

Comparative Effect of Polyherbal Agents and Organic Acid to Substitute Antibiotic Growth Promoters on Live Weight, Carcass Characteristics and Economics of Broiler Production

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Received 20 April 2016 ; Accepted 25 May 2016 ; Published online 10 June 2016

Abstract One hundred and eighty commercial, unsexed, day old broiler chicks belonging to same hatch were purchased. One hundred sixty chicks were randomly distributed in four treatment groups viz. T₀, T₁, T₂ and T₃. The body weight was found to be significantly higher in T₁ group followed by T₂ and T₃ group as compared to T₀ group. The live weight in 3rd week showed significant differences ($p < 0.05$) and T₁ group performed the best. The carcass characteristic was not significantly affected by feeding of different feed additives but dressing yield was significantly higher in T₁ treatment group followed by T₂ and T₃. Abdominal fat was significantly lower in T₁ and T₂ treatment group indicating polyherbal agents

and organic acid helps in reducing abdominal fat. Economic analysis showed that feed cost per day was highest in T₀ followed by T₃, T₂ and T₁.

Keywords Broiler, Polyherbs, Organic acids, Antibiotics, Live weight.

Introduction

Poultry are vulnerable to potentially pathogenic microorganisms such as *Escherichia coli*, Salmonella and Clostridium. Pathogenic microflora in the small intestine competes with the host for nutrients and also reduces the digestion of fat and fat-soluble vitamins due to deconjugating effects of bile acids [1]. The practice of feeding livestock with antibiotics has been in use for over fifty years. Antibiotics affect microflora by altering the metabolism of microorganisms, and suppressing microbial growth in the gut [2]. Usage of antibiotics has negative effects on animal's health and production such as residual in tissues, long withdrawal period, and development of resistance in microorganisms, allergies, genotoxicity [3] and harmful effects on human health by development of microbial resistance to specific products [4]. However in recent years great concern has been arisen about the use of antibiotics as growth promoters in poultry feed due to emergence of multi drug resistant bacteria and antibiotic residue effect [5]. Due to such consequences, plant extracts or phyto-genic feed additives have shown some capacity to replace or could

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be considered as potential alternatives to AGP. Polyherbs feed additives are plant extracts derived from herbs or spices, which have beneficial effect on animal production and health. A large variety of the plants have properties which could potentially improve feed intake, digestion, feed conversion and body weight gain [6]. Organic acid in poultry serves many actions such as stimulation of feed consumption, inhibits the growth of pathogenic bacteria and improves protein and energy digestibility by reducing microbial competition with host nutrients [7]. Inclusion of organic acids into broiler diets improved carcass yield, percentages of breast and thigh muscle [8]. Due to scanty information available on the comparative studies of herbal, antibiotic and organic acid the present study was conducted to observe the comparative effect of polyherbal agents, organic acid and antibiotic on the performance of broiler and to see whether antibiotics could be replaced by polyherbs or organic acids.

Materials and Methods

One hundred and eighty commercial, unsexed, 'Vencob' day old broiler chicks belonging to same hatch were purchased from Simrun commercial hatchery Indore. These chicks were weighed individually and one hundred sixty chicks of comparable body weight were selected and equally distributed randomly into four treatment groups viz. T₀, T₁, T₂ and T₃. The feeds were procured from the local market for the feeding of broilers (starter and finisher). The chemical composition of starter and finisher feed is given in Table 1. Each treatment group thus contained forty chicks with four replicates of ten birds in each and equally distributed randomly into four treatment groups. The chicks were fed with the corn soya based

Table 1. Chemical composition of broiler starter and finisher mash (% DM).

Nutrients	Broiler starter	Broiler finisher
Crude protein	22.05	19.05
Crude fiber	5.44	5.86
Ether extract	5.75	5.89
Nitrogen free extract	61.04	62.14
Total ash	6.34	6.23
Calcium	1.33	1.45
Phosphorus	0.73	0.68
Metabolisable energy (kcal / kg)	2913	2999

broiler mash, maintained as control group (T₀). In addition to the corn soya based broiler mash, the treatment groups T₁, T₂ and T₃ were supplemented with Polyherbal feed additive to T₁ @ 250 g / ton of diet, T₂ with organic acid @ 1 kg/ton of diet and T₃ with antibiotic @ 500 g/ton of diet. Weekly data of live weight was recorded and at the end of the experiment, four birds (one from each replicate) from each dietary treatment group were sacrificed by halal method at the end of experimental period. The birds were evaluated for carcass traits and the economics of rearing broiler chicks for complete experimental period (42 days) was calculated by taking into account the cost of chicks, cost of feed consumed by birds, supplementation cost and miscellaneous expenditure. The data generated through the experiment period was analyzed statistically by applying the completely randomized design to study the effect of treatment on various parameters [9].

Results and Discussion

The average weekly live weight for control (T₀) and

Table 2. Mean weekly cumulative live body weight (g) of experimental broilers. Mean bearing different superscripts (a, b, c) in columns different significantly ($p < 0.05$)*, ($p < 0.01$)** and NS = Non significant.

Week/ Group	T ₀	T ₁	T ₂	T ₃	
1	131.5 ± 0.64	135.5 ± 1.04	136.75 ± 0.85	135.5 ± 0.866	NS
2	313.25 ± 1.54 ^a	322.5 ± 1.44 ^b	318.75 ± 1.79 ^b	320.75 ± 0.47 ^b	*
3	548 ± 1.22 ^a	587.5 ± 3.27 ^c	571 ± 301 ^b	554.25 ± 3.54 ^a	*
4	859.75 ± 1.54 ^c	942.5 ± 3.27 ^c	901.5 ± 3.66 ^b	868 ± 3.31 ^a	**
5	1273 ± 2.51 ^a	1393.75 ± 3.94 ^c	1335.75 ± 2.65 ^b	1289.5 ± 2.90 ^a	**
6	1763.25 ± 5.93 ^a	1913 ± 4.63 ^c	1843.75 ± 1.65 ^b	1784.5 ± 2.25 ^{ab}	**

Table 3. Mean carcass yield and organs weight of experimental broilers at the end of sixth week (% of live weight). Mean bearing different superscripts (a, b) in coulms different significantly ($p < 0.05$)* and NS = Non significant.

Parameters	T ₀	T ₁	T ₂	T ₃	
Dressing	66.25 ± 0.23	72.75 ± 0.47 ^a	71.25 ± 0.25 ^b	68.59 ± 0.28	*
Breast muscle	20.25 ± 0.25	22.50 ± 0.64	21.25 ± 0.25	20.75 ± 0.48	NS
Thigh muscle	6.10 ± 0.04	7.98 ± 0.03	6.88 ± 0.02	6.80 ± 0.06	NS
Giblet	5.18 ± 0.04	5.52 ± 0.04	5.29 ± 0.05	5.24 ± 0.05	NS
Spleen	0.16 ± 0.08 ^c	0.20 ± 0.01 ^a	0.19 ± 0.01 ^b	0.17 ± 0.07 ^c	*
Bursa	0.25 ± 0.07	0.30 ± 0.01	0.29 ± 0.08	0.27 ± 0.08	NS
Thymus	0.46 ± 0.01	0.54 ± 0.01	0.52 ± 0.08	0.49 ± 0.04	NS
Abdominal fat	1.58 ± 0.09 ^c	1.38 ± 0.04 ^a	1.41 ± 0.09 ^b	1.45 ± 0.08 ^c	*

treatment groups (T₁, T₂ and T₃) are given in Table 2. The average body weight of day old chick of all groups was 52 gm. First week showed no significant difference between treatment groups (T₁, T₂ and T₃) in live weight which might be due to less feed intake while as second and third week showed significant difference ($p < 0.05$) with respect to control group (T₀). Live weight in fourth, fifth and sixth week showed significant difference ($p < 0.01$) with respect to control group (T₀) and there was significant difference ($p < 0.01$) within the group with highest live weight recorded in T₁ followed by T₂ and T₃. These findings are in agreement with Denil et al., Tirupati Reddy and Sultan [10, 11, 12]. It was also observed that organic acid treated T₂ group had significantly ($p < 0.05$) higher live body weight as compared to T₃ and T₀ group which is in partially in agreement with Alp et al. [13], Zhang et al. [14] and Skinner et al. [15].

At the end of experiment carcass characteristic

were studied and results are presented in Table 3. It was observed that the average breast muscle, thigh muscle, giblet, bursa and thymus varied non significantly with control group which is in agreement with Mahmood et al. [16] while dressing percentage, spleen weight and abdominal fat varied significantly ($p < 0.05$) which is in agreement with Pinchasov and Jansa [17]. Present results are in disparity with Rahmatnejad et al. [18], who reported that herbal additives (garlic and turmeric powders) had no effect on performance of broiler chickens.

The economics of broiler production per bird in experimental treatment groups was calculated and is presented in Table 4. In present study maximum net profits per bird was recorded in T₁ (Rs 26.87) followed by T₂ (Rs 19.14) and T₃ (Rs 12.19) and T₀ (7.59) groups. Similarly, net profit per kg body weight was highest in T₁ (Rs 14.04) followed by T₂ (Rs 10.38), T₃ (Rs 10.38) and T₀ (Rs 4.28) group. It was observed that in con-

Table 4. Economics of broiler production per bird in experimental treated groups.

Sl. No.	Particular	Treatment groups			
		T ₀	T ₁	T ₂	T ₃
1	Chick cost (Rs)	30	30	30	30
2	Feed cost (Rs)/kg	25.00	25.00	25.00	25.00
3	Cost of supplementation (Rs)/kg feed	0	15	18	20
4	Feed cost (Rs)/kg with supplementation	25.00	40	43	45
5	Feed consumed (kg)	3.302	2.945	3.061	3.176
6	Total feed cost (Rs)	82.5	73.62	76.52	79.4
7	Miscellaneous cost (Rs)	1.5	1.5	1.5	1.5
8	Production cost (Rs)/bird	114.05	105.12	108.02	110.9
9	Final body weight (kg)	1.763	1.913	1.843	1.784
10	Production cost (Rs)/kg body weight	64.69	54.95	58.61	62.16
11	Selling cost/kg body weight	69	69	69	69
12	Total selling cost (Rs)/bird	121.64	131.99	127.16	123.09
13	Net profit (Rs)/bird	7.59	26.87	19.14	12.19
14	Net profit (Rs)/kg body weight	4.28	14.04	10.38	6.83

trol group, the cost of feeding for 1 kg dressed weight at Rs 52.5, whereas in T₁, T₂ and T₃ were 43.62, 46.52 and 49.4, respectively. These results are in agreement with Mahmood et al. [16] who observed an increase in the profit margin of broiler using various herbal growth promoters in the rations. Regarding the net profit in organic acid treatment T₂ groups was higher than that of antibiotic treatment (T₃) groups, which is supported by Lokhande [19] who revealed that the group received acidifier recorded high net profit as compared to control group.

References

- Engberg RM, Hedemann MS, Leser TD, Jensen BB (2000) Effect of zinc bacitracin and salinomycin on intestinal microflora and performance of broilers. *Poult Sci* 79 : 1311—1319.
- Gadd J (1997) Life without antibiotic digestive enhancers. In: Lyons TP (ed). *Biotechnology in the feed industry*. Proc Alltechs, 13th Ann Symp, Nicholasville, Kentucky, USA, pp 277—291.
- Qamar SK, Ahsan ul Haq, Naeem Asghar, Shahid ur Rehman, Pervez Akhtar, Ghulam Abbas (2015) Effect of herbal medicine supplementations on growth performance, immunity and hematological profile in broilers. *Adv in Zool and Bot* 3 : 17—23.
- McCartney E (2012) The natural empire strikes back. *Poult Int* 41 : 36—42.
- Sethiya NK (2016) Review: Natural growth promoters available for improving gut health of poultry: An alternative to antibiotic growth promoters. *Asian J Poult Sci* 10 : 1—29.
- Ertas ON, Guler T, Ciftci M, Dalkılıç B, Simsek UG (2005) The effect of an essential oil mix derived from oregano, clove and anise on broiler performance. *Int J Poult Sci* 4 : 879—884.
- Canibe N, Engberg RM, Jensen BB (2001) An overview of the effect of organic acids on gut flora and gut health. Danish Institute of Agricultural Science. Res Center Foulum, Denmark, pp 15.
- Saki A, Harcini RN, Rahmatnejad E, Salary J (2012) Herbal additives and organic acids as antibiotic alternatives in broiler chickens diet for organic production. *Afr J Biotechnol* 11 : 2139—2145.
- Snedecor GW, Cochran WG (1994) *Statistical method*. 8th edn. Oxford and IBH Publ Co Pvt Ltd, New Delhi.
- Denil M, Khan F, Celik K (2003) Effect of dietary probiotic, organic acid and antibiotic supplementation to diets on broiler performance and carcass yield. *Pak J Nutrition* 2 : 89—91.
- Tirupathi Reddy (2010) Effect of herbal preparations on the performance of broilers. MVSc thesis. Sri Venkateswara Vet Univ, Tirupathi.
- Sultan SI (2003) The effect of curcuma longa (turmeric) on overall performance of broiler chickens. *Int J Poult Sci* 2 : 351—353.
- Alp M, Kocabagli N, Kahraman R, Boston K (1999) Effect of dietary supplementation with organic acid and zinc bacitracin on ileal microflora, pH and performance in broilers. *Turkey J Vet and Anim Sci* 23 : 451—455.
- Zhang KY, Yan F, Keen CA, Waldroup PW (2005) Evaluation of microencapsulated essential oils and organic acids in diets for broiler chickens. *Int J Poult Sci* 4 : 612—619.
- Skinner JT, Izat AL, Waldrop PW (1991) Fumaric acid enhances performance of broilers. *Poult Sci* 70 : 1444—1447.
- Mahmood S, Hassan M, Alam M, Ahmed F (2009) Comparative efficacy of *Nigella sativa* and *Allium sativum* as growth promoters in broilers. *Int J Agric and Biol* 11 : 775—778.
- Pinchasov Y, Jensen L (1988) Effect of dietary added acetic and propionic acids on voluntary feed intake of broiler chicks. *Poult Sci* 67 : 139.
- Rahmatnejad E, Roshanfekr H, Ashayerizadeh O, Mamoee M, Ashayerizadeh A (2009) Evaluation the effect of several non-antibiotic additives on growth performance of broiler chickens. *J Anim Vet Adv* 8 : 1757—1760.
- Lokhande DY (2005) Comparative evaluation of probiotic, prebiotic and acidifier in broilers diet. Unpublished MVSc thesis. Maharashtra Anim and Fish Sci Univ, Nagpur.