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Research Article

Effect of Homeopathic Medicine (Alfalfa), Methionine and Lysine Supplementation in Low Protein Based Diets on the Performance of Broiler Chicken

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Abstract

An experiment was conducted, with objective to determine the feed consumption, final live weight, weight gain, feed efficiency and economy in broiler chicken fed with locally available low protein based diets (20 percent CP in starter and 18 percent CP in finisher) supplemented with methionine, lysine and homeopathic medicine alfalfa. For this hundred fifty day-old birds of commercial broiler (Vencobb) were randomly assigned to five dietary treatments(10 chicks/treatment) and replicated three times in CRD with treatments composition of low protein based diets (LPB) (T0), LPB+ 100g/100 met + 300g/100 lysine (T1), LPB + 200g/100 met +300g/100lysine (T2), LPB + Alfalfa 5ml/100 chicks 2 day in week with drinking water (T3) and LPB + Alfalfa 5ml/100 chicks 3 day in week with drinking water (T4). Synthetic methionine and lysine was used for supplementation of deficient amino acid. Same condition was applied in finisher diets of broiler chicken. The result showed that chicks fed with LPB in both starter and finisher diet had significantly ($P<0.05$) lower feed intake, final live weight , total weight gain, feed efficiency and income over feed and chicks cost (IOFCC) with compromising chicks fed with LPB with addition of methionine and lysine each and also homeopathic medicine alfalfa in starter and finisher period. Highest feed intake, final live weight, weight gain, feed efficiency was obtained with treatment (T1) followed by treatment (T2). However, positive growth response and better health status of chicks was also observed from supplementation of homeopathic medicine alfalfa with LPB and non-significant difference on Income Over Feed and Chicks Cost was obtained with treatment (T1). So, it was concluded that with supplemental methionine, lysine and alfalfa, the CP level of broiler chicks could be reduced up to 20 percent in starter and 18 percent in finisher diets without adverse effect on feed intake, final live weight, weight gain, feed efficiency and Income overfeed and chicks cost, provided under locally based feed ingredients.

Keywords: Boiler chicks; Low protein based diet (LPB); Homeopathic medicine Alfalfa; Methionine; Lysineine

Introduction

Over the last three decades poultry production technology in world has been increasingly improved. Egg production has increased six times, over the same periods chicken meat supply has increased 13 times. Broiler meat is one of the principal sources to fill the genuine gaps of the animal protein and can play leading role in providing balanced diet (Alam and Khan, 2000). The production and marketing of

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poultry and its related products has become a large and significant industry across the world.

Poultry industry has been developed as one of the incredible business of Nepal. This industry alone contribute 8 % of the total livestock contribution to AGDP which is 26.8 %(MoAD, 2016). The total population of poultry during the year 2015/ 16 was 68630638 (MoAD, 2016). However net meat production during the year 2015/16 was 322059 metric ton, out which the contribution from chicken was 55041 metric ton (MoAD, 2016). The per capita consumption of meat and eggs in Nepal is very low (4.1kg meat and 44 egg per person per year) as compared to the world average (12 kg and 153/person/year meat and eggs, respectively).

Though this industry has been growing day by day, quality feed reach in protein and other essential feed ingredients are deficient. The current poor nutritional status is due to lack of sufficient energy and protein in the feed. Protein is the most important component of feed ingredients. Methionine and lysine are first and second limiting amino acids (Gill, 2003) in most of plant protein sources used for preparing poultry diet. The requirement of these two amino acids is substantial but variable for changes in genetic, nutrition and management of broiler chicks. Feed consumption, growth rate and carcass composition are affected by individual amino acids that is receiving considerable attention for development of broiler industry. Methionine acts as lipotropic agent through its role as an amino acid in balancing crude protein (Hesabi *et al.,* 2008).

National Research Council (NRC, 1994) recommended 23 percent crude protein in starter (0-3 weeks) and 20 percent for finisher (3-6 weeks) broiler chicken diets. At this level, it is hypothesized that, all most all of indispensable amino acids are balanced. Excess of amino acids from required level are delaminated and excreted from the faeces which lead to high cost of production and excreted amino acids and ammonia create environmental pollution. Therefore,lots of studies on phytogenic compounds of plants essential oils have been performed while there are limited evidences about the effect of herbal solid forms on live birds health and performance. Easy and practical application, availability and less cost are known as advantages of the whole herbs application in compare to extract or essential oil forms. In the other hand, a synergistic effect of phytogenic compounds have been reported in studies with essential oils (Mitsch *et al.,* 2004), and a combination of herbal powders might tends to be more effective than a single herb administration.

Among various herbal plants, alfalfa (*Medicago sativa)* is well known herb cultivated for more than 1600 years, commonly grown as animal feed in the form of alfalfa hay. It has high nutrient value, the leaves are rich in minerals, including calcium, magnesium, potassium, and carotene, as well as, protein, Vitamin E and Vitamin K. and can be include as the ingredient in the poultry feed. Currently, This Alfalfa is available in the market in the form of pellets and also in liquid remedies. Though Alfalfa is highly nutrias and reached in protein few studies on poultry feeding with these herbs has been conducted. So, this research was design to study the response of homeopathic medicine (Alfalfa), methionine and lysine supplementation in low protein based diets on the performance, feed efficiency and economics in broiler chickens production.

Materials and Methods

This research was conducted at Rapti Technical School in Lalmatiya Dang, from July 28 to September 18- 2012 (50 days), lay out under Complete Randomized Design (CRD), with 5 treatments replicated 4 times and each treatment consisted of 10 chicks purchased from Pancharatna Private Hatchery, Chitwan.

Chemical Analysis of Feed Ingredients

All the feed ingredients were purchased from local market at Ghorahi Dang, and conventional grinder was grounded and other materials were mixed in diet as ready to use and stored at research station at Lalmatiya Dang. Synthetic amino acid L-lysine99%, DL-methionine 99% and synthetic homeopathic medicine alfalfa were purchased from market and stored at the same place.

Formulation of Broiler Starter and Finisher Ration

Low protein based (LPB) starter and finisher diet were formulated for feeding 1-7 week of broiler chicks. The low protein broiler starter ration containing 20 percent crude protein and low protein broiler finisher ration containing 18 percent crude protein. The chemical composition and nutrient content of broiler starter and finisher ration is presented in Table 1. Both starter and finisher ration were deficient in essential amino acid especially lysine and methionine. To fulfil amino acid requirement synthetic L-lysine and DL-methionine were supplemented in both starter and finisher diets to meet the nutrient requirements of broilers (NRC, 1994). The diets were also fortified with vitamins and minerals mixture.

Feeding Trial

One hundred and fifty day-old commercial broiler (Vencobb) were purchased from Pancharatna private hatchery, Chitwan. One compartment of poultry house was taken as experimental site. The experiment units were partitioned in to 15 sq. fts. Compartments by hexagonal wire mesh, supported with bamboo bits. Small compartment were provided with 60 watts electricity bulbs for lighting and heating. From day-old, one hundred and fifty chicks were randomly distributed in 15 compartments with 10 chicks each following completely randomized design with 3 replications and housed on deep litter system. The dietary treatments were randomly assigned to the different

compartments of 10 chicks per replication. Composition of Diet is shown in Table 1 and experimental diet in Table 2.

Data Collection

Weekly Body Weight Gain

The initial and weekly body weight was taken on an individual basis using an electric balance. The average cumulative body weight gain was obtained subtracting initial weight of the birds from their corresponding body weight for each week

Feed Consumption

The feeds were provided to the birds in each replication in a long horizontal feeder. The weekly feed consumption of the birds in each treatment was determined by subtracting the weight of the leftover feed from the weight of feed in each week. The average cumulative feed consumption was calculated by dividing the weekly cumulative feed consumption by the number of birds in each replication.

Feed Efficiency

The weekly cumulative feed efficiency of each treatment was determined by dividing the weekly average cumulative feed consumption of the bird by their respective weekly cumulative body weight gain of the birds.

Economic Analysis

At the end of experiments, the average income over feed and chick cost (IOFCC) for each treatment were calculated by subtracting the cost of feed consumed and chick cost from market price of the finisher broiler.

Statistical Analysis

Collected data were tabulated in MS-excel 2007. For significance test data were analyzed by following Completely Randomized Design using analys of variance (ANOVA) procedure (Senedecor and Cochran, 1965) by using GEN-STAT Discover. Least significance difference (LSD) was performed for mean comparison.

Table 1: Chemical composition and nutrient content of broiler starter and finisher ration

Ingredients	Boiler Starter (20% CP)	Broiler Finisher (18% CP)
Maize	59.2	60
Soybean meal	30.45	24
Soya oil	5	4
Salt	0.25	0.25
Limestone	0.6	0.6
Bone meal	2.	2.3.
Sesame meal		7.35
DCP	1.3	1
Additives	0.5	0.5
Total	100	100
Price (NRs/kg)	44	40
Calculated nutrient content		
Metabolic energy (ME Kcal/kg)	3128.32	3136.13
Crude protein %	20.13	18.14
Phosphorus	0.8	0.8
Lysine	1.02	0.88
Methionine	0.33	0.31
Calcium	1.09	1.1

Table 2: Experimental diet

T_0	LPB (control)
T_1	LPB + Methionine 100g/100 kg + 300g/100 kglysine
T_2	LPB + Methionine 200g/100 kg + 300g/100 kglysine
T_3	LPB + Alfalfa 5ml/100 chicks 2 day in week with drinking water
T_4	LPB + Alfalfa 5ml/100 chicks 3 day in week with drinking water

Results and Discussion

Total Feed Consumption

Average weekly cumulative feed consumption (g/bird) of broiler fed low protein based diets supplemented with methionine, lysine and synthetic alfalfa from 1-7 weeks of age is presented in Table 3. Weekly cumulative feed consumption of different composition either CP alone or fortified with synthetic DL- methionine, L-lysine and alfalfa in starter (0-3 week) and finisher (4-7 week) periods. An improvement in cumulative feed consumption from first week onwards was observed with inclusion with 200g methionine +300 glysine and synthetic alfalfa at 3 days in a week was significantly different (P<0.05). The cumulative feed intake 379.43g, followed 374.60g, 373.07g 370.60g and 366.80g was recorded in chicks fed LPB+ 200g met +300g lysine followed by LPB+ 100g met + 300g lysine, LPB+ 5ml alfalfa 3 days in a week, LPB and LPB+ 5ml alfalfa 2 days in a week, respectively during second week of experimental period. Similar trend of feed consumption was recorded in 3rd 4th 5th6th and 7th week of experimental period.

Body Weight

The average initial and weekly cumulative body weight (g/bird) of broiler fed low protein based diets supplemented with synthetic DL-methionine, L-lysine and alfalfa from 1-7 weeks of age is presented in Table 4.The initial body weight of chicks assigned to various treatments ranged from 40 to 40.16 g with mean 40.06g per bird. The initial body weight of bird assigned to different treatments were statistically similar (P>0.05).Analysis of variance (ANOVA) showed significant difference (P<0.05) among treatments on weekly cumulative body weight of the broilers. Improvement in body weight of chicks was noticed from first to seventh week experimental period with supplementation of synthetic DL-methionine, L-lysine and alfalfa. Throughout feeding period, i.e. from 1st week to 7th week the highest body weight of chicken was recorded from diets with LPB+ 200g met +300glysine followed by LPB+5ml alfalfa 3 days in a week, LPB+ 100g met+300glysine, LPB+ 5ml alfalfa 2 days in a week and basal ration. LPB showed significantly (P<0.05) lower in cumulative weekly body weight of broiler than other treatment

Table 3: Average weekly cumulative feed consumption (g/bird) of broilers fed low protein based diets supplemented with methionine, lysineine and synthetic alfalfa from 1-7 weeks of age

Treatments	Weekly feed consumption(g/bird)						
	1st	2nd	3rd	4th	5th	6th	7th
T0	142.56^{a}	366.80^{c}	732.00^{d}	1308.50^{d}	2065.30^{c}	2911.00^{d}	3835.20^{d}
T1	145.34^{a}	374.60^{b}	773.20^{b}	1457.50^{b}	2253.60^{a}	3240.00^{ab}	4096.70^{b}
T2	144.47^{a}	379.43^{a}	786.60^{a}	1519.10^{a}	2288.30^{a}	3299.00^{a}	4335.50^{a}
T3	141.47^{a}	370.6b^{c}	756.30^{c}	1413.40^{c}	2156.80^{b}	3077.00^{c}	3939.30^{c}
T4	143.97^{a}	373.07^{b}	775.60^{b}	1455.30^{b}	2160.70^{b}	3207.00^{b}	4008.90^{c}
Mean	143.56	372.90	764.70	1430.80	2184.90	3147.00	4043.10
SEM	1.21	1.54	4.20	6.42	12.15	25.70	17.84
LSD	1.21	4.85	13.23	20.23	38.30	80.9	56.22
F-value	1.62	9.28	25.63	147.74	52.65	36.50	112.71
Probability	0.24	0.002	<.001	<.001	<.001	<.001	<.001
C.V%	1.5	0.7	1.0	0.8	1.0	1.4	0.8

Note: Means with in a column having same superscripts are not significantly different (P>0.05).

Table 4: Average initial and weekly body weights (g/bird) of broiler fed low protein based diets supplemented with synthetic DL-methionine, L-lysineine and alfalfa from 1-7 weeks of age.

Treatments	Mean live weight (g/bird)							
	Initial	1st	2nd	3rd	4th	5th	6th	7th
T0	40.03	112.63^{d}	217.53^{d}	396.70^{d}	683.80^{d}	952.40^{d}	1249.90^{e}	1572.00^{d}
T1	40.03	119.50^{b}	235.03^{b}	437.50^{b}	796.40^{bc}	1133.00^{b}	1568.40^{b}	1883.00^{b}
T2	40.00	123.60^{a}	247.77^{a}	462.60^{a}	880.10^{a}	1245.80^{a}	1688.70^{a}	2032.00^{a}
T3	40.06	115.50^{c}	227.60^{c}	423.60^{c}	760.50^{c}	1034.90	1402.00^{d}	1760.00^{c}
T5	40.16	120.30^{b}	233.70^{b}	436.40^{b}	797.00^{b}	1126.50^{b}	1496.50^{c}	1840.00^{b}
Mean	40.06	118.31	232.33	431.40	783.60	1098.50	1481.10	1817.00
SEM	0.07	0.69	1.93	2.52	8.42	10.05	17.23	25.80
LSD	0.24	2.18	6.08	7.94	26.52	31.67	54.28	81.30
F-value	0.66	38.25	32.75	90.39	71.10	121.35	93.22	42.88
Probability	0.63	<.001	<.001	<.001	<.001	<.001	<.001	<.001
C.V%	0.3	1.0	1.4	1.0	1.9	1.6	2.0	2.5

Note: Means with in a column having same superscripts are not significantly different (P>0.05).

Table 5: Average daily body weight gain of broiler fed low protein based diets supplemented with synthetic DL-methionine, L-lysine and alfalfa from 1-7 weeks of age

Treatment	Daily weight gain (g/bird)						
	1st	2nd	3rd	4th	5th	6th	7th
T0	10.40^{d}	15.00^{c}	25.63^{c}	41.00^{c}	40.10^{bc}	40.73^{c}	46.03^{a}
T1	11.36^{b}	16.53^{b}	28.93^{b}	51.26^{b}	48.06^{a}	62.16^{a}	44.93^{a}
T2	11.90^{a}	17.73^{a}	30.66^{a}	59.63^{a}	52.23^{a}	63.30^{a}	49.00^{a}
T3	10.80^{c}	16.03^{b}	28.00^{b}	48.13^{b}	39.20^{c}	52.46^{b}	51.20^{a}
T4	11.46^{b}	16.23^{b}	28.93^{b}	51.53^{b}	47.06^{ab}	52.86^{a}	49.13^{a}
Mean	11.18	16.30	28.43	50.31	45.33	54.30	48.06
SEM	0.09	0.25	0.43	1.25	2.36	1.96	2.06
LSD	0.298	0.815	1.382	3.965	7.451	6.202	14.720
F-value	38.08	14.48	17.57	28.53	5.50	21.45	1.51
Probability	<.001	<.001	<.001	<.001	<.001	<.001	0.269
C.V%	1.48	2.75	2.67	4.33	9.03	6.28	9.03

Note: Means with in a column having same superscripts are not significantly different (P>0.05).

Table 6: Feed efficiency of broiler fed low protein based diets supplemented with synthetic DL-methionine, L-lysine and alfalfa

Treatments	Weekly cumulative feed efficiency						
	1st	2nd	3rd	4th	5th	6th	7th
T0	1.266^{a}	1.68^{a}	1.84^{a}	1.91^{a}	2.16^{a}	2.32^{a}	2.44^{a}
T1	1.216^{b}	1.59^{b}	1.77^{b}	1.83^{b}	1.99^{c}	2.06^{c}	2.17^{bc}
T2	1.17^{b}	1.53^{c}	1.70^{b}	1.72^{c}	1.83^{e}	1.95^{d}	2.13^{c}
T3	1.22^{b}	1.63^{b}	1.78^{b}	1.85^{ab}	2.08^{b}	2.19^{b}	2.24^{b}
T4	1.19^{b}	1.59^{b}	1.77^{b}	1.82^{b}	1.92^{d}	2.14^{c}	2.18^{c}
Mean	1.21	1.60	1.77	1.83	2.00	2.13	2.23
ESE	0.01	0.01	0.01	0.01	0.01	0.02	0.03
LSD	0.03	0.03	0.04	0.05	0.05	0.06	0.10
F-value	10.57	20.24	10.51	14.08	65.83	42.74	12.70
Probability	0.001	<.001	0.001	<.001	<.001	<.001	<.001
C.V%	1.6	1.3	1.5	1.7	1.4	1.7	2.6

Note: Means with in a column having same superscripts are not significantly different (P>0.05).

Feed Efficiency

The average weekly cumulative feed efficiency of broiler fed with low protein based diets supplemented with synthetic DL-methionine, L-lysine and alfalfa from 1-7 weeks of age is presented in Table 6.The result showed significant (P<0.05) effect on feed efficiency of broiler fed diet supplemented with synthetic DL-methionine, L-lysine and alfalfa. Better feed efficiency was revealed in LPB+ 200g met+ 300glysine, followed by LPB+ 5 ml alfalfa 3 days in a week, LPB+ 200g met+ 300glysine and LPB+ 5ml alfalfa 2 days in a week during first week of experimental period. However, poor feed efficiency was observed in LPB at first week age. Similar trend of feed efficiency was found in 2nd, 3rd, 4th, 5th, 6th and 7th week feeding period.

Gross Income over Feed and Chick Cost

Average gross income over feed and chicks cost (IOFCC) of broiler fed low protein based diets supplemented with synthetic DL-methionine, L-lysine and alfalfa is presented in Table 7. Maximum gross expenditure (NRs253.36) was recorded in treatment group of broiler fed with (T2). However, minimum gross expenditure (NRs221.07) was recorded in (T0). Maximum gross income (NRs294.64) was recorded in treatment group of broiler fed with (T2). Minimum gross income (NRs227.94) was recorded in treatment group of broiler fed (T0). Similarly, maximum net income (NRs41.12) was recorded in treatment group of broiler fed (T2). Minimum net income (Rs6.87) was recorded in treatment group of broiler fed with (T0).

Table 7: Income over feed and chicks cost (Rs/bird) of broiler fed low protein based diets supplemented with synthetic DL-methionine, L-lysine and alfalfa

Variables cost(NRs)	T0	T1	T2	T3	T4
Feed cost (NRs)	161.07	172.06	182.09	165.45	168.37
Chicks cost (NRs)	60.00	60.00	60.00	60.00	60.00
Methionine cost (NRs)	-	2.87	6.07	-	-
Lysine cost (NRs)	-	4.99	5.20	-	-
Alfalfa cost (NRs)	-	-	-	4.00	6.00
Gross expenditure	221.07	240.46	253.36	229.45	234.37
Gross income	227.94	273.58	294.48	255.20	266.80
Net income	6.87	33.12	41.12	25.75	32.43
B:C ratio	1.03	1.14	1.16	1.11	1.13

*This does not include sales from manure.

Discussion

In this research an improvement in cumulative feed consumption from first week onwards was observed with inclusion with 200g methionine +300glysine and synthetic alfalfa at 3 days in a week was significantly different ($P<0.05$). This result was in agreement with the finding of Uzu (1987) who reported an increased feed intake with decreased protein levels from 20 to 16 percent lashed with methionine and lysineBarnstein and Lipstein (1975) compared 19.7 percent diet supplementation with methionine and lysine to a 23.1 percent CP diet and found equal chicks growth and feed efficiency that were similar to this finding. Similarly, Schutte (1987) examined equal weight gain and feed efficiency from 16 percent CP diet supplemented with all indispensable amino acids (IAA) and 20 percent CP. Parr and Summers (1991) reported that chicks fed low protein diet (21-16.5%) supplemented with IAA had similar growth rate, feed efficiency and total carcass protein contents as those of a 23 percent CP.

Improvement in body weight of chicks was noticed from first to seventh week experimental period with supplementation of synthetic DL-methionine, L-lysine and alfalfa. Finding of this experiment was in agreement with reports of Han (1996); Bornstin & Lepstein (1975); Hurwitz, *et al.* (1980); Waldrop, *et al.* (1976). Broiler chicks fed 14.4 percent CP diet with supplemental methionine and lysine from 36 to 63 days. Lipstein and Bernstein (1975) found similar growth and feed efficiency compared to that obtained with a 18.1 percent CP diet. Similarly Horwitz *et al.* (1980) suggested that supplementing methionine and lysine could reduce 3 percentage unit of CP than those suggested requirement of NRC (1971).

Better feed efficiency was revealed in LPB+ 200g met+ 300glysine, followed by LPB+ 5 ml alfalfa 3 days in a week, LPB+ 200g met+ 300glysine and LPB+ 5ml alfalfa 2 days in a week during first week of experimental period. This result was in agreement with Lipstein and Bornstein (1975), who observed similar growth and feed efficiency when broiler chicken were fed with 14.4 percent CP diet with additional methionine and lysine from 36 to 63 days of age compared to that obtained with a 18.1 percent CP diet. Parr and Summers (1991) found similar feed efficiency of broiler chicks when low-protein (21 to 16.5 percent CP) diets with supplemental methionine and lysine from 7 to 21 days of age were fed. Similar feed efficiency of broiler fed diets with different kinds and levels of coconut oil was observed (Sapkota, 1992) from 1 to 6 weeks feeding period

Conclusion

The results obtained from experiments concluded that broilers fed with low protein based diet could be success fully raised with supplementation of lysine and methionine without compromising performance of broiler. Also, low protein based diet added with 5ml alfalfa 2 days in a week can be the better option to the farmers for raising the poultry industries in the absent of supplement edlysine and methionine.

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