EFFECTS OF DIETARY ORGANIC ACIDS ON PERFORMANCE, CARCASS CHARACTERISTICS AND GUT FLORA OF BROILER CHICKS

E. Öztürk[1], A. Yildirim, C. Eroglu

[1] *Department of Animal Science, Faculty of Agriculture, 19 Mayıs University, 55139 Samsun/TURKEY*

[2] *Department of Animal Breeding and Health, Şarkıla Akak Veysel Vocational College, Cumhuriyet University, 58400 Sivas/TURKEY*

[3] *Department of Clinical Microbiology and Infectious Diseases, Medicine Faculty, 19 Mayıs University, 55139 Samsun/TURKEY*

Introduction

The hygienic conditions provided in the poultry farms decreases the size of population of intestinal gut flora. So animals are more sensitive against pathogen bacteria from outside in comparison to wild life or free range birds. Consequently, the growth performance of broilers decreases additionally with stress factors (Mulder, 1996; Bilal et al., 1999). This situation leads animal nutritionist to investigate solutions alternative to therapeutic and/or prophylactic (Campenhout et al., 2001). Organic acids (OA) are added to food in order (1) to improve intestinal gut flora and (2) to vanish digestive disorders from stress conditions in animals (Chapman, 1988; Guerrero and Hoyos, 1991). This study was carried out to determine whether dietary organic acid have impact on growth performance, carcass and intestinal parameters on total and gram-negative bacteria numbers.

Material and Methods

The study was conducted in the research farm of 19 Mayıs University. One day old mixed sexes 360 broiler chicks (Ross 308) were used in this study. The chicks were fed with the starter diet (12.87 mj ME kg^{-1}, 240 g CP kg^{-1} as fresh matter basis) for the first three weeks of the experiment. Consequently, they were fed on grower diet (13.40 mj ME kg^{-1}, 200 g CP kg^{-1} as fresh matter basis) during the period of 4-6 weeks of the experiment. Control group was fed with basal diet without containing organic acid while the 2nd, 3rd and 4th groups were fed with the food supplemented at the rate of 0.1% (0.1 OA), 0.2 (0.2 OA) and 0.3 (0.3 OA). Total 48 representative birds (4 birds from each sub-group 2 males and 2 females) slaughtered to determine carcass parameters. For determination of intestinal parameters, 24 male birds (2 males from each sub-group) were slaughtered. For intestinal parameters, 2 male broilers representing each group (total 6), and 24 chicken broilers for total groups were also slaughtered on the 43rd day. For microbiological analysis on the 21st day of the study total 12 chicks (one male from each group), and on the 42nd day total 24 animals (two males from each subgroup) were selected slaughtered after being weighted. The data were analysed by using General Linear Model (GLM) procedures of the SPSS, release 10.0. Because experimental animals were in both sexes, sex factor was regarded as co-variant. The treatment means were compared using Duncan's Multiple Range Test (SPSS, release 10.0).

Results and Discussion

Table 1*. Body weights of broiler chickens fed diets containing organic acids, g per chicken*

Old, days	Control	0.1OA	0.2OA	0.3OA	SEM
1	41	40	40	41	0.4
7	89	90.	88	87	1.7
14	325 **a**	326 **a**	323 **ab**	310 **b**	4.7
21	721	721	715	706	9.5
28	1207	1217	1213	1198	15.8
35	1773 **a**	1789 **a**	1758 **a**	1735 **b**	24.1
42	2342	2347	2274	2321	30.9

SEM: standard error of the mean.

a, b. Values within a row with unlike superscripts differ significantly (P < 0.05).

Table 2. *Feed intake and feed conversion ratio (g feed / g gain) of broiler chickens fed diets containing organic acids*

Old, days	Control	0.1OA	0.2OA	0.3OA	SEM
Feed intake, g/bird					
7	129	129	131	127	2.7
14	483 **b**	493 **ab**	488 **ab**	504 **a**	5.1
21	1045	1060	1062	1081	12.3
28	1870	1902	1909	1935	17.2
35	2924	2963	2983	3010	26.9
42	4196 **b**	4201 **b**	4249 **ab**	4353 **a**	33.6
Feed conversion ratio, feed/gain					
7	1.45	1.43	1.49	1.47	0.03
14	1.49 **b**	1.52 **b**	1.51 **b**	1.62 **a**	0.02
21	1.45	1.47	1.49	1.53	0.04
28	1.55	1.57	1.58	1.62	0.05
35	1.65	1.66	1.70	1.74	0.04
42	1.79 **b**	1.79 **b**	1.87 **a**	1.88 **a**	0.03

a, b. Values within a row with unlike superscripts differ significantly (P < 0.05).

Table 3*. Slaughter body weight (SBW), carcass weight (CW), dressing out percentage (DP), heart weight, liver weight, gizzard weight, abdominal fat pad (AFP), AFP per 100 g body weight (BW) of broiler chickens fed diets containing organic acid.*

Variable	Control	0.1OA	0.2OA	0.3OA	SEM
SBW, g	2387	2513	2351	2403	65.3
CY, g	1745	1847	1744	1778	46.0
DP, %	73.1	73.5	74.2	74.3	0.52
Heart, g	11.2	11.8	11.0	11.8	0.53
Liver, g	44.6	44.9	42.8	42.6	1.79
Gizzard, g	31.8	31.8	31.1	33.0	1.30
AFP, g	35.5 **b**	40.6 **a**	38.9 **a**	45.8 **a**	2.54
AFP, g/100g BW	1.49 **b**	1.64 **ab**	1.67 **ab**	1.95 **a**	0.030

a, b. Values within a row with unlike superscripts differ significantly (P < 0.05).

Table 4. *Small intestine length (SIL), small intestine weight (SIW),*
SIW per 100 g body weight (BW) and pH values of duodenum, ileum
and caecum of broiler chickens fed diets containing organic acids

Variable	Control	0.1OA	0.2OA	0.3OA	SEM
SIL, cm	195.7	194.3	189.2	194.2	5.76
SIW, g	46.1	47.8	42.2	47.2	1.72
SIW, g/100 g BW	1.82	1.87	1.68	1.80	0.054
pH of duodenum	6.6	6.5	6.5	6.6	0.06
pH of ileum	6.6	6.4	6.4	6.6	0.11
pH of caecum	7.1	6.7	7.1	6.7	0.06

Table 5. *Number of total and gram (-) bacteria of ileum and caecum in broiler chickens, fed diets containing organic acid, log coloni forming unit (cfu)/g*

Old, days	Control	0.1OA	0.2OA	0.3OA	SEM
21st day bacteria counts					
Total in Ileum	9.54	8.82	9.78	9.80	0.266
Total in Caecum	10.01	9.72	9.89	9.96	0.127
Gram (-) in Ileum	8.98	8.11	7.81	8.28	0.566
Gram (-) in Caecum	9.96	9.52	9.67	9.85	0.165
42nd day bacteria counts					
Total in. Caecum	9.17	9.22	9.18	9.35	0.075
Gram (-).in Caecum	8.59	8.63	8.45	8.77	0.174

Conclusion

These results showed that organic acids supplementation did not affect the performance of broiler chicks, especially 0.20 % and 0.30% dietary organic acid supplementation decreased feed efficiency without affecting intestinal gram-negative bacteria populations. In conclusion, the dietary supplementation of organic acid had no beneficial effect on either the performance or intestinal flora.

References

1. Bilal, T., Kutay, C., Özpınar, H., Eseceli, H., Abak, I., 1999. The effect of Broilact® on performance and feed digestibility of broilers. VIV International Poultry Conference and Exposition. Pp: 472-479, Istanbul/TURKEY.
2. Campenhout, L. V., Hemel, J. V., Vandenkerckhove, J., Mollen, K., Sas, B., 2001. Performance of an alternative to antibiotics in Broilers With High intestinal counts of *Clostridium Perfringens*. 13th Eur. Symp. Poult. Nutr., oct. Pp.127-128.
3. Chapman, J.D., 1988. Probiotics, acidifiers and yeast culture: A place for natural additives in pig and poultry production. In: Biotechnology in the feed industry, Alltech Technical Publications (Ed. Lyons T.P.) Nicholasville, Kentucky, 269-291.
4. Guerrero, R., Hoyos, G., 1991. Direct fed microbials and acidifiers for poultry. In: Biotechnology in the food industry, Alltech Technical Publication (Ed. Lyons T.P.) Nicholasville, Kentucky, 407-411.
5. Mulder, R.W.A., 1996. Probiotics and competitive exclusion microflora against *salmonella.* World Poultry. 5:30-32.