS}	1718 \pm 21.35 ^a	4274.4 \pm 61.47 ^a
D	Fourtedes	430 \pm 20.84 ^{NS}	1715 \pm 16.04 ^{bc}	4143 \pm 167.03 ^a
E	Control	423 \pm 23.07 ^{NS}	1662 \pm 56.35 ^a	3961 \pm 137.25 ^b

SD : Standard Deviation;
abc : Any two means carrying the same superscripts in a column are non significant between each other and that carrying the different superscripts are significant between each other at 5% level using LSD;
NS : Non-significant.

Table 5
Feed conversion of the experiments

Groups	Treatment	(Mean \pm SD)		
		15 Days	30 Days	45 Days
A	TH ₄	1.45 \pm 0.08 ^{NS}	1.76 \pm 0.11 ^{NS}	2.23 \pm 0.03 ^a
B	Prophyl	1.41 \pm 0.12 ^{NS}	1.79 \pm 0.15 ^{NS}	2.15 \pm 0.04 ^b
C	Beloran	1.39 \pm 0.11 ^{NS}	1.78 \pm 0.16 ^{NS}	2.16 \pm 0.05 ^b
D	Fourtedes	1.34 \pm 0.08 ^{NS}	1.75 \pm 0.17 ^{NS}	2.17 \pm 0.06 ^b
E	Control	1.5 \pm 0.09 ^{NS}	1.82 \pm 0.1 ^{NS}	2.25 \pm 0.04 ^a

SD : Standard Deviation;
abc : Any two means carrying the same superscripts in a column are non significant between each other and that carrying the superscripts are significant between each other at 5% level using LSD;
NS : Non-significant.

The birds of C group by all quality standards were healthy; lungs, kidneys and livers of the groups D and E were also normal. Kidneys of A and B group birds were slightly increased in size with urates deposited in them. Besides, their livers were also atrophied. However, lungs of all the birds were of normal size and shape.

Table 4
Proximate analysis of experimental chicken meat

Groups	Treatment	Mean±SD				
		pH	Moisture (%)	Protein (%)	Fat (%)	Ash (%)
A	TH ₄	5.81 ^{NS}	69.38 ^{NS}	23.17 ^{NS}	7.01 ^{NS}	1.16 ^{NS}
		±0.11	±3.38	±3.31	±0.48	±0.15
B	Prophyl	6.11 ^{NS}	72.9 ^{NS}	20.90 ^{NS}	7.73 ^{NS}	1.03 ^{NS}
		±0.47	±2.96	±2.31	±1.18	±0.15
C	Beloran	5.98 ^{NS}	72.66 ^{NS}	22.53 ^{NS}	6.23 ^{NS}	1.18 ^{NS}
		±0.20	±5.21	±2.78	±1.22	±0.12
D	Fourtedes	5.67 ^{NS}	72.83 ^{NS}	21.36 ^{NS}	8.18 ^{NS}	1.102 ^{NS}
		±0.27	±1.91	±1.66	±1.83	±0.13
E	Control	5.95 ^{NS}	71.45 ^{NS}	24.73 ^{NS}	8.48 ^{NS}	1.00 ^{NS}
		±0.28	±1.88	±1.41	±0.68	±0.08

SD : Standard Deviation.

NS : Non-significant

Table 5
Test and panel score of experiments

Groups	Treatment	Colour	Flavour	Juicines	Tenderness	Overall acceptability
A	TH ₄	7	6	7	8	7
B	Prophyl	6	7	8	8	8
C	Beloran	7	8	7	7	8
D	Fourtedes	8	9	8	6	7
E	Control	8	8	8	7	8

1, dislike extremely; 9 like extremely.

This study indicates that there is no significant difference between consumer acceptance of the meats derived from chickens of treated and control groups with regard to chemical composition (Table 6) and sensory characteristics (Table 7)

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