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## A Preliminary Investigation in Trinidad on the use of an *Aloe barbadense* pulp Extract in the Starter and Finishing Phases of Broiler Production

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### ABSTRACT

The purpose of this experiment was to carry out a preliminary comparison of growth rates, Feed Conversion efficiencies (FCR), Dressing percentages (DP) and from two batches of broilers reared under standard management practices except that to one batch only, Aloe vera (*Aloe barbadense*) pulp was added to the drinking water. Broiler weights via pen and pen X sex were subjected to ANOVA for the seven weeks of the trial. During the second ( $P < 0.0001$ ) and third ( $P < 0.05$ ) weeks mean broiler weights for the aloe added water pen was significantly higher than that of broilers fed conventional feed only. In the third week the feed conversion efficiency (FCR) for the aloe added water pen was numerically lower (1.16) than that of the conventional feed (1.31). The dressing percentages of dressed carcass and taste characteristics were not different ( $P > 0.05$ ) for the two diets. From preliminary observations, the use of aloe vera extracts could be a simple mechanism to reduce the cost of feeding of broilers in poultry production.

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### INTRODUCTION

The poultry industry in Trinidad and Tobago comprises over 3,000 traditional cottage or small-scale poultry processors, four conventional processing plants and over 500 contract farmers. The industry produces in excess of 40 million heads of finished broilers per annum, or 80,000 tonnes, with a value of about 1.4 billion Trinidad and Tobago dollars [1]. However, the bulk of raw materials for feed manufacture are imported, as the country does not produce corn in any competitive quantity for animal feed. Also, feed is about 65% of the cost of a chicken of production at the farm gate. Any practice which reduces the cost of production will be of benefit to the poultry producer.

Aloe Vera (*Aloe barbadense*) grows naturally in Trinidad and is easily available to poultry farmers. Several studies have shown that broilers kept on conventional diets supplemented with Aloe water resulted in improved weight gains without significant improvement in feed conversion ratios (FCR) [2, 3, 4, 5]. In other experiments broilers administered Aloe extracts displayed improved weight gain, and feed intake [5, 6, 7]. Notwithstanding, extracts containing Aloe and turmeric (*Curcuma longa*) combined can result in an improved FCR in early growth [8] whereas dressed weights had improved at high aloe vera concentrations [5, 9]. However, neither abdominal nor breast nor thigh fat weights were different for broilers administered Aloe vera treated water compared to those on non treated water. Organoleptic taste tests on finished products are enhanced or unchanged when compared to untreated controls [9, 10].

Pertaining to immune function, one study have shown that inclusion of Aloe vera powder in broiler diets resulted in an increase of haemagglutination inhibition titers [8] to Newcastle disease virus whereas another study only reported a decrease in mortality and severity of clinical signs in the acute phase of infection [11]. However, several studies have demonstrated that aloe vera extracts can result in significant reduction in oocyst counts and intestinal lesions due to coccidiosis [12, 13, 14]. Hence the plant has the potential to be an antiviral agent, anticoccidial and more recently may also act as a substitute for antibiotics in growth promotion in poultry production [5].

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In Trinidad small scale rural poultry producers traditionally use aloe vera concoctions to purge their birds [15, 16]. Similarly, contracted poultry large scale producers traditionally grind whole leaves of the Aloe barbadense (aloes) plant, and place the macerated extract into a pair of suspended socks into 500 gallons water tanks dispensing water, during the first four weeks of the starter phase of broiler production. Although this practice has been reputed to produce heavier birds, no systematic study in Trinidad has been carried out to verify these ‘claims’ of local farmers. The purpose of this experiment was to carry out a preliminary comparison of growth rates, Feed Conversion efficiencies (FCR), Dressing percentages (DP) and from two batches of broilers reared under standard management practices, except that to one batch only, Aloe vera pulp was added to the drinking water..

### MATERIAL & METHODS

#### Pen Management

Two hundred broiler chicks (Vedette ISA) were divided in two (2) groups placed on deep litter (wood shavings) and assigned two pens. The pens were oriented east to west. Pen space per bird was approximately 0.09 m<sup>2</sup>.

The day-old chicks were vaccinated with Marex- Gumboro - Fowlpox vaccine subcutaneously, and with Newcastle / Bronchitis vaccine administered intraocularly. The starter ration was fed up to the fourth week then gradually changed over to the finisher ration for the next three (3) weeks. Aloe vera pulp was added from the same plant source to one batch only, at rate of 15mls/3L throughout the starter and finishing phases. Table 1 shows the guaranteed feed analysis (Warner Grains Mill Ltd. Trinidad) of the conventional starter and finisher rations (CF) fed to both batches of broilers.

**Table 1.** *Manufacturer guaranteed feed analysis of the starter and finisher rations fed to both batches of broilers*

Feed ingredients	Starter ration %	Finisher ration %
Crude Protein	22	18
Crude Fat	4.55	4.75
Crude Fibre	3.50	3.50
Sodium Monensin	0.10	—
Amprolium hydrochloride	—	0.0125
3- nitro-4-Hydroxyphenyl arsenic acid	45 g/tonne	45 g/tonne

During the first 4 – 5 days, four 1-gallon baby chick waterers and one kilogram galvanize feeders were used in the brooding area. During the first week, four 200 watt bulbs were used at ground level in an enclosed area for brooding. These were gradually raised to the ceiling and provided light up to the finishing period. At the end of the first week, both batches of broilers were allowed water via an automatic watering system.

Birds were weighed once per week on early mornings. Birds were allowed fixed amounts of feed and feed eaten was determined by weekly differences in weights of the previously filled feed pans. Weekly feed conversions (feed eaten per unit gain) was calculated from the weighing of 10 chicks from each pen from day 1 to week 1; then 20 birds each on week 2 followed by 10 cocks and 10 hens from each pen from week 3 to week 7. At the end of the seventh week 43 and 46 birds from the CF and CF & AW pens were fasted, weighed live, suspended through tapered killing cones and slaughtered humanely with a single cut severing the carotid artery and jugular vein. Dressing percentage was calculated as a percentage of dressed weight divided by live weight.

The ethical clearance for this study was received from the School of Veterinary Medicine, University of the West Indies.

#### Taste Tests

Two cocks and 2 hens each from the Conventional Feed Pen (CF) and Aloe water treated pen (CF & AW) were minimally seasoned with salt and bland condiments, baked for two hours in aluminium foil without removal of fat trimmings. The breast, thigh and leg areas were then sliced into two-inch mixed portions and served to the tasters (females= 18; males=28). The ages of the tasters who were between 15-50 years were asked to chew samples X and Y for 20 – 30 bites before swallowing.

They were then asked to rank the samples as follows:

1. Not tender or not juicy or not flavourful
2. Tender or juicy or flavourful

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3. very tender or very juicy or very flavourful

**Statistical Analysis**

Broiler weights via pen and pen X sex were subjected to ANOVA from week 2 (20 cf 20), weeks 3 to 6 (10 cocks and 10 hens from each pen). All birds weighed in the seventh week and dressing percentages compared via ANOVA (GenStat release 13.1, 2010 VSN International Ltd.).

Rankings of tasters were subjected to a Chi Square (n=2) analysis.

**RESULTS & DISCUSSION**

During the second (P< 0.0001) and third (P< 0.05) weeks mean broiler weights for the aloes added water pen was significantly higher than that of broilers fed conventional feed only (Table 2).

**Table2.** Comparison of weight gains (kg) and feed eaten on conventional feeds (CF) and aloes added water (CF & AW) in the starter and finisher phases of broiler production

Time weeks (Wk) n	Conventional Feed(CF)/CF& Aloes Water(AW)	Wk 1 Starter 10	Wk2 Starter 20	Wk3 Starter 20	Wk4 Starter 20	Wk5 Finisher 20	Wk6 Finisher 20	Wk7 Finisher 20
Average weight CF	CF	0.172	0.43	0.927	1.394	1.939	2.346	2.704
Average weight CF & A`	CF & AW	0.172	0.49	0.959	1.381	1.933	2.362	2.717
Total feed eaten per total no. birds per week (kg)	CF	12.11	40.88	65.6	84.77	103.396	103.78	95.121
	CF& AW	12.37	36.99	57.78	81.75	113.154	107.213	101.56
Feed Conversion Ratio	CF	0.97	1.31	1.43	1.99	2.10	2.83	2.99
	CF & AW	0.99	1.16	1.30	2.04	2.20	2.69	3.07
Average feed intake per bird per week (kg)	CF	0.124	0.398	0.628	0.889	1.149	1.153	1.069
	CF & CW	0.126	0.43	0.643	0.892	1.217	1.153	1.104
Mortality	CF		1		1	1		
	CF & AW		1			2		1

Average weight of day old chicks was 40g; Average FCR for the CF diet only; 1.95; Average FCR for the AW water 1.92

In the third week the Feed Conversion efficiency (FCR) for the aloes added feed was numerically lower (1.16) compared with the conventional feed (1.31) (Table 2 and 3).

**Table3.** Weekly Weights of broilers as affected by conventional feeding (CF) and Conventional Feed and aloes added water (CF &AW)

Time in weeks (no.) (A)(B)	Pen A Mean	CF ±SE	Pen B Mean	CF&AW ±SE	Cocks (A&B) Mean	±SE	Hens (A&B) Mean	±SE	Pen	Significance Sex	Pen x Sex
Week 2	0.43	0.036	0.49	0.014					P<0.0001		
Week 3	0.98	0.018	1.04	0.018	1.06	0.018	0.96	0.018	P<0.05	P<0.0001	NS
Week 4	1.44	0.023	1.38	0.023	1.56	0.023	1.27	0.023	NS	P<0.0001	P<0.05
Week 5	1.94	0.031	1.93	0.031	2.08	0.031	1.8	0.031	NS	P<0.0001	NS
Week 6	2.35	0.037	2.36	0.037	2.6	0.037	2.1	0.037	NS	P<0.0001	NS
Week 7	2.73	0.028	2.69	0.027	2.96	0.029	2.47	0.026	NS	P<0.0001	NS
DP Week7	73.5	0.939	74.7	0.837	73.1	0.947	75.1	0.088	NS	NS	NS

DP-Dressing Percentages (43), (46); 7<sup>th</sup> week; CF – Conventional Feed Only-Pen A (10 cocks &10 hens combined)

CF & AW – Conventional Feed & Aloes Water – Pen B (10 cocks &10 hens combined)

Cocks A & B (10 cocks & 10 cocks); Hens A & B (10 hens & 10 hens); Week 2 (5 cocks & 5 hens only)

Similarly, average feed intake per bird per week for the CF and AW (0.43 kg) was higher than for the conventional diet (CF) only (0.40 kg) (Table 2). Improvements in broiler weights have been reported

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in other studies [2, 3, 4, 5]. A similar improvement in FCR has been reported by Mehala and Moorthy when aloe vera extracts have been combined with turmeric [8] in the first week of male broiler production. The better growth rates observed in the second and third week of the added aloe water birds may be due to an improvement in the villi architecture of the ileum for absorption of digested nutrients [5] due to compounds in the aloe vera. Also, increased weight of broilers in second and third week might be due to a factor in the aloe vera causing increased amino acid intake for protein deposition [17]. Note, however that the effect of improved growth rates and FCR may have been due to a synergistic effect of compounds present in the aloe vera pulp and the additives present in the medicated feed fed.

Aloe vera biochemical compounds include enzymes that can assist in digestion; anthraquinones and phenolic compounds that aid in intestinal absorption including amino acids, the building blocks of tissue proteins [9].

Average FCR for both the CF and CF & AW were slightly better than expected ratios for broiler production from Trinidad of 2.0 to 2.2 [1]. The dressing percentages of dressed carcass were not different ( $P > 0.05$ ) for the two diets (Table 4). Similar findings have been reported in other studies [6, 7, 8]. Contrastingly, Bejar and Colapo [9] reported improved dressing percentages of broilers administered aloe vera water. Also there do not appear to be any difference ( $P > 0.05$ ) ( $df = 2$ ) in taste characteristics of baked bland leg and thigh cuts from the aloe added water finished broilers compared to products without treatment (Table 4). A similar finding has been reported by Bejar and Colapo [9].

**Table 4.** Organoleptic taste tests of bland baked chicken products fed conventional feed (CF) and aloe added water (CF & AW)

Taste characteristics N%	Ranking	Conventional feed (CF) 48%	Aloes added water (CF & AW) 46%	Chi square significance 2 df
Tenderness	Not tender	20	24	NS
	Tender	48	43	
	Very tender	32	33	
Juiciness	Not juicy	22	33	NS
	Juicy	48	39	
	Very juicy	30	28	
Flavourfulness	Not flavourful	50	52	NS
	Flavourful	33	24	
	Very flavourful	17	24	

## CONCLUSIONS

From preliminary observations, the use of aloe vera extracts appear to enhance growth and Feed Conversion Efficiency in the starter phase and could be a simple mechanism to reduce the cost of feeding of broilers in poultry production.

## ACKNOWLEDGEMENTS

I would like to thank Mr Bruce Luckner and Mr Marcus Jones of the Caribbean Agricultural Research and Development Institute (CARDI) for lending support to the statistical analyses carried out on the study.

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