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Research Article

EFFECTS OF FEEDING RATIONS WITH VARYING LEVELS OF ALFALFA (MEDICAGO SATIVA L) MEAL ON BROILER PERFORMANCE AND SOME INTERNAL ORGANS CHARACTERISTICS

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ABSTRACT

This study was conducted with the objective of studying the effect of adding four levels of alfalfa plant powder on the performance of broiler chicks and on the weights of the carcass cuts (thighs, wings, and chest, Neck and back) and on the characteristics of some of the internal organs (intestine, cecum, liver, fat and heart). Sixty, un-sexed broiler chicks of the (Ross) strain were used in this study. They were randomly distributed into four treatments with three replicates of five birds provided with water and food continuously. The experiment was designed as a complete random design. By adding four different levels of alfalfa powder (0, 1, 2 and 3%), the diets were prepared to meet all the needs of broiler chickens according to (NRC, 1994), which are approximately equal in protein and energy content. The experiment lasted for five weeks. The birds and the feed consumed were weighed weekly, measuring weight gain and conversion ratio. One chicken was randomly selected from each replicate at the end of the fifth week (three chickens for each treatment), slaughtered. The intestines and caecum were measured; liver weight, abdominal fat and heart were weighed as well as the wings, thighs, chest's and necks. The data were analyzed using analysis of variance and differences between the parameters were analyzed via analysis of variance and differences among means were detected using the Least Significant Difference Test (LSD). The results showed that the addition of alfalfa plant powder had no significant effect (P> 0.05) on the conversion efficiency, and the ratios were 1.39 for group (I), 1.32 (II), 1.56 (III), and 1.37 (IV). Similarly no differences were detected for the carcass parts and the internal viscera. The addition showed a significant effect (P <0.01) on the total amount of feed consumed, especially in the second week, and the final feed consumer was 2684.5, 2223.4, 2380.3 and 2514 g / bird, respectively. The weight gain was 1925, 1686, 1546 and 1830 g / bird, respectively. The carcass weight was 1435, 1258, 1140 and 1381 g/bird, respectively. The dressing percentage is 0.7240, 0.7183, 0.7060 and 0.7240%, respectively. The feed consumption rate was high for the control diet, but in the fifth week the feed consumption rate was higher in the group consuming the fodder containing 3% of alfalfa powder. The study concluded that the addition of alfalfa powder in the diets of broiler chickens led to a decrease in the consumption of feed without affecting the growth rate. The consumption increased in the final phase with an increase in the weight gained. The study recommends further research to know the effect of adding alfalfa powder on the performance of chicks and meat quality.

Keywords: Broiler chicks, rations, Medicago sativa, growth rates.

INTRODUCTION

The poultry industry plays a key role in reducing the increase in global demand for animal protein as a result of the large population increase during the past decades the economics of many countries also rely on it to secure job opportunities for a wide segment of workers, and increase the gross domestic products, and to supply high protein source of human, as many studies in the Arab world mentioned that the percentage of workers in the poultry sector is 20% and includes all workers in the poultry sector, including feed production, mills, slaughterhouses and sales outlets (Abd Elmutalab, 1998). The aim of broiler production is to maximize revenue over and above fixed production costs. This is not attained under the present Sudan condition especially because of the high feed costs. Nevertheless, feed price constitute about 70% of the cost poultry indeed, most of this cost is approximately due to the heavy dependence on the imported super- concentrates as a source of protein. Also there is an urgent need in industrialized societies to develop novel products that can lower human dietary cholesterol intake so we needed additives in order to minimize the costs of feeding and in same time produced healthy and acceptable products to consumers (Abd Elmutalab, 1998). Alfalfa can be useful for these purposes; it is one of earliest cultivated plant, used for centuries for feeding livestock and poultry. This is true because it is easy to grow, thrives in many varied climate throughout world (Mac Donald *et al.,* 1981). Alfalfa generally is use at very low levels in poultry feeding, primarily to its high fiber content. Also alfalfa provides excellent protein-rich food, high in vitamins content, provides beta-carotene, vitamin A, C, E and K (Brinker, 1998). Alfalfa meal is an extremely nutrient-rich food source of hypocholetrolemic compounds such as saponins. Consumption of alfalfa meal by chicken would decrease the cholesterol content of .Alfalfa meal is also source of xanthophylls, which when deposit in the skin and shanks give poultry carcasses a desirable yellow color (Rao and Gurfinkel, 2000; Francis *et al.,* 2002)

Objective of the study

In view of the above, the objective of this study is to investigate the effect of feeding broiler chicks, different levels of alfalfa meal on performance, different cuts of carcass (thighs, wings, chest, neck, and back) and some internal organs characteristics (intestine, Cecum, liver, fat, and heart).

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MATERIALS AND METHODS

Study area

The experimental was carried out in the poultry house of the poultry unit in department of animal production, university of kordofan, during the period from March 26/3/2020 to May.13/2020 (minimum and maximum temperature were 23 and 40^{0}c, respectively).

Processing of alfalfa meal

Medicago sativa was collected from a single filed at early blooming. Alfalfa was left three days in a shade area to reduce the moisture. And then crushed into small units in the form of green meal to be mixed in broiler diet.

Experimental birds

Sixty, one day old, unsexed commercial broiler chicks (Roos) were obtained from Inmaa Company for feed and poultry production in Khartoum North. On arrival, all chicks were assigned to the basal diet for four days adaptation period. Thereafter were randomly distributed into (12) pens, (five per pen). The mean initial weight of chicks in each pen was approximately equal. The pen was then divided randomly among four experimental diets.

Experimental feed\rations

Four experimental diets were formulated from local ingredients. The diets were approximately isocaloric and isonitrogenous with different levels of alfalfa meal (0, 1, 2, and 3%). The experimental diets were formulated and adjust to meet the nutrients requirements of broiler as outlined by national research council USA (NRC, 1984). The chemical analysis of alfalfa meal is illustrated in table (1). The constituent of ingredients of experimental diets were shown in table (2). The calculate and determined chemical compositions of experimental diets were presented in (Table 3).

Housing and equipment

The experimental was conducted in an open- sided house long axis was situated in an east- west direction. The shed was 18 × 12 square meters, with height of 3.5 m.; constructed of iron posts; short brick wall 60 cm; iron material roof; concrete floor and wire mesh in all sides. The whole shed was designed and divided into 56 small pens each constructed of the same materials used in the shed. Before the commencement of the experiment, the house was cleaned and burned, then disinfected with formalin, and then 12 pens 1 square meter for each were selected for this experiment. Each pen was provided with clean disinfected feeders and drinkers, dry wood shavings were used as a litter material. Light were provided for 24 hours, in the form of natural light and supplemented with artificial light in the evening. Sixty watt bulb was used in each pen, and then the birds were distributed randomly among 12 pens equally (five birds in each).

Management And Data Collection

Performance parameters

Feed and water were offered ad labium. All birds were vaccinated against Newcastle disease (ND) and infectious bronchitis disease (IB), at5 day's old, using clone 30+ IB stain. At (14) days old birds were vaccinated against gumboro disease using strains and at (23) days old revaccinated against Newcastle disease using clone 30 strains in water. Body weight, feed intake were recorded weekly, body weight gain and feed conversion ratio (FCR) were estimated for the individual replicate of each dietary treatment. Mortality was observed and registered throughout the experimental period. The experiment continued for five weeks. At the end of the experiment, all birds were fasted over night to evacuate their digestive tract, but allowed water, one bird from each pen was selected, for organ characteristics determination. The liver, abdominal fat, Gizzard and heart were weighted; the length of intestine and Cecum were measured. The different cuts of carcass: wings, chest, back, nick and thigh were weighted.

Table (1) proximate analysis of alfalfa meal

Ingredients	%
Dry mater	95.12
Crude protein	14.18
Crude fiber	31.09
Ash	10.51
Ether extract	1.06
Nitrogen- free extractive (NFE)	38.28
Metabolizable energy	2138.62

*calculated according to Lodhi *et al.,* 1976.

Me = (1.459+0.102*cp+0.275*EE+0.148*NFE-0.034*CF) ×239.

Table (2) Ingredient of experimental diets (%)

Ingredients	Treatments rations (%)			
	I	II	III	IV
Sorghum	68.00	67.00	66.00	67.00
Groundnut meal	15.50	15.50	15.50	15.50
Wheat bran	8.00	8.00	8.00	6.50
Alfalfa meal	0.00	1.00	2.00	3.00
Super concentrate	5.00	5.00	5.00	5.00
Dicalcium phosphate	2.00	2.00	2.00	2.00
NaCl	0.25	0.25	0.25	0.25
Oil	1.00	1.00	1.00	1.00
Premix	0.20	0.20	0.20	0.20

*super concentrate contain %: CP 40, Lysine 12, Methionine 3, Methionine +Cysteine 3.2, Ca10, p 4, CF 2, and ME 2100 kcal/kg.

*premix provided per kg of experimental diets : vitamin A 8000 IU, vitamin D3 1400 IU, Vitamin E2 2 IU, Vitamin K3 2mg, Vitamin B2 4mg, Vitamin B1 2mg, Vitamin B12 5mg, Ca-d- pantothenate 5mg, Nicotinamide 5mg, choline chloride 100mg, folic acid 0.5, iron 22mg, Mn 33mg, Cu 2.2mg, Co 0.5mg, Zn 25mg and Iodine 1.1mg

Table (3) Calculated and determinate chemical composition of experimental diets.

Items (%)	Alfalfa meal (%)			
Calculated composition	0	1	2	3
Crude protein	23.1	23.07	23.05	23.079
(ME) Kcal/kg	3173	3161	3148	3160
Crud fiber	3.464	3.756	4.047	4.246
Lysine	1.235	1.231	1.228	1.219
Methionine	0.645	0.642	0.639	0.638
Calcium	0.979	0.989	0.999	0.899
Available phosphorus	0.736	0.736	0.737	0.639

Table (4) chemical composition of dry matter of alfalfa meals

Items	Pre-bud	In-bud	Early flower
Crud fiber (g/kg)	220.00	282.00	300.00
Ash (g/kg)	120.00	82.00	100.00
Crude protein (g/kg)	253.00	205.00	171.00
Digestible crude protein	213.00	164.00	130.00
Met-energy (MJ/kg)	10.6	9.40	8.20

Source: Mac Donald et al., 1981.

Experimental Design and Statistical Analysis

A completely randomized design was used in this study with four treatments of experimental diets replicated three times, with five birds in each replicate. Data obtained from experiment were subjected to analysis of variance according to Snedecor and Cochran, (1978). Means were separated by LSD test.

RESULTS AND DISCUSSION

Alfalfa meal is one of such legume sources which can be used for livestock feeding. Table (1) showed its nutrient contents.

Feed intake

With the exception of second week, the table revealed no significant difference in feed intake during fives week of age, the mean of F.I ranged from 295.3 to 622.3 (Table 5).

Table (5) Effect of different dietary levels of alfalfa meal on the weekly feed intake (g/bird) of Ross broiler chicks

Alfalfa meal (%)	Age in weeks				
	1	2	3	4	5
0	278.3a	381.6a	724.0a	662.3a	801.0a
1	300.3a	214.3b	546.6	550.3	863.6
2	301.3a	288.6a	651.6	574.3	619.6
3	301.3a	295.3a	637.0	605.6	891.6
Mean	295.3	295.0	639.8	598.2	794.0
CV%	3.1	21.9	10.1	11.3	20.9

a-b values within the Colum with different letter differ significantly($p<0.05$)

Body weight gain

Table (6) shows the weekly body weight gain. The table revealed only significant difference in body weight gain during the first week of age. Average B.WT ranged between 81.17 to 794.0

Table (6) Effect of different dietary levels of alfalfa meal on the weekly body weight gain (g/bird) of Ross broiler chicks

Alfalfa meal%	Initial weight	Age in weeks				
		1	2	3	4	5
0	61.6	101.0	211.3a	319.0a	492.6a	68.1a
1	65.0	69.6b	165.6	233.3	354.3	611.1
2	65.0	80.6ab	167.3	270.0	409.0	564.3
3	65.0	73.3b	189.3	277.0	398.6	675.0
Mean	64.16	81.17	183.4	274.8	413.7	622.3
CV%	2.38	14.3	13.6	13.6	18.9	20.9

a-b values within the Colum with different letter differ significantly ($p<0.05$)

Feed conversion ratio

The analysis of variance indicated non-significant difference among dietary treatment for this parameter on weekly basis, the mean of FCR ranged from 2.77 to 4.24 in the first week and 1.81 to 1.52 in second week and 2.27 to 2.34 in the third week and 1.37 to 1.52 in the four week and 0.79 to 0.75 in five week.(Table 7).

Table (7) Effect of different dietary levels of alfalfa meal on the weekly feed conversion ratio (g feed/g BWG) of Ross broiler chicks

Alfalfa meal %	Age in weeks				
	1	2	3	4	5
0	2.77a	1.81a	2.27a	1.37a	1.25a
1	4.39	1.29	2.34	1.55	1.41
2	3.76	1.71	2.42	1.44	1.09
3	4.24	1.52	2.34	1.52	1.32
Mean	3.80	1.59	2.35	1.47	1.27
CV%	17.9	14.4	10.9	12.0	16.3

*mean with the same letters showed no significant difference ($p>0.05$)

Overall performance

The analysis of variance indicated non-significant difference among dietary treatment for this parameter on weekly basis, average overall performance ranged 2684.5 to 2514.3 in feed intake and 1925 to 1830 in B.WG and 1.39 to1.37 in the final weight and 1435 to 1381in the carcass weight and dressing percentage ranged from 0.7240 to 0.7240 (Table 8).

Table (8) Overall performance of Ross broiler chicks feed alfalfa meal at different dietary levels

Alfalfa meal %	Feed intake (g/bird)	Body weight gain (g/bird)	Feed conversion ratio (g feed/g BWG)	Final Weigh t	Carcass weight (g/bird)	Dressing percentage
0	2684.5 a	1925a	1.39a	1986a	1435a	0.7240a
1	2223.4	1686	1.32	1751	1258	0.7183
2	2380.3	1546	1.56	1611	1140	0.7060
3	2514.3	1830	1.37	1895	1381	0.7240
Mean	2450.6	1747.1	1.42	1811.3	1303.8	0.7177
CV%	9.1	14.0	7.9	13.6	16.7	4.5

*mean with the same letters showed no significant difference ($p>0.05$)

Different cuts of carcass

Generally Table (9) indicated that non-significant different among dietary treatment for the parameter of cuts of carcass on weekly basis. the mean different cuts of carcass ranged from 145-148.3 for wings and the chest ranged from 465-415 and back , nick ,and thigh ranged from 288.3-276.6 and 96.6-96.6 and 426.6-430 respectively.

Table (9) Effect of different dietary levels of alfalfa meal on different cuts of carcass of Ross broiler chicks

Alfalfa meal%	WINGS	CHEST	BACK	NICK	THIGH
0	145a	465a	288.3a	96.6a	426.6a
1	131.6	375	246.6	100	393.3
2	130	301.6	230	100	363.3
3	148.3	415	276.6	96.6	430

Mean	138.8	389.2	260.4	98.3	403.3
CV%	10.3	19.9	21.4	18.5	14.6

*mean with the same letters showed no significant difference (p>0.05)

internal organ characteristics

The analysis of variance indicated non-significant difference among dietary treatment for the parameter of internal organ character on weekly basis, the average internal organs ranged from 26.6 to 20.0 for abdominal fat, and 30.0 to 35.0 for gizzard weight and weight of liver, heart, and length of intestine, and Cecum ranged from 40-36.6 and 10 and 165.6 and 19.0-19.6 respectively (Table 10).

Table (10) Effect of different dietary levels of alfalfa meal on length or weight of some internal organs of Ross broiler chicks.

Alfalfa meal %	Abdominal fat (g)	Gizzard weight (g)	Liver weight (g)	Heart (g)	Intestine length (cm)	Cecum length (cm)
0	26.6a	30.0a	40a	10a	165.6a	19.0a
1	18.3	31.6	40	10	164.3	19.6
2	20.0	30.0	31.6	10	160.3	18.3
3	20.0	35.0	36.6	10	165.6	19.6
Mean	21.3	31.7	37.1	10.0	164.0	19.2
CV%	32.6	14.4	14.6	0.0	8.7	5.2

*mean with the same letters showed no significant difference (p>0.05)

In this study and through all experimental period birds appeared healthy and no mortality was recorded. The analysis of alfalfa meal indicated that it contains, curd protein 23.44%, crud fiber 21.00%, ether extract 1.44% and ash 14.25% table (1). Similar findings were reported by AbdElmutalab (2005) and Waldroup (1997).

Feed intake

From the first to the fourth week the bird preferred the control diet with 0% alfalfa meal, however during 5 weeks broiler checks preferred the dietary treatment with high alfalfa meal inclusion, especially in the second week where feed intake was significantly different among alfalfa meal. The drop in the feed intake in the first 4 weeks is in according with Omekam (1994) who mentioned that the meal might impart an unpalatable taste to the feed, which consequently inhibited the birds from consuming adequate quantities. On the other hand the increasing in feed intake on the last week might be due to adaptability of the digestive tract of the birds to consume more quantities of alfalfa meal. The table showed that there is an increase in feed intake in the third week, and this may be a result of the intestine acclimatization to the feed. This is followed by a decrease in the food intake in the fourth week, as a result of the high temperature conditions inside the barn due to the lack of fans, cooling devices, and the constant power cuts. (Abu Dieyeh, 2006) mentioned that the body weight, feed intake, and feed conversion ratio were significantly reduced in broiler in heat stress. A highly significant difference was obtained among experimental rations for feed intake g/bird for the whole period. Feed intake was greater for the group on control diet. Except the group treatment by high alfalfa meal have a greater feed intake than control group especially in the last week. This finding is in line with Escou *et al*., (2002).

Weekly body weight gain:

The table showed that there are high significant differences in the first week, this may be a result of the birds not being acclimatized to the environmental conditions during the brooding period, and the intestinal not acclimatizing to the feed. This corresponds to (VMB Moraes *et al.,* 2002) mentioned that the brooding temperature of 20c^{O} during the first seven days post-hatching and environmental temperature was stressful decreasing broiler bond development and reducing chicks body weight.

Overall broiler chick

Dietary alfalfa meal had no significant effect on overall broiler chick. This result agrees with the finding of Abd Elmutalab (2005), Liuzzo *et al.,* (1959), and Cooney *et al.,* (1948).

Feed conversion ratio

Feed conversion ratio was similar for broiler chicks fed on four dietary treatments. This result is similar to that obtained by Abd Elmutalab (2005). The different cuts of carcass wings, chest, back, nick and thighof broiler chicks has no significant different. This may be due to high fiber content, similar findings were reported by (Sen *et al.,* 1998), also the length or weight of some internal organs for broiler chicks has no significant different. Due to anti nutritional factor content such as saponins this depressed gross rate and feed intake this according to (Huisman *et al*., 2001).

Conclusion And Recommendation

The result of this study indicated that:

- Alfalfa meal had no adverse effect on, same internal organ character, different cuts of carcass and feed conversion ratio of broiler Chicks.
- It is recommended to use up to 4% alfalfa meal in broiler diets as a Source of plant protein.
- Inclusion of alfalfa meal reduced feed intake especially in the first and second week this due to high fiber content.
- An economical study should be conducted to determine the critical amount of the alfalfa meal added as substitution of other sources.

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