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Use of *Moringa Oleifera* Seeds in Broilers Diet and its Effects on the Performance and Carcass Characteristics

Talha E. Abbas and Mohamed E. Ahmed

Department of Poultry Production and Technology, Faculty of Agricultural Technology and Fish Science, University of ALneelain, Khartoum, Sudan

A B S T R A C T

This study was carried out to evaluate the effects of *Moringa oleifera* undecorticated seeds powder (MOUSP) on the performance and carcass characteristics of broilers. A total of one hundred sixty, day old unsexed broiler chicks (Hubbard) were assigned into 16 pens (four groups) of ten chicks (replicates) in a pen, in a completely randomized design. The experiment lasted 5 weeks (8 – 42 day). Four experimental iso-caloric and iso-nitrogenous diets were supplied *ad-libitum*. First experimental diet was free of MOUSP (control diet). Other three experimental diets contained 0.37, 0.75 and 1.5% MOUSP. Feed consumption, weight gain, feed conversion ratio and carcass quality characteristics (Dressing, Heart, gizzard, liver and abdominal fat percentage) were recorded for the individual replicate of each dietary treatment. It was found that, addition of (MOUSP) up to 1.5% to broiler chicks diet significantly ($P<0.05$) lowered weight gain, feed efficiency and body weight during starter period. During finisher and whole periods supplying broiler chicks diet with 0.37% (MOUSP) resulted in significant ($P<0.05$) increase in feed consumption, but addition of different levels of MOUSP had no significant ($P>0.05$) effects on weight gain, feed efficiency, final live body weight, dressing percentage, liver weight and heart weight. It was concluded that the use of MOUSP in the broiler diet adversely affected the performance during starter period, but enhanced the performance during finisher and whole period.

Key words: Broilers, Moringa, Seeds, Carcass quality

Corresponding author: Talha E Abbas, Department of Animal Production, Faculty of Agricultural Technology and Fish Science, Alneelan University, Sudan, P.O. Box, 12702.

INTRODUCTION

Researchers have great interest in finding natural growth promoters to enhance poultry production and to reduce feed cost. Plant products have been used for centuries by humans as food and to treat ailments. Natural medicinal products originating from herbs and spices have also been used as feed additives for farm animals (Guo, 2003).

Moringa oleifera is a plant that posses multiple advantages, because different parts of the tree (leaves, fruits, immature pods and flowers) are edibles and entered in traditional diets in many tropics and sub-tropics countries (Siddhuraju and Becker, 2003; Anhwange *et al*., 2004). Jahn (1986) mentioned that rural women in Sudan use *Moringa oleifera* seeds instead of alum to remove turbidity from Nile water. Eilert *et al*. (1981) reported that *Moringa oleifera* seeds have antimicrobial effects. Madsen *et al*. (1987) found that use of *Moringa oleifera* seeds reduced bacterial count of turbid Nile water in Sudan by 1-4 log units (90-99.9%) within the first 1-2 hours of treatment. In addition, Walter *et al*. (2011) assured that *Moringa oleifera* and *Moringa stenopetala* methanol and n-hexane seed extracts produced inhibition effect on *Salmonella typhii*, *Vibrio cholerae* and *Escherichia coli*, which normally cause water borne diseases. Regarding chemical composition, Compaoré *et al*. (2011) reported that *Moringa oleifera* seeds are good source of fats, proteins and minerals. This research was performed to examine the effect of *Moringa oleifera* seeds powder in the broilers diet on their performance and carcass characteristics.

MATERIALS AND METHODS

The experiment was conducted at the experimental poultry farm (open sided house) of Faculty of Agricultural Technology and Fish Sciences, University of Elneelain, Jebel–Awlia, Khartoum South. One hundred and sixty day–old, unsexed commercial broiler chicks (Hubbard) were assigned into 16 pens in groups of 10 chicks in a pen. Each pen was provided with feeder and drinker. Each experimental diet was fed to 4 replicates, in a completely randomized design. Broiler chicks were kept on a deep litter floor system. Four experimental iso-caloric and iso-nitrogenous diets were formulated to meet or exceed the NRC (1994) requirements of broiler chicks. One group was kept as control while other three experimental diets contained 0.37, 0.75 and 1.5% *Moringa oleifera*. Feed (Table 1) and water were provided *ad libitum*. Feed

consumption, weight gain and feed conversion ratio were recorded weekly for the individual replicate of each dietary treatment. At the end of the experiment period (day 42) 2 chicks from each replicate within each treatment were randomly selected and weighed to obtain live body weight, then slaughtered by a sharp knife for complete bleeding and feathers were plucked. Head, viscera and shanks were removed. Carcass was left for one hour to remove excess water. Dressing percentage was calculated without giblets using the following equation:

$$\text{Dressing percentage} = \frac{\text{Carcass weight}}{\text{Live body weight}} \times 100$$

Heart, gizzard, liver and abdominal fat were weighed. Mortality was recorded as it occurred. Routine and occasional management, vaccination and medication were carried out as and when due, and all possible steps were taken to avoid animal suffering at each stage of the experiment. The experiment lasted five weeks (8–42 days). During first week chicks offered pre-starter diet for five days and completed seven days as adaptation period. Table 1 shows composition and calculated analysis of experimental diets.

Statistical Analyses: The data generated from the experiment was subjected to analysis of variance according to SAS Institute (1990). Duncan's multiple range tests was used to assess significance of difference between means as described by little and Hills (1978).

RESULTS

Table 2 showed that supplementation of 0.37% MOUSP to broiler chick diet significantly ($P<0.05$) increased feed consumption compared to 0.75 and 1.5% MOUSP supplementation during starter period (8-21 days). Addition of MOUSP up to 1.5% to broiler chicks diet significantly ($P<0.05$) lowered weight gain, feed efficiency and body weight during starter period. Table 3 and 4 revealed that supplementing broiler chicks diet with 0.37% (MOUSP) resulted in significant ($P<0.05$) increase in level of feed consumption than the control diet, but addition of different levels of MOUSP had no significant ($P>0.05$) effect on weight gain, feed efficiency and body weight during finisher period (22-35 days) and whole period (8-35 days). Inclusion of 0.37% (MOUSP) in the broiler chicks diet resulted in significant ($P<0.05$) lower weight of gizzard than the control diet (Table 5). It was found that abdominal fat weight significantly ($P<0.05$)

Table 1: Composition and calculated analysis of Experimental diets

Ingredients	Without MOUSP		0.37% MOUSP		0.75% MOUSP		1.5% MOUSP	
	Starter%	Finisher%	Starter%	Finisher%	Starter%	Finisher%	Starter%	Finisher%
Sorghum (Feterita)	58.00	61.00	57.50	61.00	57.50	61.00	57.50	61.50
Ground nut Cake	16.40	08.10	16.53	08.10	16.65	08.35	17.10	08.60
Sesame Cake	14.00	11.00	14.00	11.00	14.00	11.00	14.00	11.50
Wheat bran	02.50	09.50	02.50	09.13	02.00	08.50	00.80	06.50
Super Concentrate★	05.00	05.00	05.00	05.00	05.00	05.00	05.00	05.00
Lysine	00.10	00.10	00.10	00.10	00.10	00.10	00.10	00.10
Oyster shell	00.30	00.70	00.30	00.70	00.30	00.70	00.30	00.69
Dicalcium phosphate	01.20	00.60	01.20	00.60	01.20	00.60	01.20	00.61
Oil	02.00	03.50	02.00	03.50	02.00	03.50	02.00	03.50
NaCl	00.25	00.25	00.25	00.25	00.25	00.25	00.25	00.25
Vitamin (Premix)	00.25	00.25	00.25	00.25	00.25	00.25	00.25	00.25
Moringa Seeds	00.00	00.00	00.37	00.37	00.75	00.75	01.50	01.50
Total	100	100	100	100	100	100	100	100
Calculated analysis:								
Metabolizable energy (Kcal/Kg)	3161	3218	3147	3211	3141	3206	3131	3206
Crude protein (%)	23.06	19.77	23.05	19.71	23.02	19.71	23.01	19.76
Lysine (%)	1.16	1.04	1.16	1.03	1.16	1.03	1.16	1.04
Methionine (%)	0.51	0.45	0.51	0.45	0.51	0.45	0.51	0.46
Calcium (%)	1.03	0.94	1.03	0.94	1.03	0.94	1.03	0.95
Available phosphorous (%)	0.48	0.36	0.48	0.36	0.48	0.36	0.48	0.36

★Cp 40%, ME 2000 kcal/kg, C. fiber 3%, EE 3%, Ash 34%, Ca 8%, Av. P 1.38%, Lysine 12%, Methionine 3%, Methionine + Cystine 3.5%. Vitamin A 250000 IU/kg, Vitamin D3 50000 IU/kg, Vitamin E 500 mg/kg, Vitamin K3 60 mg/kg, Vitamin B1/Thiamin 20 mg/kg, Vitamin B2/Riboflavin 100 mg/kg, Niacin Vitamin PP 600 mg/kg, Pantothenic acid/Vitamin B3 160 mg/kg, Vitamin B6/Pyridoxine 40 mg/kg, Vitamin B12 300 mcg/kg, Biotin/Vitamin H 2000 mcg/kg, Choline 10000 mg/kg, Vitamin C 4000 mg/kg, Folic Acid 30 mg/kg, Iron 800 mg/kg, Manganese 1400 mg/kg, Copper 120 mg/kg, Zinc 1000 mg/kg, Iodine 6 mg/kg, Cobalt 12 mg/kg, Selenium 3 mg/kg

Table 2: Effects of supplementation of *Moringa oleifera* undecorticated seeds powder (MOUSP) to broilers diet on the performance during starter period (8–21 days)

	Without MOUSP	0.37% MOUSP	0.75% MOUSP	1.5% MOUSP	SE
Feed consumption (g/bird/week)	408.00^{ab}	427.20^{a}	395.00^{b}	395.50^{b}	7.84
Weight gain (g/bird/week)	217.70^{a}	205.10^{a}	191.50^{ab}	175.90^{b}	8.51
Feed conversion ratio (g feed/g weight)	1.88^{a}	2.09^{b}	2.07^{b}	2.270^{b}	0.07
Live body weight (g)	599.50^{a}	573.3^{ab}	547.00^{ab}	524.70^{b}	16.51
Mortality (%)	0.00	0.00	0.00	0.00	0.00

$^{a-c}$Values in the same raw with different superscripts are significantly different ($P<0.05$)

Table 3: Effects of supplementation of *Moringa oleifera* undecorticated seeds powder (MOUSP) to broilers diet on the performance during finisher period (22–35days)

	Without MOUSP	0.37% MOUSP	0.75% MOUSP	1.5% MOUSP	SE
Feed consumption (g/bird/week)	614.20[b]	679.50[a]	612.10[b]	595.70[b]	19.67
Weight gain (g/bird/week)	394.20	420.70	378.90	401.10	21.01
Feed conversion ratio (g feed/ g weight)	1.57	1.62	1.62	1.50	0.067
Live body weight (g)	1388.00	1414.60	1333.50	1320.00	47.27
Mortality (%)	0.00	0.00	0.00	0.00	0.00

[a-c]Values in the same raw with different superscripts are significantly different

Table 4: Effects of supplementation of *Moringa oleifera* undecorticated seeds powder (MOUSP) to broilers diet on the performance during whole period (8–35days)

	Without MOUSP	0.37% MOUSP	0.75% MOUSP	1.5% MOUSP	SE
Feed consumption (g/bird/week)	511.10[b]	553.30[a]	503.60[b]	495.60[b]	12.77
Weight gain (g/bird/week)	306.00	313.00	285.20	288.50	11.47
Feed conversion ratio (g feed/ g weight)	1.68	1.77	1.77	1.72	0.048
Live body weight (g)	1388.00	1414.60	1333.50	1320.00	47.27
Mortality (%)	0.00	0.00	0.00	0.00	0.00

[a-c]Values in the same raw with different superscripts are significantly different

Table 5: Effects of supplementation of *Moringa oleifera* undecorticated seeds powder (MOUSP) to broilers diet on the carcass characteristics during whole period (8-35 days)

	Without MOUSP	0.37% MOUSP	0.75% MOUSP	1.5% MOUSP	SE
Live body weight (g)	1388.00	1414.00	1333.00	1320.00	47.27
Dressing percentage (%)	69.75	66.75	68.75	66.25	1.80
Liver weight (g)	38.13	27.50	33.33	39.38	4.62
Gizzard weight (g)	40.00 [a]	25.63 [b]	40.00 [a]	43.75 [a]	2.22
Heart weight (g)	12.25	10.00	17.50	20.00	5.27
Abdominal fat weight (g)	10.65[c]	17.50[b]	20.83[ab]	25.83[a]	1.83

[a-c]Values in the same raw with different superscripts are significantly different

increased with increased supplementation level of (MOUSP). Addition of different levels of MOUSP had no significant (P>0.05) effect on final live body weight, dressing percentage, liver weight and heart weight.

DISCUSSION

Reduction in weight gain, feed efficiency and body weight as a result of addition of higher level of MOUSP (1.5%) to broilers diet during starter period may be due to the presence of phytate which is considered as anti-nutritional factor. Makkar and Becker (1997) reported that extracted kernel and extracted seed meal of *Moringa oleifera* have higher levels of phytate. As mentioned by some researchers, phytate reduced bioavailability of minerals in non-ruminant animals (Reddy *et al*., 1982) and decline digestibility of starch and protein (Thompson, 1993). But this negative effect appeared to be overcome during finisher and whole periods (Tables 3 and 4) due to the presence of benefit factors in MOUSP including antibacterial materials as reported by Eilert *et al*. (1981). Also Madsen *et al*. (1987) mentioned that use of *Moringa oleifera* seeds reduced bacterial count of turbid Nile water in Sudan by 1-4 log units (90-99.9%) within the first 1-2 hours of treatment. Furthermore, Walter *et al*. (2011) noticed that *Moringa oleifera* and *Moringa stenopetala* methanol and n-hexane seed extracts produced inhibition effect on *Salmonella typhii*, *Vibrio cholerae* and *Escherichia coli*, which normally cause water borne diseases. Compaoré *et al*. (2011) mentioned that *Moringa oleifera* seeds are considered as a good source of fat, protein, antioxidants and minerals (Mg and Zn), so it can overcome malnutrition due to micronutrients deficiencies in children. Increase in abdominal fat weight with increased supplementation level of MOUSP to broiler chicks diet (Table 5) may be due to the higher level of fat content of Moringa seeds as observed by Compaoré *et al*. (2011).

Conclusion: According to the results obtained from the research it was concluded that higher levels of MOUSP in the broiler chicks diet adversely affected the performance. Therefore, it is suggested to restrict the use of (MOUSP) in broiler diet.

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