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Comparative study of the effects of different feed supplements on feed conversion ratio and performance index of broiler chickens

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Abstract

A feeding trial was conducted to evaluate the Influence of organic mineral mixture, probiotics, enzymes, emulsifier and liver stimulants on Feed Conversion Ratio and Performance Index of broilers. For this purpose, a total of 396 day old broiler chicks (Cobb) were used and randomly allocated into 11 groups with three replicates of 12 chicks each. The results revealed that at 42nd day, All the supplemented group showed significant ($P<0.05$) lower in feed conversion ratio than T₀ (control) group except in T₆, T₇ and T₈ groups. All the supplemented group showed significant ($P<0.05$) higher in Performance Index than T₀ (control) group except in T₆, T₇ and T₈ groups.

Keywords: feed supplements, broiler chickens

Introduction

Poultry is one of the fastest growing segments of the agricultural sector in India with compound growth rates of 6% and 10% per annum in egg and broiler production. Globally, India ranked 3rd in after China and USA with a production of 88.1 billion eggs (2016-2017) and 6th after USA, China, Brazil, Mexico and Indonesia with a production of 3.46 million tons of chicken meat (BAHS, 2017). The per capita consumption of eggs and meat is about 69 eggs and 3.4 kg meat per person per annum in India. In the country, eggs and broilers has been shown to rise at a rate of 8 –10 per cent per annum. The poultry sector in totality accounts for 0.60 per cent of the national GDP (2017–2018). As per FAOSTAT (2016), world's per capita consumption of poultry meat has increased from 2.88 kg to 14.13 kg over the last five decades. Poultry meat is an excellent source of high quality protein, vitamins, and minerals and is not subjected cultural and religious restrictions. Broiler meat is rich in nutrients primarily as a source of protein (21.4g/ 100g) with fewer calories (119 kcal/ 100g). Organically complexed minerals may provide alternative pathways for absorption, by decreasing mineral excretion. Organic trace minerals (OTM) supplementation to broiler diet is not directly associated with improved broiler performance, a single or blend of OTM in diets has been shown to have multiple beneficial effects. Probiotics are live microbial feed supplements which beneficially affect the host poultry birds by improving its intestinal microbial balance (Isolauri *et al.*, 2004)^[4]. *Lactobacillus spp*, *Saccharomyces cerevisiae* and *Bacillus coagulans* have been used as a source of probiotics for improving growth performance. Poultry naturally produces enzymes which help in digestion of feed nutrients. The benefits of using enzymes in poultry diets include not only enhanced bird performance. Poultry produce emulsifiers in the form of bile however it is at times insufficient in view of added fats and oils. Hence, addition of emulsifier from external sources becomes obligatory in poultry feed. Broilers fed the diet containing soybean oil and emulsifier presented higher body weight gain. Liver stimulants possess hepato – protective and hepatogenic properties, tone up liver resulting into increase utilization of nutrients and hence better performance. Keeping the above facts in view, an experiment was conducted to determine the effect of supplementation of organic mineral mixtures, probiotics, enzymes, emulsifier and liver stimulants on the Feed Conversion Ratio and Performance Index of broilers.

Materials and Methods

A total of 396 day old commercial broiler chicks (Cobb) were procured for conducting the experiment. All the chicks were individually weighed and randomly allotted to eleven different groups each with three replicates of 12 chicks.

Average Body Weight of chicks was similar for all the treatment groups. All the Housing and Managemental conditions were similar for different treatment groups in the experiment. The groups were designated as T₀; Basal diet, T₁; Chicks fed basal diet along with Organic Mineral Mixture 1 (Organomin Forte) @ 0.5 g per kg feed, T₂; Basal diet along with Organic Mineral Mixture 2 (Vannamin) @ 0.5 g per kg feed, T₃; basal diet along with Probiotics (Microguard) @ 0.1g per kg feed, T₄; Basal diet along with Enzymes + Probiotics (Brozyme -XPR) @ 0.5 g per kg feed, T₅; Basal diet along with Emulsifier(Lipigon) @ 0.5 g per kg feed, T₆; Basal diet with 3% less energy, T₇; Basal diet with 3% less energy along with Liver Stimulant1(Superliv Premix) @ 0.5 g/kg feed, T₈; Basal diet with 3% less energy along with Liver Stimulant 2 (X- Liv Pro) @ 0.5 g/kg feed, T₉; Basal diet along with

Enzymes with Probiotics (Brozyme - XPR) and Liver Stimulant 1(Superliv Premix) @ 0.5 g/kg feed, and T₁₀; Basal diet along with Enzyme with Probiotics (Brozyme - XPR), Liver Stimulant1(Superliv Premix) and Emulsifier (Lipigon) @ 0.5 g/kg feed. All the chicks were weighed individually from all groups at weekly intervals to obtain week wise body weights. The average value of body weight gain under each treatment group was then calculated. The experimental data obtained were analyzed statistically using Completely Randomized Design (CRD) as per the methods given by (Snedecor and Cochran, 1994) [8]. The significant mean differences between the treatments were determined by using Duncan's Multiple Range Test (DMRT) as given by Kramer (1957) [6].

Table 1: Effect of feed supplements on Feed Conversion Ratio of broilers

Treatments	Feed conversion ratio / broiler / week						Overall
	Starter			Finisher			
	I	II	III	IV	V	VI	
T ₀	1.59 ^a ± 0.08	1.71 ^a ± 0.05	1.87 ^a ± 0.02	2.05 ^a ± 0.02	2.36 ^a ± 0.02	2.48 ^a ± 0.01	2.15 ^a ± 0.01
T ₁	1.44 ^b ± 0.04	1.55 ^b ± 0.02	1.69 ^b ± 0.01	1.84 ^b ± 0.05	2.09 ^b ± 0.02	2.27 ^b ± 0.02	1.94 ^b ± 0.01
T ₂	1.43 ^b ± 0.05	1.53 ^b ± 0.02	1.67 ^b ± 0.02	1.83 ^b ± 0.05	2.03 ^{bc} ± 0.03	2.28 ^b ± 0.06	1.92 ^b ± 0.04
T ₃	1.42 ^b ± 0.02	1.51 ^{bc} ± 0.02	1.66 ^{bc} ± 0.02	1.81 ^{bc} ± 0.02	2.04 ^{bc} ± 0.02	2.23 ^b ± 0.05	1.90 ^{bc} ± 0.04
T ₄	1.37 ^c ± 0.02	1.47 ^c ± 0.04	1.61 ^c ± 0.05	1.76 ^c ± 0.02	2.00 ^c ± 0.02	2.18 ^c ± 0.05	1.85 ^c ± 0.05
T ₅	1.36 ^c ± 0.03	1.46 ^c ± 0.04	1.60 ^c ± 0.05	1.75 ^c ± 0.01	2.04 ^{bc} ± 0.02	2.10 ^d ± 0.05	1.84 ^c ± 0.02
T ₆	1.68 ^d ± 0.04	1.80 ^d ± 0.02	1.97 ^d ± 0.03	2.15 ^d ± 0.02	2.48 ^d ± 0.01	2.61 ^e ± 0.02	2.26 ^d ± 0.01
T ₇	1.66 ^d ± 0.04	1.78 ^d ± 0.02	1.94 ^d ± 0.04	2.12 ^d ± 0.03	2.36 ^a ± 0.06	2.65 ^e ± 0.01	2.23 ^d ± 0.05
T ₈	1.65 ^d ± 0.04	1.77 ^d ± 0.03	1.93 ^d ± 0.06	2.11 ^{ad} ± 0.02	2.28 ^e ± 0.05	2.71 ^f ± 0.01	2.22 ^d ± 0.01
T ₉	1.35 ^c ± 0.00	1.44 ^c ± 0.02	1.57 ^c ± 0.01	1.72 ^c ± 0.04	1.97 ^{cf} ± 0.02	2.10 ^d ± 0.02	1.81 ^c ± 0.05
T ₁₀	1.33 ^c ± 0.02	1.42 ^c ± 0.03	1.56 ^c ± 0.01	1.70 ^c ± 0.02	1.92 ^f ± 0.01	2.10 ^d ± 0.02	1.79 ^c ± 0.02

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

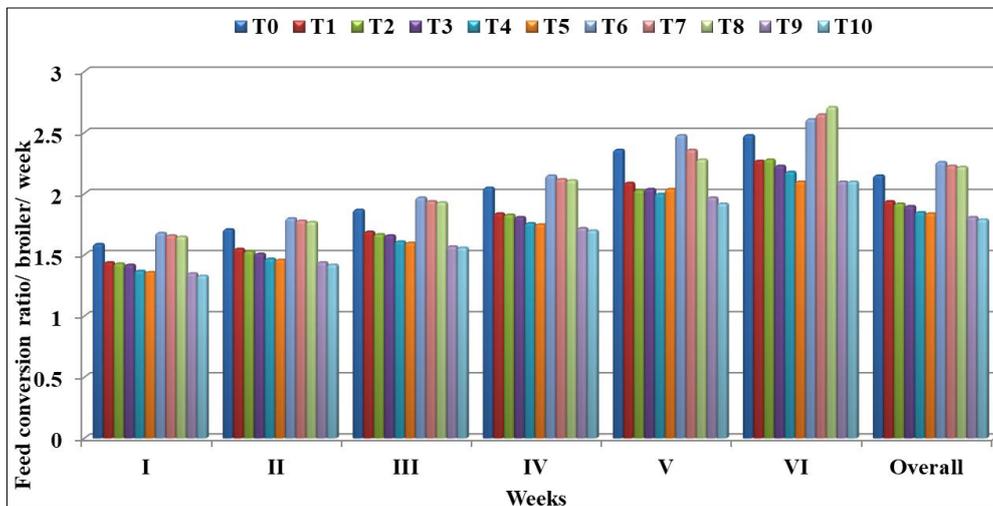


Fig 1: Effect of feed supplements on Feed Conversion Ratio of broiler

Results and Discussion
Feed Conversion Ratio

Feed conversion ratio of broilers obtained at weekly interval as well as on overall basis is presented in Table1 and Fig.1

Starter Phase

During the starter phase the feed conversion ratio of broilers reduced significantly in all the treated groups as compared to control group at the end of third week except in T₆, T₇ and T₈ groups wherein it increased significantly.

Similar trend in feed conversion ratio was observed in finisher phase also with significantly reduced feed conversion ratio observed in all the treated groups than the control except in

T₆, T₇ and T₈ groups wherein it increased significantly.

Overall Feed Conversion Ratio

The overall (I - VI week) mean values for feed conversion ratio of broilers were 2.15 ± 0.01, 1.94 ± 0.01, 1.92 ± 0.04, 1.90 ± 0.04, 1.85 ± 0.05, 1.84 ± 0.02, 2.26 ± 0.01, 2.23 ± 0.05, 2.22 ± 0.01, 1.81 ± 0.05 and 1.79 ± 0.02 in T₀ to T₁₀ groups, respectively. The overall feed conversion ratio at the end of 6 week of age showed significantly lower values in all the groups as compared to control group except in T₆, T₇ and T₈ groups. The minimum feed conversion ratio of 1.79 ± 0.02 (16.74% less than control) was observed in broilers of T₁₀ group where all the supplements (probiotics, enzymes,

emulsifier and liver stimulant I) were added in the basal diet. The maximum feed conversion ratio of 2.26 ± 0.01 was observed for T₆ where basal diet with 3% less energy was given followed by T₇ (2.23 ± 0.05) and T₈ (2.22 ± 0.01). There were no significant differences in feed conversion ratio among T₁, T₂ and T₃; T₃T₄, T₅, T₉ and T₁₀; T₆, T₇ and T₈ group of broilers.

The results of study revealed that addition of organic mineral mixtures, probiotics, enzymes, emulsifier and liver stimulants alone or in combination were found to decrease feed conversion ratio significantly. Reduction of 3% energy in group T₆ had undesirable impact on feed conversion ratio by (-) 5.11%. However, loss in feed conversion ratio due to 3% reduction in dietary energy was compensated by addition of liver stimulant I and II in T₇ & T₈ groups respectively.

Allahdo *et al.*, (2018) [2] noted better feed to gain ratio in broilers supplemented with probiotics. Upadhaya *et al.*, (2017) [10] found significant ($P < 0.05$) decrease in feed conversion ratio of broilers fed low density diet supplemented with emulsifier. Rabie *et al.*, (2010) [7] also observed that feed conversion ratio was adversely affected ($P < 0.01$) with low energy diet.

Performance Index

Performance index of broilers obtained at weekly interval as well as overall basis are presented in Table 2 and Fig. 2.

Starter Phase

During the starter phase the performance index of broilers increased significantly in all the treated groups as compared to control group at the end of third week. It decreased significantly in T₆, and T₇ groups.

Finisher Phase

Similar trend in performance index was observed in finisher phase also with significantly increased performance index

observed in all the treated groups than the control except in T₆, T₇ and T₈ group where it decreased significantly.

Overall Performance Index

The overall (I - VI week) mean values for performance index of broilers were 861.62 ± 1.64 , 998.60 ± 0.72 , 1010.46 ± 1.07 , 1049.15 ± 1.21 , 1089.13 ± 0.42 , 1059.89 ± 0.73 , 778.93 ± 0.82 , 828.96 ± 1.11 , 836.84 ± 0.58 , 1140.27 ± 1.03 and 1184.52 ± 0.57 in T₀ to T₁₀ groups, respectively. The overall performance index at the end of 6 week of age showed significantly higher values in all the groups as compared to control group except T₆, T₇ and T₈ group. The maximum performance index of 1184.52 ± 0.57 (37.47% more than control) was observed for T₁₀ where all the supplements (probiotics, enzymes, emulsifier and liver stimulants I) were added in the basal diet followed by T₉ (1140.27 ± 1.03), T₄ (1089.13 ± 0.42), T₅ (1059.89 ± 0.73), T₃ (1049.15 ± 1.21), T₂ (1010.46 ± 1.07) and T₁ (998.60 ± 0.72). The minimum performance index of 778.93 ± 0.82 was observed in broilers of T₆ group where 3% less energy was provided in feed. There were no significant differences in performance index among T₁ and T₂; T₃ and T₅; T₇ and T₈; T₀ and T₈ group of broilers.

The results of study revealed that addition of organic mineral mixtures, probiotics, enzymes, emulsifier and liver stimulants alone or in combination were found to increase performance index significantly. Reduction of 3% energy in group T₆ led to significantly depression in performance index by 9.59%. However, loss in performance index due to 3% reduction in dietary energy was compensated by addition of liver stimulant I and II in T₇ & T₈ respectively.

These findings were similar to Kaushal (2015) who noted that there was significantly ($P < 0.05$) higher performance index of broilers fed diet supplemented with enzymes and probiotics. Thorat *et al.*, (2015) [9] reported significant ($P < 0.05$) improvement in performance index of broilers fed diet supplemented with prebiotics, probiotics and multi-enzymes.

Table 2: Effect of feed supplements on Performance Index of broilers

Treatments	Performance Index / broiler / week						
	Starter			Finisher			Overall
	I	II	III	IV	V	VI	
T ₀	47.52 ^a ± 0.05	109.05 ^a ± 1.79	159.21 ^a ± 0.91	199.20 ^a ± 0.62	181.08 ^a ± 0.72	184.26 ^a ± 0.60	861.62 ^a ± 1.64
T ₁	54.60 ^b ± 0.03	125.58 ^b ± 5.39	183.93 ^b ± 1.55	232.32 ^b ± 2.06	213.77 ^b ± 1.15	210.96 ^b ± 0.48	998.60 ^b ± 0.72
T ₂	54.87 ^b ± 0.02	127.73 ^b ± 1.70	186.57 ^b ± 1.08	233.68 ^b ± 0.58	220.20 ^c ± 0.71	210.51 ^b ± 1.34	1010.46 ^b ± 1.07
T ₃	56.76 ^c ± 0.01	132.87 ^c ± 1.56	192.66 ^c ± 1.07	242.95 ^c ± 1.62	225.27 ^c ± 0.59	221.08 ^c ± 0.69	1049.15 ^c ± 1.21
T ₄	59.62 ^d ± 0.01	137.85 ^d ± 3.90	201.05 ^d ± 2.12	252.55 ^d ± 0.49	232.30 ^d ± 1.22	228.33 ^d ± 1.01	1089.13 ^d ± 0.42
T ₅	58.27 ^d ± 0.01	134.60 ^{cd} ± 6.07	196.00 ^c ± 1.55	245.93 ^c ± 0.36	220.36 ^c ± 0.96	228.99 ^d ± 0.54	1059.89 ^c ± 0.73
T ₆	42.58 ^e ± 0.05	98.57 ^e ± 1.67	143.51 ^e ± 1.76	180.68 ^e ± 0.55	163.60 ^e ± 1.22	166.46 ^e ± 1.21	778.93 ^e ± 0.82
T ₇	45.13 ^f ± 0.05	104.32 ^f ± 5.93	153.02 ^f ± 1.27	192.29 ^f ± 1.14	180.77 ^a ± 0.59	172.38 ^f ± 0.43	828.96 ^f ± 1.11
T ₈	45.82 ^f ± 0.04	105.36 ^f ± 1.70	154.74 ^{fa} ± 1.00	194.19 ^f ± 0.97	187.98 ^f ± 0.97	169.25 ^e ± 1.36	836.84 ^{fa} ± 0.58
T ₉	61.95 ^g ± 0.02	144.13 ± 1.76	211.25 ^g ± 1.46	264.72 ^g ± 1.89	241.49 ^g ± 0.59	242.83 ^g ± 0.49	1140.27 ^g ± 1.03
T ₁₀	64.42 ^h ± 0.05	150.43 ^h ± 2.91	218.35 ^h ± 1.20	275.00 ^h ± 1.60	254.41 ^h ± 1.30	249.70 ^h ± 0.89	1184.52 ^h ± 0.57

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

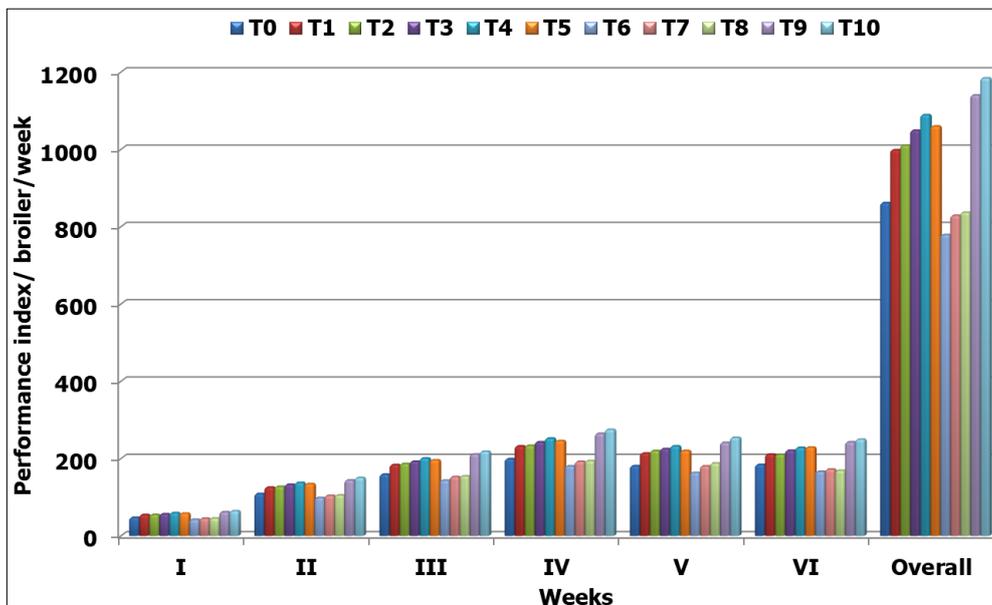


Fig 2: Effect of feed supplements on Performance Index of broilers

Conclusion

Thus, it may be concluded that organic mineral mixtures, probiotics, enzymes, emulsifier and liver stimulant supplementation has been found beneficial in the improved performance is the pivotal role played by supplements which resulted into better nutrient absorption and is thus responsible for better performance.

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