www.roavs.com EISSN: 2223-0343
RESEARCH OPINIONS IN ANIMAL & VETERINARY SCIENCES

Short communication

The effect of prebiotic and isoleucine on some carcass characteristics and intestinal morphology of broiler

Elham Agdar[1], Nima Eila[1*] and JafarYadi[2]

[1]Department of Animal Science, Faculty of Agriculture & Natural Resources ,Karaj Branch, Islamic Azad University, Karaj, Iran; [2]Department of Animal Science, Faculty of Agriculture & Natural Resources ,Saveh Branch, Islamic Azad University, Saveh, Iran

Article history
Received: 14 Jun, 2015
Revised: 12 Jul, 2015
Accepted: 13 Jul, 2015

Abstract

This study conducted to evaluate the effect of prebiotics (Fermacto), isoleucine and their combination on carcass characteristics and morphology of ileum during finisher period in broiler. A total 300 one-day-old mixed Ross broiler chicks were reared in same condition up to 21 day. Birds were distributed randomly into 4 treatments and 5 replicates. Control group was fed with the basal diet composed of corn-soya and wheat. In the experimental groups; either 0.1% prebiotic and 0.04% isoleucine or their combination was added. The experiment lasted from 22 to 42 days of broiler age. The results at the end of the experiment showed that prebiotic and isoleucine significantly ($P<0.05$) improved the efficiency of the villus height, width and the ratio of villus height to crypt depth and reduction of crypt depth, but it had no significant effect on traits such as dressing percentage, breast weight, abdominal fat weight and weight of bursa, however, the leg weight increased significantly in the group fed isoleucine and prebiotic. These results showed that the combination of prebiotic and isoleucine improved the leg weight and intestinal morphology in broiler.

Keywords: Prebiotic; isoleucine; carcass characteristics; ileum morphology; broiler

To cite this article: Agdar E, N Eila and J Yadi, 2015. The effect of prebiotic and isoleucine on some carcass characteristics and intestinal morphology of broiler. Res. Opin. Anim. Vet. Sci., 5(6): 275-278.

Introduction

Prebiotic is non-digestible substances which are used as additive in poultry diets in order to stimulate reproduction of endogenous bacteria such as Bifidiobacteria that is beneficial to the host. Prebiotics include short-chain carbohydrates that are indigestible by host enzymes (Ashraf et al., 2013). They can also be used as an alternative to antibiotics. Prebiotics have been shown to alter gastrointestinal microbes and immune response, reduce incidence of *Salmonella enteritidis* and *E. coli* (Cummings and Macfarlane, 2002).

Good quality amino acids are very important for successful minimization of excess dietary protein in the poultry feed. The negative effect on bird performance could be minimized by increasing a specific amino acid. Kidd et al. (2004) reported that isoleucine could be the fourth limiting amino acid among other protein sources in broiler diet. Providing the forth limiting amino acid in the final period allows minimizing the excess amount of essential amino acids in the diet (Kidd, 2000). Moreover, NRC (1994) recommended that broilers need 0.73% isoleucine during 21-42 days of age. According to Kidd et al. (2004) isoleucine-deficient broiler feed showed reduced weight gain, feed efficiency and carcass quality.

***Corresponding author:** Nima Eila, Department of Animal Science, Faculty of Agriculture & Natural Resources, Karaj Branch, Islamic Azad University, Karaj, Iran; E-mail: nimaila@kiau.ac.ir

This study investigated the effect of prebiotic and isoleucine on carcass traits and morphology of the ileum in broiler chickens during finishing period.

Materials and Methods

A total 300 one day old broilers (Ross 308) were distributed randomly into 20 Pen (each pen contained 15 chicks). The chicks were provided the same diet until 21 day of age. On 22nd day of age, birds were equally distributed into four groups. One group served as a control and the other groups were provided 0.1% prebiotics (Fermacto, Sabzdasht Company, Iran), isoluecine (0.04%) and both prebiotic and isoleucine. Fermacto contained manan oligosacheride. At the end of the 42 days, the chicks from each pen were randomly selected and each chick was weighed individually and their live weight was recorded. After slaughter, different parts of carcasses were separated and weighed. The parts that were measured include breast weight, leg weight (both), abdominal fat and bursa weight as percentage of live weight.

Ileum samples from two birds per replicate were processed for histological morphology including villus height, width and crypt depth and the ratio of villus height to crypt depth.

Data was analyzed with statistical software SPSS 2011 software (Version, 20.1 IBM corporation, SPSS, Inch., Chicago, IL.) using analysis of variance and Duncan's test to compare the means. P values less than 0.05 was statistically considered significant.

Results and Discussion

In the present study, we found that supplementation of isoleucine and prebiotic significantly affected leg weight with no effect on weight of other organs as shown in Table 3. Mixed results have been reported in the literature regarding the use of isoleucine and prebiotic in broiler diet. Falah and Rezai (2013) found that prebiotic in the diet may improve performance and increase efficiency of the carcass. In contrast, Tavernari et al. (2012) did not find significant effect on carcass efficiency at the final stage of growth (30-43 days old) in response to isoleucine that is in line with the results of this study. Crozo et al. (2010) reported that breast meat yield improved in broiler chicks which were fed isoleucine supplement.

The effect of isoleucine and prebiotic on the intestinal morphometery is shown in Table 4. The results showed that villus height, width and the ratio of height and crypt increased significantly in group of birds fed prebiotic and isoleucine. Crypt depth decreased significantly in all the experimental groups.

Oliveira et al. (2008) reported that prebiotic (mannan oligosaccharides) and enzymes treatment caused a significant increase in the morphmetery of small intestines which agreed with this study results.

Santos et al. (2004) reported no significant differences in villus height between the control group and the birds that received diet containing probiotic and prebiotic. However, Santin et al. (2001) did not find difference in the ileum villus height using probiotics and prebiotics in broiler diet.

Table 1: Percentage composition of the ingredients of the feed

Items (%)	Starter (1-10 d)	Grower (11-24 d)	Finisher phase (21-42 d)			
			A	B	C	D
Corn	55.39	55.565	55.54	55.44	55.5	55.4
Wheat	–	–	12.9	12.9	12.9	12.9
Soybean meal	32.7	31.6	22.7	22.7	22.7	22.7
Fishmeal	5.0	4.86	–	–	–	–
Oil	3.0	4.8	4.6	4.6	4.6	4.6
DCP	1.86	1.3	2.0	2.0	2.0	2.0
Calcium carbonate	0.86	0.85	0.76	0.76	0.76	0.76
Methionine	0.34	0.285	0.25	0.25	0.25	0.25
Lysine	0.1	–	0.25	0.25	0.25	0.25
Threonine	–	–	0.1	0.1	0.1	0.1
Supplement*	0.5	0.5	0.5	0.5	0.5	0.5
Salt	0.15	0.12	0.15	0.15	0.15	0.15
Sodium bicarbonate	0.1	0.12	0.25	0.25	0.25	0.25
Fermacto	–	–	–	0.1	–	0.1
Isoleucine	–	–	–	-	0.04	0.04
Total	100	100	100	100	100	100

*Supplied per kilogram of diet: vitamin A (retinyl acetate + retinyl palmitate): 6050µg; vitamin D_3: 55µg; vitamin E (α-tocopheryl acetate): 22.05 µg; vitamin K_3: 2 mg; vitamin B_1: 5 mg; vitamin B_2: 6 mg; vitamin B_3: 60 mg; vitamin B_6: 4 mg; vitamin B_{12}: 0.02 mg; Pantothenic acid: 10.0 mg; Folic acid: 6 mg; Biotin: 0.15 mg and Ethoxyquin: 0.625 m CaCO: 500 mg; Fe: 80 mg; Zn: 80 mg; Mn: 80 mg; Cu: 10 mg; I: 0.8 mg and Se: 0.3 mg; A: control; B: Prebiotic; C: Isoleucine; D: Isoleucine + prebiotic

Table 2: Chemical composition of the diet

Ration	starter	grower	Finisher phase (21-42)			
			A	B	C	D
Metabolizable energy(Kcal/Kg)	3040	3190	3224	3221	3223	3220
Protein (%)	23.5	22.9	17	17	17	17
Digestible Methionine (%)	0.68	0.61	0.5	0.5	0.5	0.5
Digestible Methionine and Cysteine (%)	0.97	0.9	0.74	0.74	0.74	0.74
Digestible Lysine (%)	1.23	1.13	0.95	0.95	0.95	0.95
Digestible Threonine (%)	0.75	0.73	0.64	0.64	0.64	0.64
Digestible Tryptophan (%)	0.24	0.23	0.18	0.18	0.18	0.18
Digestible Arginine (%)	1.47	1.42	1.05	1.05	1.05	1.05
Digestible Isoleucine (%)	0.87	0.85	0.63	0.63	0.67	0.67
Digestible Valine (%)	0.97	0.95	0.74	0.74	0.74	0.74
Calcium (%)	1	0.9	0.82	0.82	0.82	0.82
Available Phosphorus (%)	0.5	0.45	0.42	0.42	0.42	0.42
Sodium (%)	0.16	0.16	0.16	0.16	0.16	0.16

A: control; B: Prebiotic; C: Isoleucine; D: Isoleucine + prebiotic

Table 3: Effect of isoleucine and prebiotic on the carcass characteristics in broilers during finishing period

Treatments	Bursa weight (%)	Abdominal fat (%)	Leg weight (%)	Breast weight (%)	Dressing percentage (%)
Control	0.130±0.06	2.22±0.07	28.86±1.63^{b}	23.46±1.12	77.33±4.17
Prebiotic	0.136±0.03	2.12±0.27	29.66±0.73^{ab}	23.44±1.87	76.36±1.34
Isoleucine	0.108±0.08	1.67±0.73	29.23±1.66^{ab}	24.34±2.02	77.29±2.80
Prebiotic+ Isoleucine	0.134±0.05	2.21±0.53	30.53±2.43^{a}	24.29±2.23	76.28±2.00

Means values bearing different superscripts in a column differ significantly (P<0.05)

Table 4: Effect of isoleucine and prebiotic on the morphometeric characteristics in broilers during finishing period

Treatments	hc ratio (µm)	Crypt depth (µm)	Villus width (µm)	Villus height (µm)
Control	2.77±0.3^{c}	302.05±87.85^{a}	208.98±20.65^{b}	838.71±191.75^{b}
Prebiotic	4.50±0.54b^{c}	204.80±55.93^{b}	236.06±41.89^{b}	923.55±182.93^{ab}
Isoleucine	4.75±1.90^{b}	198.56±26.45^{b}	225.50±48.32^{b}	943.76±364.34^{ab}
Prebiotic+ Isoleucine	5.37±1.7^{a}	205.16±41.48^{b}	271.41±44.98^{a}	1101.82±245.82^{a}

Means values bearing different superscripts in a column differ significantly (P<0.05)

Conclusion

The result showed that supplementation of isoleucine and prebiotic significantly improved leg weight and enhanced the intestinal morphometery in broiler chicks.

Acknowledgement

Financial support for this study was provided by Islamic Azad University, Karaj Branch which is thankfully acknowledged.

References

Ashraf S, H Zaneb, MS Yousaf, A Ijaz, MU Sohail, S Muti, MM Usman, S Ijaz and H Rehman (2013) Effect of dietary supplementation of prebiotics and probiotics on intestinal microarchitecture in broilers reared under cyclic heat stress. J Anim Physiol Anim Nutr 97: 68-73.

Crozo A, Dozier WA, Loar RE, Kidd MT, Tillman PB (2010) Dietary limitation of isoleucine and Valin in diets based on maize, soybean meal, and meat and bone meal for broiler chickens. Brit Poult Sci 4: 558-563.

Cummings JH, Macfarlane GT (2002) Gastrointestinal effects of prebiotics. Br J Nutr 87(suppl. 2): S145-151.

Fallah R, Rezaei H (2013) Effect of dietary prebiotic and acidifier supplementation on the growth performance, carcass characteristics and serum bio chemical parameters of broilers. J Cell Anim Biol 7: 21-22.

Kidd MT, Burnham DJ, Kerr BJ (2004) Dietary isoleucine responses in male broiler chickens. Brit Poult Sci 45: 67-75.

Kidd MT, Kerr BJ, Allard JP, Rao SK, Halley JT (2000) Limiting amino acid responses in commercial broilers. J Appl Poult Res 9: 223-233.

National Research Council (1994) Nutrient Requirements of Poultry. 9th rev. ed. Natl. Acad. Press, Washington, DC.

Oliveira MC, Rodrigues EA, Marques RH, Gravena RA, Guandolini GC, Moraes VMB (2008) Performance and morphology of intestinal mucosa of broilers fed mannan-oligosaccharides and enzymes. Arq Brasmed Vet Zootec 60: 442-448.

Santin E, Maiorka A, Macari M, Grecco M, Sanchez JC, Okada TM, Myasaka AM (2001) Performance

and intestinal mucosa development of broiler chickens fed diets containing Saccharomyces cerevisiae cell wall. J Appl Poult Res 10: 236-244.

Santos Jr, AA, Ferket PR, Grimes JL, Edens FW (2004) Dietary pentosanase supplementation of diets containing different qualities of wheat on growth performance and metabolizable energy of turkey poults. Int J Poult Sci, 3: 33-45.

Tavernari F deC, Lelis GR, Careiro PRdeO, Vieira RA, Polveiro RC, Luengas JAP, Rostagno HS, Albino LFT (2012) Effect of different digestible isoleucine/lysine ratios for broiler chickens. R Bras Zootec 41: 1699-1705.