

Tchoukoutou residue and yogurt as feed additives in broilers feed

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Abstract

An experiment was carried out to evaluate during six weeks the bio-economic effects of tchoukoutou residue in broiler feeding. A total of 225 day-old of mix sex broiler chicks (Ross308) were divided into three dietary treatments of 75 chickens per treatment (three replicates of each). The control diet (Ro) was fed basal diet, whereas 3% of tchoukoutou (Rt) and 0.078% of a yoghurt (Ry) were supplemented to the other groups. The daily feed intake was similar. During the first 21 days, the daily weight gain was significantly higher in Rt treatment, and the feed conversion ratio was lower in Rt (1.89) compared to Ro (2.06) and Ry (2.00). The mortality rate was significantly reduced by the supplementation of both treatments. The feed cost was lower in Rt (0.78 € feed/kg weight gain) compared to that in Ro (0.81 € feed/kg weight gain) and Ry (3.75 € feed/kg weight gain). This study suggested that tchoukoutou residue can be added to diet to improve bio-economic performance of broilers during the first 21 days.

Keywords: Broilers, Feed Efficiency, Probiotic, Tchoukoutou residue

Introduction

The efficiency of feed and the effects of pathogen microflora are the most important factors affecting poultry productivity. To control these factors, enzymes, organic acids, antibiotics and probiotics are used (Nava et al., 2005). Use of antibiotics results sometimes in bacteria resistance. Probiotics to control pathogen intestinal microflora and to improve feed efficiency appeared therefore as a bio-practice. Species of *Bacillus*, *Enterococcus* and *Saccharomyces* yeast have been the most common organisms used in livestock (Simon et al., 2001). In Benin, lactic acid bacteria and yeasts were reported as responsible for the sorghum bier tchoukoutou (Kayodé et al., 2007). It was therefore postulated that addition of tchoukoutou residue to a basic poultry feed could therefore improve their productivity in tropical conditions where feed efficiency is low. In that perspective, an experiment was carried out to evaluate the bio-economic effects of such supplement in broiler chickens' feeding.

Materials and Methods

A total of 225 day-old mixed sexed broiler chicks (Ross 308) were divided into nine replications of 25

chicks each. Chicks were kept in pens during a starter (1 to 21 days) and a grower (22 to 42 days) phases. The respective densities at these phases were 23 and 11 chicks/m². Control/basis diet (Ro), tchoukoutou diet (Rt) and yoghurt diet (Ry) were fed *ad libitum*, each to three random replications.

The wet residue of tchoukoutou was sun-dried and added to the control diet (Table 1) at the rate of 3%, whereas the freeze dry yoghurt yeast (YO-MIX TM 601 LYO 50 DCU) was added at 0.78 %. The market prices of feeds and of live broiler chickens were collected.

The broilers chickens were weighted weekly. After six weeks, 3 chickens per replicate were slaughtered for carcass study.

Statistic analysis

Data were analyzed using general linear model in SAS Institute Inc. (2004), version 9.1.2. The effect of pen and its interaction with diet were not significant ($P>0.05$). Hence, analyses were performed according to the model:

$$Y_i = \mu + R_i + \varepsilon_i; \text{ With}$$

Y_i = Observation for dependent variables;

μ = Overall mean;

R_i = Fixed effect of diet;

ε_i = Residual error.

Table 1: Ingredients and chemical compositions of control diets as formulated and fed

Ingredients (%)	Starter diet	Grower diet	Nutrients/energy	Starter diet	Grower diet
Maize	58.3	59.4	Dry matter (%)	87.4	87.9
Wheat bran	3.0	5.0	Crude Protein (%)	20.2	19.2
Soybean meal	30	25	Lysine (%)	1.19	1.02
Cotton seed meal	4.0	6.0	Methionine (%)	0.50	0.50
Palm oil	1.0	1.0	Methionine + Cystine (%)	0.87	0.85
Oyster shell	1.8	1.8	Calcium (%)	1.00	1.00
Lysine	0.20	0.10	Phosphate (%)	0.60	0.70
Bicalcic phosphate	1	1	Metabolizable energy (kcal/kg)	2879	2858
NaCl	0.30	0.30	Crude fiber (%)	4.30	4.43
Premix ¹	0.20	0.20			
Total	100	100			

¹Premix provided per kg: Vitamins: A 4000000 UI, D3 800000 UI, E 2000 mg, K 800 mg, B1 600 mg, B2 2000 mg, niacin 3600 mg, B6 1200 mg, B12 4 mg, choline chloride 80000 mg; Minerals: Cu 8000 mg, Mn 64000 mg, Zn 40 000 mg, Fe 32000 mg, Se 160 mg

Results and Discussion

At both phases, the average daily feed intake (DFI) were similar ($P>0.05$) in the dietary treatments (Table 2). However, at starter phase specifically, DFI were higher than reported by Houndonougbo et al. (2009) and Fasuyi and Aletor (2005). In general, the growth was better in Rt than in Ry and Ro treatments (Table 3). The daily weight gain was affected by diets ($P<0.05$) at starter phase, but not later (Table 3). At three weeks-old (d21), the average body weight in Rt (718 g) represented 1.2 times that in Ro (Table 3). Up to six weeks of age, the daily weight gain of broilers (42.7 to 45.7 g) was higher than 30.3 g reported in Nigeria (Obun et al., 2008). The body weight of broilers at six weeks-old was 7 % higher in Rt (1921 g) than Ro (1794) (Table 3). These weights were higher than reported in Cameroon (Dongmo et al., 2005) and Côte d'Ivoire (Yo, et al., 1998); but, close to that recorded at 36 days-old in Hubbard JV broiler chickens by Ayed and Ghaoui (2011), when *Saccharomyces cerevisiae* var. *ellipsoideus* was supplemented to the diet.

Mortality of chickens was recorded only in the first week and it decreased significantly ($P<0.05$) when chickens received starters (4 %, 1.3 % and 0 % in Ro, Rt and Ry respectively) as shown in Table 4. Mortality rate in Rt and Ry diets were lower than 3.3 to 6.7% reported by Erubetine et al. (2003) in similar experiment with broilers. The decrease of mortality in Rt might be due to reduction of the gastro-intestinal infection (Nava et al., 2005) through probiotics bacterial colonization against the pathogens microorganisms (Reid et al., 2001).

The addition of tchoukoutou to the basic diet had beneficial effect on broiler chickens' growth and survival, without any significant effect on feed intake. This result was similar to the probiotics effects of palm

wine yeast reported by Bohoua (2008). However, the effect of tchoukoutou residue was more effective at the earlier age of broilers.

No significant effect of diets was noticed on carcass yield, gizzard and liver relative weights (Table 5). Carcass yield was higher than reported by Tegua and Fon Fru (2007) but lower than Ayed et al. (2011). Gizzard relative weight was in the range reported by Erubetine et al. (2003). The relative weight of liver was lower than found by Al-Kassie et al. (2011). To improve broiler chickens growth, tchoukoutou residue can therefore be used as feed additive up to 21 days of age.

Irrespective of diet, the feed conversion ratio (FCR) of broiler chickens increased from starter phase to grower phase, showing a better efficacy of diets at the earlier growth phase of broilers (Larbier and Leclercq, 1994). The FCR in all diet (Table 6) was close to 1.74 to 1.89 g feed/g body weight gain (Al-Kassie et al., 2011). The FCR was about 8% lower in Rt diet than in control diet (Ro). Thus, compared to Ro, the feed cost decreased slightly in Rt and increased significantly in Ry due to the high price of yoghurt starter in Benin (Table 7). The feed cost was higher than 0.48 € feed/kg body weight gain (Houndonougbo et al., 2009) and 0.59 € feed/kg body weight gain (Ezieshi and Olumu, 2004). The feed cost and the economic feed efficiency (EFE) showed the economic effect of Rt diet (Table 7). In general the economic feed efficiency was lower than 2.70 € weight gain/€ feed reported earlier in Benin (Houndonougbo et al., 2009).

Table 2: Daily feed intake (g) of control and experimental broiler chickens

Phases	Ro	Rt	Ry	MSE ¹	P
Starter	54.3	55.6	56.1	8.00	0.994
Grower	120.9	120.7	120.3	8.85	0.999

¹Standard error of mean

Table 3: Daily body weight gain (WG, g) and live body weight (BW, g) of control and experimental broiler chickens

Phases	Ro	Rt	Ry	MSE ¹	P
WG, starter	25.6 ^b	31.4 ^a	27.2 ^b	2.00	0.041
WG, grower	57.05	57.30	57.69	3.47	0.991
BW at d21 ²	596 ^b	718 ^a	627 ^b	21.2	0.016
BW at d42 ³	1794	1921	1839	27.6	0.125

¹Standard error of mean; ²three week-old, ³six week-old, ^{a,b}Means with unlike superscripts in the same row differ significantly (P<0.05)

Table 4: Mortality rate (%) of control and experimental broiler chickens

Phase ¹	Ro	Rt	Ry	MSE ²	P
Starter	4.0 ^a	1.3 ^b	0.0 ^c	0.23	< 0.0001

¹Mortality rates were null at grower phase; ²Standard error of mean; ^{a, b, c} Means with unlike superscripts in the same row differ significantly (P<0.05)

Table 5: Carcass characteristics of control and experimental broiler chickens carcass (% of body live weight)

	Ro	Rt	Ry	MSE ¹	P
Carcass yield	72.6	73.5	73.5	0.56	0.42
Gizzard	2.97	3.06	3.06	0.10	0.76
Liver	2.22	2.30	1.99	0.11	0.15

¹Standard error of mean

Table 6: Feed conversion ratio of control and experimental broiler chickens (kg feed/kg body weight gain)

Phases	Ro	Rt	Ry	MSE ¹	P
Starter	2.00	1.68	1.94	0.13	0.21
Grower	2.11	2.09	2.07	0.07	0.93

¹Standard error of mean

Table 7: Feed cost (FC, € feed/kg WG¹) and economic feed efficiency (EFE, € WG¹/€ feed) of control and experimental broiler chickens

Phases	Ro	Rt	Ry	MSE ²	P
FC Overall	0.81 ^a	0.79 ^a	3.75 ^b	0.043	0.0001
EFE Overall	2.30 ^a	2.35 ^a	0.48 ^b	0.0002	0.0001

¹Body weight gain; ²Standard error of mean; ^{a, b}Means with unlike superscripts in the same row differ significantly (P<0.05)

Conclusion

The supplementation of tchoukoutou residues to broiler chickens' diet significantly reduced the mortality and improved the growth performance mainly, at the starter phase. Consequently, it improved the feed efficiency without any effect on feed intake and carcass characteristics. It is therefore relevant to define the optimal rate of that starter in diets of different animals.

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