
SAADC
2011
THE 3rd INTERNATIONAL CONFERENCE ON
SUSTAINABLE ANIMAL AGRICULTURE FOR
DEVELOPING COUNTRIES SAADC 2011
Suranaree University of Technology (SUT)
Nakhon Ratchasima, THAILAND
26 - 29 JULY 2011
jointly organized by

NON-RUMINANT NUTRITION/ RUMINANT NUTRITION / MEAT SCIENCE

-OP4037-

Performances, carcass percentage and abdominal fat of broilers fed ration containedprebiotics from corncobs and challanged with *E. Coli*

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Abstract

Prebiotics are nutrients, which are not digested, and selectively improve growth and activity of beneficial microbes in the intestine. Corncobs contain hemicelluloses which are potential as prebiotic sources. The objectives of this research were to study the performance, the percentage of carcass, and abdominal fat of broilers fed a ration contained prebiotic from hydrolyzed corncobs. This research used factorial completely randomized design which consisted of two factors. The first factor consisted of three treatments: basal ration, basal ration +2.5% prebiotics, and basal ration +0.01% bambermycin, meanwhile the second factor consisted of two treatments: without *E. coli* infection and with *E. coli* infection, with five replications (10 birds/replicate). The variables observed were performances (consumption, body weight, feed conversion ratio, mortality), the percentage of carcass, and abdominal fat. The results show that the performances, the percentage of carcass, and abdominal fat of broiler fed a ration contained 2.5% prebiotics were not significantly different to that of control and antibiotic treated broilers, although broilers offered prebiotic tended to have lower values of all parameters measured except for abdominal fat and mortality. It is concluded that supplementation of prebiotics from hydrolyzed corncobs may be used in broiler diet at the level 2.5% of ration dry matter.

Keywords: broiler, prebiotic, corncobs, performance, carcass

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Introduction

In the last decade many developed countries have restricted the addition of antibiotics in the feed due to its negative effects such as residue in animal products as well as stimulate resistance to targetted bacteria. Therefore, some alternative additives which are safer than antibiotics need to be implemented in animal industry. One of them is the utilization of prebiotics.

Prebiotics are nutrients which are not hydrolyzed by digestive tract enzymes, but beneficial to animals by stimulating the growth or activities of certain bacteria in the intestine which finally improve the animal health (Pato 2003; Manning & Gibson 2004). Some examples of prebiotics are inulin, galactooligosaccharides, lactulose, lactosucrose, isomaltoseoligo-saccharides, trans-galactooligosaccharides, fructooligosaccharides, glucooligosaccharides, soy-oligosaccharides, and xylooligosaccharides (Tamime 2005; Roberfroid 2007).

Corncobs have the potency as source of prebiotics because it contains celluloses (40%) and hemicelluloses around 36% (Aylianawati & Susiani, 2008) that can be hydrolysed to produce glucooligosaccharides and oligoxylose using cellulolytic and xylanolytic bacteria. Previous experiment by Moura et al. (2007) showed that oligosaccharides from corncobs (xylotriose and xylotetraose) could stimulate the growth of *Bifidobacterium adolescentis* and *Lactobacillus brevis*. In addition, Alonso et al. (2003) reported that xylooligosaccharides can stimulate the growth of *Bifidobacterium* sp. Therefore, the aim of this experiment was to evaluate the use of prebiotics from corncobs on performances, carcass percentage, and abdominal fat of broiler chicken challanged with *E. coli*.

Materials and Methods

Production of prebiotics

Two loop of isolate combination of *Actinomyces* sp. KBM6 and *Streptomyces* sp. 45I-3 were grown in 2000 ml corncobs containing media in a shaker incubator for 5 days at room temperature. The bacterial culture was then inoculated into 8000 ml corncob containing media for 10 days at room temperature with aeration. The cultures were evaporated until its volume became 1 liter. Degree of polymerization (DP) of prebiotics was calculated by dividing total sugar with reduced sugar.

Animal and diet

Three hundred day old chick of Cobb CP-707 strain were reared for 35 days. In the first 14 days the chickens were fed starter diet, and the remaining days were fed with finisher diet. During starter period, chickens were subjected into six different treatments of factorial design 3 x 2 with 5 replications containing 10 chickens for each replication. The first factor was three rations containing different additives i.e., starter ration without additive, starter ration with 2.5% corncob prebiotics, and starter ration with 0.01% bambermycin antibiotics. The second factor was two treatments of *E. coli* challenge i.e., without infection of *E. coli* and with infection of *E. coli* (10^6 cfu head^{-1}). Water was provided ad libitum. The starter diet consisted of 19% crude protein and 3050 kcal kg^{-1} of metabolic energy, whereas finisher diet consisted of 18% crude protein and 3100 kcal kg^{-1} metabolic energy.

Parameters and data analysis

The chicken body weight was measured in the first day and every week during the experiment, and feed consumption was measured every week. At the end of experiment, one chicken from each treatment was slaughtered using the method of Kosher to determine the carcass percentage and abdominal fat. Parameters measured were feed consumption, final body weight, feed conversion ratio, carcass percentage, and abdominal fat. Data were subjected to analysis of variance, and significance differences were further analyzed with Duncan test (Steel & Torrie, 1993).

Results and Discussion

Production of prebiotics

Prebiotics produced had degree of polymerization (DP) of 3. Gibson (1999) reported that DP of prebiotics vary between 2 to 60 for inulin and between 2 to 20 for oligosaccharides. The prebiotics produced in this experiment is a mixture of glucooligosaccharides and xylooligosaccharides. These oligosaccharides were produced by the action of cellulolytic bacteria of *Actinomyces* sp. (KBM6) and xylanolytic bacteria of *Streptomyces* sp. (45I-3).
Xylooligosaccharides as prebiotics have been reported by Alonso et al. (2003). It can stimulates the growth of *Bifidobacterium* sp. and depresses the activity of intestinal pathogen as well as improve nutrient absorption. In addition, Moura et al. (2007) reported that oligosaccharides (xylotriose and xyloyatraose) from corncobs could improve the growth of intestinal bacteria such as *Bifidobacterium adolescentis*, and *Lactobacillus brevis*.

Feed Consumption, Final Body Weight, and Feed Conversion Ratio

Feed consumption of broiler during 35 days ranged from 2328 to 2457 g head^{-1} and there was no effect of additive inclusion (prebiotics and antibiotic), *E. coli* infection, and interaction both of them on feed consumption (Table 1). This might be due to good nutrient content of the ration and good environment during the experiment. The prebiotics and antibiotics will have better influence on consumption when the animals are offered bad quality ration or exposed to bad environment. However, feed consumption of broilers fed with prebiotics from corncobs in this experiment was higher (68 g head^{-1} day^{-1}) compared to the results reported by Hakim (2005) who used commercial prebiotics (61 g head^{-1} day^{-1}). This means that prebiotics from corncobs can be used as additive in broiler ration.

Similar to feed consumption, broiler body weight was also not affected by all treatments. This could be related to consumption and good quality ration. Prebiotics and antibiotics are expected to improve nutrients absorption in the intestine (Leeson & Summer, 2001), however as the rations had similar quality, the nutrients digestibility might be the same causing similar nutrient absorption and deposition as body weight. Average body weight gain of broilers fed corncobs prebiotics was similar to those reported by Hakim (2005) using commercial prebiotics (239,36 vs 238,94 g head^{-1} week^{-1}).

Table 1. Feed consumption, final body weight, and feed conversion ratio of broiler fed prebiotics containing ration and challenged with *E. coli* for 35 days.

Parameter	Factor 1	Factor 2		X ± SD
		Without *E. coli*	With *E. Coli*	
Consumption (g head^{-1})	Control	2334 ± 101	2374 ± 194	2354 ± 28
	Prebiotics	2328 ± 134	2400 ± 180	2364 ± 51
	Antibiotic	2457 ± 89	2394 ± 153	2426 ± 44
	X ± SD	2373 ± 107	2389 ± 176	2381 ± 41
Final body weight (g head^{-1})	Control	1228 ± 44	1185 ± 67	1206 ± 30
	Prebiotics	1210 ± 41	1183 ± 64	1197 ± 19
	Antibiotic	1234 ± 54	1202 ± 43	1218 ± 23
	X ± SD	1224 ± 46	1190 ± 58	1207 ± 24
Feed conversion ratio	Control	1.90 ± 0.12	2.00 ± 0.10	1.95 ± 0.07
	Prebiotics	1.92 ± 0.13	2.03 ± 0.05	1.98 ± 0.08
	Antibiotic	1.99 ± 0.06	1.99 ± 0.06	1.99 ± 0.00
	X ± SD	1.94 ± 0.10	2.01 ± 0.07	1.97 ± 0.05

Feed conversion ratio ranged from 1.90 to 2.03 and was not significantly difference amongst treatments (Table 1). This means that the addition of corncob prebiotics did not have negative effect on nutrient utilization and can be used to replace antibiotics in broiler ration.

Carcass Percentage and Abdominal Fat

The average carcass percentage ranges from 68.02% to 71.03% (Table 2) and was higher compared to those reported by Syukron (2006) and Daud et al. (2007) who obtained carcass percentage between 56.64% - 60.02% and 65.35 of live weight, respectively. All treatments did not affect carcass percentage, this means that prebiotics and antibiotics addition, as well as infection with *E. coli* did not influence carcass percentage of broilers. The percentage of abdominal fat of broilers during 35 days experiment ranged from 1.44% to 1.96% and was not affected by treatments (Table 2) and lower to that reported by Daud et al. (2007) who obtained abdominal fat percentage was 2.22% at 42 days age. It may be that broilers at five week of age are still growing, so that the nutrients are used for growth instead of for fat deposition.

Table 2. Carcass percentage, and abdominal fat of broiler fed prebiotics containing ration and challenged with E. coli for 35 days.

Parameter	Factor 1	Factor 2: Without *E. coli*	Factor 2: With *E. Coli*	X ± SD
Carcass percentage (%)	Control	71.03 ± 3.79	69.48 ± 1.86	70.26 ± 1.10
	Prebiotics	69.35 ± 2.84	68.02 ± 1.43	68.69 ± 0.94
	Antibiotic	70.36 ± 2.34	68.96 ± 2.88	69.66 ± 0.99
	X ± SD	70.25 ± 2.99	68.82 ± 2.06	69.53 ± 1.06
Abdominal fat (%)	Control	1.56 ± 0.25	1.96 ± 0.48	1.76 ± 0.28
	Prebiotics	1.44 ± 0.49	1.54 ± 0.19	1.49 ± 0.07
	Antibiotic	1.70 ± 0.41	1.61 ± 0.33	1.66 ± 0.06
	X ± SD	1.57 ± 0.38	1.70 ± 0.33	1.64 ± 0.18

Conclusion

Prebiotics from corncobs at the level 2.5% can be added into broiler ration and replace bambermycin without affecting the broiler performances, carcass percentage, and abdominal fat.

Acknowledgment

This research was funded by Directorate General of Higher Education, Ministry of National Education, Indonesia, through Competitive Grant No. 219/SP2H/PP/DP2M/V/2009.

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