

EFFECT OF DIETARY MORINGA (*Moringa oleifera*) SEEDS INCLUSION ON PERFORMANCE OF BROILER CHICKENS

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SUMMARY

The experiment was conducted at Abu Naama area- about 400 kilometers south Khartoum- to determine the effect of dietary *Moringa oleifera* seeds supplementation on the performance of broiler chickens and carcass characteristics. A total of 160 one day old Ross 308 broilers were distributed into 4 groups (treatments) with 4 replicates containing 10 chicks each. Four broiler rations were formulated with graded levels of *Moringa oleifera* seeds (0, 0.5, 1 and 2%/kg). All diets were kept isocaloric with a metabolizable energy 3200 kcal/kg diet. The experiments have lasted for 44 days of age. All chicks were fed on a starter diet for 2 days (adaptation period). The results of feed intake showed that there were significant different ($P \leq 0.05$) between the treatments through all weeks. The birds fed the control diet had a greatest feed consumption throughout the experimental period except at week four of age, at which the birds fed diets containing 1% *Moringa* consumed the largest amount of feed ($p \leq 0.05$). The effect of varying levels of *Moringa oleifera* seeds on weekly weight gain showed that, there were significant different ($P \leq 0.05$) between the treatments through all weeks except the first one. The control group (0% moringa) achieved a significantly highest weight gain values through all weeks except the fourth one. There were significant different ($P \leq 0.05$) between the treatments through the third, fourth, fifth and sixth weeks of age. The control (0% moringa) gave a significantly worst feed conversion value through the third and fourth weeks. Group fed 1% moringa recorded highest values in the fifth week. Moreover, group fed 2% moringa recorded highest values in the sixth one. There were highly significant different ($P \leq 0.01$) between the treatments (mean values) for rib back, wings, carcass shrinkage and hind back percent. Moreover, there were significant different ($P \leq 0.05$) between the treatments (mean values) for warm carcass, cold carcass, left side, right side and all values of the parts and cuts except dressing empty body and muscles percent. The highest ratio of mortality observed at group with 2% *Moringa oleifera* while the level 0.5% recorded no mortality rate. On the other hand, the mortality rate of unsupplemented group was 5%.

INTRODUCTION

The rapid growth of human and livestock population is creating increased needs for food and feed in the less developed countries demands that alternative feed resources must be identified and evaluated (Odunsi, 2003). 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). In many tropical and subtropical countries, various parts of *Moringa oleifera* (leaves, fruits, immature pods, and flowers) are incorporated into the traditional food of humans (Siddhuraju and Becker, 2003 and Anhwange *et al.*, 2004). Leaves of the moringa tree are the preferred part for use in animal diets as leaf meal. Research was conducted to study the effect of this leaf meal on the growth performance of layer chicks (Melesse *et al.*, 2011), productive performance of laying hens (Kakengi *et al.*, 2007, Olugbemi *et al.*, 2010 and Abou-Elezz, 2011) on broilers' performance (Juniar *et al.*, 2008 and Olugbemi *et al.*, 2010), and on the growth, carcass, and blood indices of weaner rabbits (Nuhu, 2010). The effect of *Moringa oleifera* seeds on broilers' performance was also examined by researchers (Abbas, 2012). *Moringa oleifera* is a plant that possess 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

Study area

This study was conducted at Abu Naama area about 400 kilometers South Khartoum at the Faculty of Agriculture, Sinnar University. The area at latitude 12°44' N and longitude 34°08'E, altitude, 445 meter above sea level. The rainfall was approximately 600-800ml annually, and the maximum and minimum temperature ranged between 35.6 to 43.7 and 23.2 to 26.0 minimum.

Moringa oleifera collection and preparation

Moringa oleifera seeds were collected from Abu Naama area. The seeds were sorted, cleaned and ground to powder using grinding machine. The ground seeds were compounded into feed for the feeding experiment. The ground seeds were included in experimental diet in following proportion 0% ,0.5% ,1% and 2%.

Housing management and duration of experiment

The experiment was carried out in an open system-oriented house, which was located east - west direction to a void solar radiation. The open sides of the house measured 8 x12m and 2.5m high. The roof was constructed with corrugated iron sheets built from cement bricks and wires. Before the commencement of the experiments, the houses were cleaned and disinfected using formalin solution. Dry wood shavings were used as a litter material with a depth of approximately 6 cm. A total of 16 pens measuring 159m area were divided using wire rots as partitions each pen was supplied with a feeder and a drinker about 40 and 20 cm in diameter respectively. Throughout the experimental period light was provided for 24 hrs.12 hrs on day light and the rest on artificial lighting, using 40 watt bulbs. The electrical bulbs were initially kept at about 15 cm above the ground to provide heat and then raised gradually to a height of 1.75 m towards the end of the experimental period chicks, immediately after hatching were vaccinated against Marek's disease and Newcastle disease. At day 12 post hatching they were also vaccinated against Gomboro. The experiment was conducted for a period of 6 weeks, with adaptation period, starter and finisher periods 1,3 and 2 week each respectively. Temperature and humidity were recorded at the mid of the day using a normal thermometer and hygrometer.

Experimental chicks

A lot of 160 day-old, unsexed commercial broiler chicks (Ross 308) were used and assigned into 16 pens (in groups of 10 chicks in a pen).

Experimental rations

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 isonitrogenous diets were formulated to meet or exceed the NRC (1994) requirements of broiler chicks (Table 3). One group was kept as control while the other three experimental diets contain 0.5, 1, and 2% *Moringa Oleifera*. Feed (Table1) and water was provided *adlibitum*.

Moringa seeds chemical analysis

Moringa sample were analyzed at Agricultural Research Cooperation-Wed Medani. Proximate chemical analysis and anti-nutritional factors and protein digestibility of Moringa seeds removal hulls content 51.8% crude protein, 25.7% oil, 11% crude fiber and 4.7% ash. M.E content was 13.39 k cal/kg on dry matter basis. (Table2).

Statistical Analysis

The data generated from the experiment was subjected to analysis of variance -Complete Randomized Design (CRD) according to SPSS (1990). Duncan's Multiple range tests (DMRT) was used to assess significance of Difference between means as described by Little and Hills (1978).

Table (1): The Composition of Experimental diets and The Chemical Composition of Moringa Oliefera seeds percentage.

Ingredient	0% (M.S)		0.5% (MS)		1% (MS)		2% (MS)	
	Starter	Finisher	Starter	Finisher	Starter	Finisher	Starter	Finisher
Sorghum (feterita)	58.00	61.00	57.50	61.00	57.50	61.00	57.00	61.50
Ground nut Cake	16.40	08.10	16.50	08.10	16.60	08.30	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	02.40	09.00	01.80	08.30	00.80	06.00
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	00.70
Dicalcium phosphate	01.20	00.60	01.20	00.60	01.20	00.60	01.20	00.61
Oil	02.00	03.00	02.00	03.00	02.00	03.00	02.00	03.00
Na Cl	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	00.50	00.50	01.00	01.00	02.00	02.00

M.S=Moringa oleifera seed

Table (2):The Chemical Composition of Moringa Oliefera seeds percentage.

Moisture%	2.85
Oil	25.750
Sodium	09.700
Phosphorus	00.535
Potassium	00.200
Protein	51.800
Total carbohydrate	15.5
N3O	00.045
M.E (mg/100g)	3.39

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Table (3): Requirements of experimental chicks according to (NRC,1994)

Nutrient	Starter %	Finisher%
Grude protein	23	18
Metabolizable energy	3100	3200
Calcium	0.9	1.0
Phosphorus	2.3	1.8
Lysine	1.0	1.2
Methionine	0.72	0.83

RESULTS

The effect of varying levels of *Moringa oleifera* on weekly feed intake is presented in Table (4). There were significant different ($P \geq 0.05$) between the treatments through all weeks. The birds fed the control diet had the greatest feed consumption throughout the experimental period except at week four of age, at which the birds fed diets containing 1% moringa consumed the largest amount of feed ($p \leq 0.05$). The control (0% moringa) gave significantly the highest feed intake values through all weeks except at the fourth one. 1% moringa recorded highest values in the fourth week. The birds fed the control diet had greatest feed consumption throughout the experimental period except at week four age, at which the birds fed diets containing 1% moringa consumed the largest amount of feed ($p \leq 0.05$).

Effect of Moringa oleifera levels on weight gain of broiler chicken

The effect of varying levels of *Moringa oleifera* seeds on weekly weight gain is presented in Table (5). There were significant different ($P \geq 0.05$) between the treatments through all weeks except the first one. The control (0% moringa) gave a significantly highest weight gain values through all weeks except the fourth one. Similar results were obtained by their counterparts C and D, which also, had the largest weight gain at weeks (2,3 and 4) and (3,4 and 5), respectively). 1% and 2% moringa recorded highest values in the fourth week. Similar results were obtained by their counter parts C and D, which also, had the largest weight gain at weeks (2,3 and 4) and (3,4 and 5), respectively.

Effect of Moringa oleifera levels on feed conversion ratio of broiler chickens

The effect of varying levels of *Moringa oleifera* on weekly feed conversion ratio is presented in table (6). There were significant different ($P \geq 0.05$) between the treatments through the third, fourth, fifth and sixth weeks of age. The control (0.0% moringa) gave a significantly worst feed conversion value through the fourth weeks while 1% moringa recorded worst values in the fifth week. Moreover, 2% moringa recorded worst values in the six one.

Effect of Moringa oleifera levels on carcass characteristics of broiler chickens

The effect of varying levels of *Moringa oleifera* on carcass characteristics is presented in table (4) There were highly significant different ($P \geq 0.01$) between the treatments (mean values) for rib back, wings, carcass shrinkage and hind back percent. 1% level obtain the best carcass, breast and drumstick. Moreover, there were significant different ($P \geq 0.05$) between the treatments (mean values) for warm carcass, cold carcass, left side, right side and all values of the parts and cuts except dressing empty body and muscles percent.

Effect of Moringa oleifera levels on mortality of broiler chickens

The mortality ratios were presented in Table (5). The highest ratio of mortality observed at group 2% while the level 0.5% recorded no mortality rate. On the other hand, the mortality rate of un-control group was 5%.

Table (4): Weekly average feed intake values of experimental chicks fed different levels of Moringa seeds for 42 days (gram/chick)

Week	Treatment				SE	Sig.
	A (0% M.S)	B (0.5% M.s)	C (1% M.s)	D (2% M.s)		
1 st week	100.00 ^a	94.00 ^b	93.00 ^b	90.00 ^b	1.205	*
2 nd week	377.45 ^a	358.25 ^c	370.45 ^b	357.98 ^c	1.2125	*
3 rd week	617.73 ^a	588.33 ^b	592.50 ^b	569.43 ^c	1.96	*
4 th week	807.73 ^b	761.75 ^c	906.85 ^a	780.16 ^c	1.6575	*
5 th week	1001.63 ^a	949.75 ^c	987.75 ^b	930.13 ^c	1.5725	*
6 th week	1160.80 ^a	1066.13 ^c	1092.40 ^b	1036.50 ^d	1.52	*

Means in a row followed by the same letter are not significantly different ($p \geq 0.05$).

SE: Standard error of means

M.S: *Moringa oleifera* seeds

*: Significant at level 0.05

Table (5): Weekly average weight gain values of experimental chicks fed different levels of Moringa seeds for 42days. (gram/chick)

Weeks	Treatment				SE	Sig.
	A (0% M.S)	B (0.5%M.s)	C (1%M.s)	D (2%M.s)		
1 st week	87.75 ^a	87.62 ^a	87.37 ^a	87.87 ^a	3.65	N.S
2 nd week	270.35 ^a	260.62 ^b	265.22 ^{ab}	258.8 ^c	4.025	*
3 rd week	419.82 ^a	380.5 ^b	413.35 ^{ab}	411.13 ^{ab}	3.2	*
4 th week	470.30 ^b	458.75 ^b	510.23 ^a	502.87 ^a	2.955	*
5 th week	500.70 ^a	445.38 ^c	463.48 ^b	488.85 ^{ab}	3.675	*
6 th week	524.17 ^a	524.17 ^a	479.8 ^b	431.83 ^b	3.525	*

Means in a row followed by the same letter or no letter subscript are not significantly different ($P>0.05$).

SE: Standard error of means

M.S :Moringa Oliefera seeds

*: Significant at level 0.05

N.S: Not Significant

Table (6): Weekly average feed conversion ratio values of experimental chicks fed different levels of Moringa seeds for 42days. (gram/chick).

Week	Treatment				SE	Sig.
	A (0% M.S)	B (0.5%M.s)	C (1%M.s)	D (2%M.s)		
1 st week	1.12±2.10 ^a	1.11±2.30 ^a	1.13±2.20 ^a	1.11±2.30 ^a	2.225	N.S
2 nd week	1.36±2.40 ^a	1.37±2.33 ^a	1.39±2.37 ^a	1.38±2.45 ^a	2.3875	N.S
3 rd week	1.45±4.44 ^{ab}	1.54±4.30 ^a	1.45±4.43 ^{ab}	1.39±6.01 ^b	4.795	*
4 th week	1.71±6.21 ^a	1.66±3.67 ^a	1.58±4.65 ^b	1.55±6.74 ^b	5.3175	*
5 th week	2.00±4.02 ^{ab}	1.86±3.64 ^b	2.12±4.66 ^a	1.90±3.77 ^b	4.0225	*
6 th week	2.21±3.11 ^b	2.22±4.00 ^b	2.33±3.54 ^{ab}	2.49±6.22 ^a	4.2175	*

Means in a row followed by the same letter or no letter subscript are not significantly different ($p>0.05$).

SE: Standard error of means

M.S :Moringa oliefera seeds

*: Significant at level 0.05

N.S: Not Significant

Table (7). Effect of *Moringa oleifera* levels on Carcass characteristics values of broiler chickens (6 weeks).

Item	A(0%)	B(0.5%)	C(1%)	D(2%)	Sig
Warm carcass	1666.00±75.53 ^d	1806.00±68.41 ^b	1918.26±36.76 ^a	1708.50±55.01 ^c	*
Cold carcass	1600.00±72.22 ^c	1697.50±69.56 ^b	1797.50±34.73 ^a	1608.25±54.17 ^c	*
Left side	844.25±37.81 ^{bc}	901.65±34.72 ^b	953.75±19.72 ^a	850.00±28.93 ^{bc}	*
Right side	830.00±38.91 ^b	913.32±38.31 ^a	963.25±17.11 ^a	858.25±26.56 ^b	*
Rib back	55.00±3.53 ^c	63.32±4.24 ^b	76.75±3.11 ^a	73.75±2.39 ^{ab}	**
Hind part	91.75±26.69 ^c	141.75±6.56 ^{ab}	120.00±2.04 ^b	151.75±3.11 ^b	*
Round	131.75±716 ^b	153.25±4.25 ^a	150.00±2.08 ^a	138.25±3.11 ^b	*
Drumstick	116.75±3.11 ^b	110.0±5.40 ^c	120.00±4.08 ^{ab}	121.75±3.11 ^a	*
Breast	321.75±49.84 ^b	296.25±12.14 ^c	336.50±8.25 ^a	276.75±20.75 ^{bc}	*
Wings	83.25±2.35 ^b	93.25±5.13 ^b	106.75±5.13 ^a	91.75±1.18 ^c	**
Neck	118.25±3.11 ^a	131.75±1.18 ^b	92.50±27.4 ^c	118.75±3.14 ^a	*
Dressing on slaughter	70.25±0.75 ^d	72.40±2.66 ^c	73.45±1.20 ^b	74.28±0.93 ^a	*
Dressing empty body	79.19±0.35 ^a	78.32 ^a ±3.02 ^a	79.29±1.12 ^a	80.14±2.38 ^a	N.S
Carcass shrinkage	4.19±0.14 ^c	6.04±0.33 ^a	6.30±0.12 ^a	5.87±0.44 ^b	**
Mussels weight	1197.50±77.92 ^c	1316.75±27.28 ^a	1385.00±43.49 ^a	1253.25±19.21 ^b	*
Bone	362.50±27.19 ^c	375.00±15.5 ^{bc}	387.50±9.46 ^b	403.25±10.27 ^a	*
Muscles percent	74.78±3.66 ^a	73.74±0.9 ^a	72.81±1.14 ^a	73.29±0.57 ^a	NS
Bone percent	22.69±1.15 ^d	24.28±0.23 ^b	25.07±1.25 ^a	23.61±0.16 ^c	*
Rib back percent	6.60±0.12 ^c	7.08±0.76 ^b	8.1±0.25 ^a	8.7±0.31 ^a	*
Hind back percent	14.77±0.74 ^c	15.71±0.55 ^b	12.67±0.60 ^d	17.8±0.78 ^a	**
Drumstick percent	14.14±0.33 ^a	12.20±0.42 ^b	12.67±0.36 ^b	14.33±0.80 ^a	*
Round	15.61±0.32 ^c	17.05±0.50 ^a	15.84±0.37 ^c	16.20±0.21 ^b	*
Breast percent	32.04±0.52 ^b	32.74±0.39 ^b	35.59±1.22 ^a	35.52±2.91 ^a	*
Wing percent	10.06±0.63 ^b	10.32±0.26 ^b	11.25±0.36 ^a	10.76±0.22 ^{ab}	*
Neck percent	14.23±0.45 ^a	14.62±0.53 ^a	12.83±0.65 ^c	13.97±0.73 ^b	*
Liver wet (%)	1.70±0.45 ^b	1.90±0.45 ^a	1.71±0.45 ^b	1.70±0.45 ^b	*
Intestine weightt (%)	4.10±0.41 ^a	4.00±0.41 ^a	3.60±0.45 ^b	4.00±0.41 ^a	*
Intestine length (cm)	188±0.23 ^a	175±0.45 ^c	185a±0.45 ^b	180±0.45 ^b	*
Gizzard weight (%)	1.76±0.22 ^c	2.07±0.25 ^b	2.19±0.22 ^{ab}	2.24±0.21 ^a	*
Fat weightt (%)	1.76±0.41 ^b	1.95±0.45 ^a	1.92±0.41 ^a	1.30±0.45 ^c	*

Means in a row followed by the same letter or no letter subscript are not significantly different ($p>0.05$).

M.S : *Moringa Oleifera* seeds

*and**: Significant at level 0.05 and 0.01, respectively.

N.S: Not Significant

DISCUSSTION

Nutrition accounts for 60-70% of the total production cost in modern poultry production systems. Natural medicinal products originating from herbs and spices have been used as feed additives for farm animals (Guo, 2003). In most developing countries, the major sources of protein in commercial poultry production are Fish meal (FM) and oil seed cakes. However, these are usually scarce, expensive and used extensively by other livestock and humans. *Moringa oleifera* seed supplement have been included into the diets of poultry as means of reducing high cost conventional protein sources (Makkar and Becker, 1996). *Moringa Oleifera* seeds as other legumes. The protein concentration (253.5 to 264.3 g/kg) and crude fiber levels varied from (51.5% to 58.1%). The result obtained by Henshaw, 2008 showed that there were difference in protein contents, where *Moringa olifera* seeds contained appreciable amount of crude protein (39.1%), crude fiber

(11%), moisture (2.85%), ash (4.7%) and oil (39.1%), respectively. In the present study the chemical composition of *Moringa oleifera* seeds results for crude protein (51.8%) value was similar to those from Malaysia with 38% (Abdulkrium et., al 2005) and pakestan (Anwar, et al, 2006) have found a value ranging from 29.6% to 31.3%. Protein seeds of *Moringa Oliefera* in this study is greater than those reported for imported grain legumes and cereals which contain in general 18% to 25% of dry matter (Singh and Singh,1992). The protein analysis by Nzikou et al.(2009) in Congobrazzvaile by the method of micro-kjeldahl revealed a value of 37.6%. These seeds are a potentially good sources of proteins and oil which should be exploited to determine if they are commercially viable. The differences in high content and low content of protein can be attributed to geographical location, soil composition, cultivation, climate, ripening stage, differences in the locality of it is growth, the stage at maturity prior to harvesting and the extraction method used. 25.1% C.P of leaves in an experiment where extract and un-extracted leaves of *Moringa oliefera* were used as a component of animal feed (Makkar and Becker ,1996). Anwar *et al.* (2006) have found after oil extraction by hexane method 38.7%. The variation observed in the *Moringa oliefera* seeds with regards to oil content may have been due to either a different genetic makeup of the plants on more probably due to environmental effects and variation in oil content across countries might be attributed to the environmental and geological conditions in the regions Nzikou et al., (2009) have found a value of carbohydrates 13.6 and Abdulkarim et al (2005) reported a range value of it was about 16.5 to 17.8%. Nzikou et al.,(2009) found that crude fiber value of (3.2) while (Anwar et al., 2006) have found a range value of (6.6% to 9%). Although crude fiber does not contribute to nutrients or energy, it is source of dietary fiber. Minerals of *Moringa oliefera* seeds Ca^{++} (83.75+₋ 0.01 mg /100g) Mg^{++} (251+₋ 0.02mg /100g), $p(36.53+_{-}0.02mg/100g)$, Na^{++} (22.5+₋0.01 mg/100g) (Nzikou et al.,2009) .These values are slight higher than these results of the current study. Although the atomic absorption spectrophotometer method has been used for minerals analysis .The greater content of total phenol (237.77mg/100g) was observed with the seeds of *Moringa oliefera* Comparing these results with the literature ,values that differed from results were found by Compaoré et al (2011). The variation may be due to differences in varieties, climate, ripeness and extraction method. According to the results obtained seeds of *Moringa oliefera* were found the most active one with an anti-oxidante value, it has higher phenolic content with good correlation (Nzikou et al.,2009) also it content slight appreciable of tannin (0.028mg/100). There is no available literature information about the content of phenolic compounds and /or the anti-oxidant capacity. Based on the profile of *Moringa oliefera* seeds dietary treatments had no negative effect on broiler chicks feed consumption during the experimental period. The feed consumption values were negatively affected for the birds fed 2% level at moringa dietary inclusion. When age advanced the feed consumption values not affected negatively for the birds fed 1% *Moringa* seed .This slight improvement might due to improvement of tolerance of off-taste resulting from higher inclusion of moringa in the diet (Table 4) .Similar feed intake was observed in all groups , since all diets were aporoximately iso-caloric and iso-nitrogenous. Consequently, the weight gain improved when the age advanced due to increase in moringa utilization for C and D treatments (Table 5). It also, might be attributed to birds capability to resist the moringa anti nutritional factors.Generally, in the present study there is no tendency for feed consumption and performances. These trend does not agree with various reports from other studies in (*Moringa oliefera* leaf), notably those by Guo et al (2003). Olugbemi et al (2010) who used *Moringa stenopetala*, which indicated that performance improvement was associated with leaf meal dietary inclusion rate not exceeding 5- 6% (Cariaso1988). In other study showed reduction in birds' performance at higher leaf meal inclusion levels in the range of 7.5% -10. Reduction in performance at higher dietary levels of *Moringa oliefera* leaf meal that attributed to anti-nutritional factors in the leaf meal, Makar and Becker (1996) , mentioned that *Moringa oliefera* seeds contain appreciable amount of anti-nutritional factors compared with leaves of *Moringa oliefera*. Reduction in weight gain, feed efficiency and body weight as a result of addition of higher level of *Moringa oliefera*. (2%) 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 whole periods *Moringa oliefera* include 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 *Moringa oleifera* to broiler chicks' diet. The lower feed intake of broiler chicks fed on diet contains *Moringa oleifera* seeds may be attributed to the bitter taste in the seeds of the *Moringa oleifera*, whereby made the consumption of feeds so less than usually which that taste refers to the saponins. The seeds bitter taste is generally attributed to alkaloids, saponins, cyanogenic glucosides and glucosinolates which are removed by treatment, suggesting that this taste would not limit the use of this material in animal diets. There is considerable genetic diversity between *Moringa oleifera* and *Moringa stenopetala*, for example, Odee (1998) reported that there are many different varieties whose kernels taste from sweet to very bitter. Seeds of some varieties are consumed by humans after roasting and taste like peanuts. Ramachandran et al., (1980). The effect of inclusion 2% decorticated *Moringa oleifera* Seeds instead of commercial concentrate in broiler chicks' diet on daily feed intake observed that the amount of the feed intake so less. Reduction in weight gain, and body weight gain as a result of addition of higher level of *Moringa oleifera* seeds to broilers diet during the experiment 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 due to the presence of benefit factors in *Moringa oleifera* seeds including antibacterial materials as reported by Eilert et al (1981). Compaore *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. Data of carcass characteristics indicated a significant difference ($P \leq 0.05$) in carcass weight and dressing percentage in chicks fed *Moringa oleifera* seeds compared that with *Moringa oleifera* leaf meal these results are disagree with result reported by Ibrahim (2005). *Moringa oleifera* seeds were better during the starter and finisher period and lowered gain were observed during the starter period, these observations may be related to the presence of some anti-nutritional factors of *Moringa oleifera* seeds Igwilo *et al.* (2010). All these factors faced the trial no mortality mentioned at the whole period of experiment and we exert most effort at that period of the experiment. The tree, according to Fahey et al., (2001) has in recent decade been shown to be an outstanding indigenous source of highly digestible protein, calcium, iron, vitamin C and carotenoids suitable for utilization in many of the so-called "developing" regions of the world where undernourishment is a major concern.

CONCLUSION

According to the results obtained from the research it was concluded that higher levels of *Moringa oleifera* seeds in the broiler chicks die adversely affected the performance. Therefore, it is suggested that *Moringa oleifera* should be included in broiler diet with low levels.

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أثر إضافة المورينقا (مورينقا أوليفيرا) على أداء الدجاج اللحم

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أجريت هذه التجربة لتحديد أثر إضافة مستويات مختلفة من بذور المورينقا أوليفيرا على أداء الدجاج اللحم وصفات الذبيح. استخدم عدد (160) كتكوت غير مجنسة من عمر يوم (روس 308). درجت أربعة مستويات لبذور المورينقا أوليفيرا في أربع مكررات (0%، 0,5%، 1% و 2%). تساوت الطاقة تقريباً (3200 كجم/ك كالوري) بكل المعاملات. استمرت التجربة لمدة 42 يوم مع فترة أقلمه لمدة 7 يوم. استخدم برنامج (الحزم التقنية للعلوم الاجتماعية) لتحليل البيانات عرضت نتائج التحليل الإحصائي قيم المتوسطات والخطأ القياسي للمتوسطات. أظهرت نتائج الاستهلاك الغذائي وجود فروقات معنوية خلال كل الأسابيع. المستوى صفر% سجل أعلى قيمة للاستهلاك الغذائي خلال كل الأسابيع ما عدا الأول، المستوى 1% سجل أعلى قراءة في الأسبوع الرابع. هنالك فروقات معنوية للزيادة الوزنية خلال كل الأسابيع. المستوى صفر% سجل أعلى قيمة للاستهلاك الغذائي خلال كل الأسابيع ما عدا الأول، المستوى 1% و 2% سجل أعلى قراءة في الأسبوع الرابع. الكفاءة التحويلية أظهرت فروقات معنوية في الأسبوع الثالث، الرابع، الخامس والسادس لمستويات صفر% و 0,5% سجل أعلى قيم في الأسبوع الثالث والرابع (1% في الأسبوع الخامس و 2% في الأسبوع السادس). أثبتت النتائج وجود فروقات معنوية عالية عند مستوى (0.01%) بالنسبة للظهر الأمامي، نسبة الظهر الخلفي، نسبة الأجنحة ونسبة معدل الأنكماش بينما كانت هنالك فروقات غير معنوية عند مستوى (0.05%) بالنسبة لنسبة التصافي للوزن الفارخ ونسبة العضلات. كانت هناك أيضاً فروقات معنوية ($P \geq 0.05$) لكل القطعيات الأخرى بمستوى معنوية. تشير النتائج أيضاً أن نسبة النفوق عند إضافة 0.5% من المورينقا أوليفيرا كانت صفر% بينما زاد معدل النفوق إلى 5% في حالة عدم إضافة المورينقا أوليفيرا كذلك سجل معدل النفوق 7% في حالة إضافة المورينقا في المعاملة ج (1%) ووصلت إلى (10%) عند إضافة أعلى مستوى من المورينقا أوليفيرا في المعاملة د (2%). لوحظ أن أعلى نسبة نفوق في المجموعة التي تحتوي على 2% مورينقا أوليفيرا بينما سجل المستوى 0,5% أقل نسبة نفوق.