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Original Article

Nutritional Evaluation of Dried Purslane (*Portulaca Oleracea* L.) in Broiler Performance

E.H. Elhussein[1], K.A. Abel Atti[2], E.A. Ibrahim[3] and K.M. Elamin[4,*]

[1]Department of Animal Production, Faculty of Natural Resources and Environmental Studies, University of Kordofan, Sudan
[2]Department of Animal Nutrition, Faculty of Animal Production, University of Khartoum, Sudan
[3]Department of Crop Sciences, Faculty of Natural Resources and Environmental Studies, University of Kordofan, Sudan.
[4]Department of Poultry Production, Faculty of Animal Production, University of Khartoum, Sudan

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Corresponding Author
K.M. Elamin
khalid1130@yahoo.com

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ABSTRACT

The experiment was conducted to determine the effect different levels of purslane (*P. oleracea* L.) meal on broiler performance. One hundred and eighty one-day old unsexed (Ross 308) broiler chicks were randomly divided into five groups each represent a treatment (36 birds/treatment), with six replicates, (6 birds/replicate). A Completely Randomized Design (CRD) was used, with different levels of purslane meal (0, 2, 4, 6 and 8%). The experiment was continued for six weeks. Feed intake and body weight were recorded and determined on weekly basis with body weight gain and feed conversion ratio throughout the experimental period. The results of weekly performance indicated significant differences ($P<0.05$) among the dietary treatments (0, 2, 4, 6 and 8% purslane meal) for feed intake, body weight gain and feed conversion ratio. The differences among the dietary treatment for, the overall feed intake, body weight gain, feed conversion ratio and dressing percentage, were significant ($P<0.05$) except feed conversion ratio. It is concluded that the use of 4% is not suitable for broiler feeding.

Keywords: Broilers, Green feed, minerals, lameness.

INTRODUCTION

In spite of the advancement made in the producing of fast growing high yielding broilers and high egg producing pullets does not meet the continually changing needs of the consuming public. The low level of supply of poultry protein in most countries is due to the poor performance of birds which could be attributed to many factors such as inadequate nutrition, imbalanced diets, environmental factors and diseases.

Opera (1996) stated that the total feed account for 70-85% of the production cost of poultry, and the bulk of feed arises from protein concentrates such as groundnut cake, fish meal and many other sources. Prices of these conventional sources have soared so high in recent time that it is becoming uneconomical to use them in poultry feed. Therefore, there is a need to look for cheap locally available sources

or additives of feed ingredients particularly those that are competed for by human.

Several attempts have been made to bridge the gap between supply and demand of poultry products by using agricultural by-products or non-conventional feedstuff. These include the use of legume seeds and leaves of forage legumes such as alfalfa, which improve the productivity of exotic breeds (Elhussein, 2007). Also many efforts have been directed to the nutrients requirement of the birds, not only in term of production but also in term of altering the composition of poultry products (Lesson, 1993).

The use of antibiotics as growth promoters in poultry industry has been seriously criticized by government policy makers and consumers because of the microbial resistance to these products and the potential harmful effect on human health (Bostsoglu and Fletouris, 2002). With the increased concern of consumers on the safety of food additives, natural additives are replacing the chemical compounds as food additives, including preservatives (Bae, 2004).
Purslane (*Portulaca oleraca* L.) is one such plant can be used in poultry feeding. It is fascinating that a plant so prevalent around the world has achieved almost identical recognition in each culture for the benefits. The name portulaca is thought is to be derived from Latin name (Portp) to carry and (Lac) meaning milk, since the plant contain a milky juice (Boulos and El Hadidi, 1989). Purslane pocess useful pharmacologically potent chemical substances for use in animal and plant. Several workers claimed that *portulaca oleraca* contains several biological active compounds and it is a source of many nutrients. Also it contains other chemical constituents, including urea, calcium, iron, phosphorus, manganese, copper and fatty acids, especially omega -3 fatty acids (Ezekoetal., 1999., Hussein, 1985., Mohamed and Hussein, 1994 and Simopoulos., 1992).

Tom and Preston (2007) reported that *portulaca oleraca* contain 13.2% dry matter, 15.7% crude protein, 5.4% ether extraction, 11.1% crude fiber and 15.% ash. Belcheff (2001) reported that purslane is rich in naturally occurring omega-3 fatty acids, antioxidants and protein. Moreover, Leung and Foster (1996) reported that the plant contain vitamin A and C, α-tocopherol, B-carotene, glutathione and omega-3 fatty acids. It has also many effects including antibacterial and antifungal; wound healing; anti-inflammatory; and diuretic effect. In addition *portulaca oleraca* was reported to reduce serum and egg cholesterol (DalleZotteetal, 2005).

Purslane can be cultivated all over the year; it has a short life cycle (15-20 days) and the production of the crop often exceed the human consumption. Purslane has been used in pig (Tram and Preston2007) and rabbits feeding (Leung and Foster, 1996). Thus, the purslane can make available contribution on the net income by improving the performance of the birds or reduction of the cost. The objective of this study was to investigate the effect of feeding purslane to broiler chicks.

MATERIALS AND METHODS

Processing of Purslane Meal

Purslane (*Portulaca oleraca* L.) was cultivated and collected after three weeks and before blooming. Purslane was left ten days in a shade area to reduce the moisture. Thereafter, the dried whole purslane was sent to the mill and prepared in a form of green meal to be mixed with broiler diets.

Experimental Birds

One hundred and eighty, one-day old, unsexed commercial broiler chicks (Ross 308) were obtained from Enma Company, were used for this experiment.

On arrival, all chicks were assigned to the basal diet for three days as adaptation period. Thereafter, they were randomly distributed into 30 pens, (six per pen). The mean initial weight of the chicks in each pen was approximately equal. The pens were then divided randomly among five experimental diets.

Experimental Diets

Five experimental diets were formulated from local ingredients. The diets were approximately isocaloric and isonitrogenous with different levels of purslane meal (0, 2, 4, 6 and 8%).

The experimental diets were formulated and adjusted to meet the nutrients requirement of broiler chicks.

The purslane meal was analyzed in CIRAD Institute laboratories, in France, for chemical

composition and mineral profile which illustrated in Table (1).

The constituents of ingredients of experimental diets were shown in Table (2). The calculated compositions of experimental diets were presented in Table (3), and the data in Table (3-4) showed the determination composition of experimental diets.

Table (1): Proximate analysis and mineral profile of purslane meal

Ingredients	%
Dry matter	96.45
Crude protein	12.09
Crude fiber	11.8
Ash	47.98
Ether extract	1.52
Nitrogen-free extractive (NFE)	23.06
*Metabolizable energy (ME)	1463
Phosphorus	0.467
Potassium	9.124
Calcium	1.068
Mg	0.864
Na	0.341
Fe	0.658
Mn	164.7 ppm
Cu	12.1 ppm

*Calculated according to Lodhi *et al.* (1976).
ME = (1.549 + 102 * CP + 0.275 * EE + 0.148 * NFE – 0.034 * CF) * 239

Table (2): Composition of experimental diets (%)

Ingredients	Experimental diet based on purslane meal %				
	0	2	4	6	8
Sorghum	70	68.26	68.5	68.5	67.96
Ground Nut meal	4.75	5	5.25	7.6	10.15
Sesame meal	9.3	9.3	9.5	7.6	4.76
Wheat bran	9.15	8.75	5.8	2.68	1.06
Super concentrate	5	5	5	5	5.00
Purslane	0	2	4	6	8.00
Di calcium Phosphate	1.3	1.2	1.11	1.185	1.25
NaCl	0.25	0.25	0.25	0.25	0.25
Lysine	0.05	0.04	0.04	0.04	0.04
Methionine	0.2	0.2	0.2	0.2	0.21
Vegetable oil	0	0	0.35	0.94	1.34

Table (3): Calculated chemical composition of experimental diets

Item %	Purslane meal %				
	0	2	4	6	8
ME (kcal/kg)	3139.97	3105.58	3101.74	3107.32	3100.13
Crude protein	22.03	22.05	22.00	22.07	22.02
Crude fiber	3.50	3.69	3.71	3.71	3.76
Ether extract	4.92	4.88	4.83	4.63	4.38
Ash	4.57	5.40	6.15	6.86	7.51
NFE	54.60	53.72	52.84	51.83	51.17
Ca	1.00	1.00	1.00	1.00	0.98
Available phosphorus	0.63	0.61	0.58	0.58	0.58
Lysine	1.16	1.14	1.13	1.12	1.12
Methionine	0.72	0.72	0.71	0.69	0.67
K	0.50	0.67	0.83	0.98	1.14
Mg	0.23	0.25	0.25	0.25	0.25
Cu	0.0012	0.0012	0.0012	0.0011	0.0010
Fe	0.014	0.026	0.039	0.052	0.064
Mn	0.0034	0.0036	0.0036	0.0033	0.0032

Table (4): Determinated composition of experimental diets

Item %	Purslane meal %				
	0	2	4	6	8
Dry matter	93	93	94	94.5	95
Crude protein	22.5	22.8	22.2	22.5	22.8
Ether extract	4.4	4.8	5	5	5.2
Crude fiber	3.6	3.8	4	4.2	5
Ash	5.5	5.7	7.2	7.8	8.2
NFE	57	55.9	55.6	55	53.8

Management and Performance parameters

Feed and water were offered *ad libitum.* All birds were vaccinated against New Castle disease (ND) and Infectious Bronchitis disease (IB), at 5 day old using clone 30+IB strain. At 14 day old birds were vaccinated against Gamboro disease using 78 strain, also at 23 day old were vaccinated against New castle disease using clone 30 strain in water.

Body weight (g) and feed intake (g/bird) were recorded weekly. Body weight gain (g/bird) and feed conversion ratio were estimated for each dietary treatment. Mortality was observed and registered through the experimental period.

Statistical Analysis

A completely Randomized Design was used in this study with five treatments of experimental diets replicated six times, with six birds in each replicate.

Data obtained from the experiment were subjected to analysis of variance according to (Snedecor and Cochran); means were separated by LSD test. The statistical analysis was carried out using Statistix 8.0 analytical software Copyright (C) 1985-2003.

RESULTS AND DISCUSSION

This study was performed to evaluate the nutritive value and effects of purslane (*Portulaca oleracea* L.) on broiler performance. The proximate analysis of purslane meal in this study (Table 1) showed that its crude protein content was 12.09%. This value is lower than that obtained by Obieda *et al*. (2003), Abdellah (1989) and Pirie (1971). The crude fiber was found to be lower (11.8%) compared to the values reported by Obieda *et al.*, (2003) who obtained (20.3%) and but is comparable to the value reported by Abdellah (1989) who reported (10.3%). Carbohydrate, calcium and phosphorus contents were comparable to those reported by Obieda *et al.*, (2003). Also the proximate analysis showed the high potassium content of purslane meal (9.124%) which is almost high when compared with other plants.

In this study, all birds appeared to be healthy and no mortality was recorded till the 4th week of age. In week 5 and week 6 some cases of leg rickets or leg abnormality appeared in chicks fed purslane diets, and this cases of rickets increased with increasing of the level purslane meal in the diet. These Cases of rickets and muscle relaxant observed might be due to the high potassium contents in the diets which resulting from purslane supplementation. This result is in line with that obtained by Solomon *et al.*, (1993) who reported that the muscle relaxant properties of *Portulaca oleracea* are associated with high concentrations of potassium ions in chicks. Also similar findings were obtained by Obieda *et al*., (2003) who evaluated the nutritive value and toxic effects of *P. oleracea* on Nubian goats, they reported weakness of the fore and hind limbs which progressed to an inability of the animals to stand and move.

Driver *et al*., (2005a) stated that rickets is caused by calcium and phosphorus deprivation in young broilers, the incidence of calcium-responsive rickets in broiler chicks is increased by feeding excess phosphorus in low-calcium diets, but was hard to eliminate in one study.

In General, the results of weekly performance indicated significant differences among the dietary treatments (0, 2, 4, 6 and 8% purslane meal) for feed intake, body weight gain and feed conversion ratio (Tables 5, 6 and 7). Strongly poor performance was observed for (feed intake, body weight gain, feed conversion ratio and dressing percentage) on diet containing 4% purslane through the six weeks and overall period (Table 8). Chiba (2007) stated that excess Ca interferes with utilization of P, Mg, Mn, and Zn and it can reduce palatability of the diet. Moreover, the hypothesis "mineral bioavailability" for various cell targets in digestion process must take in accounts to have

real perception from completion of each mineral. It need to keep in mind that life is a dynamic, complex process and consequently basic mineral requirements and interaction might constantly shifting (Hemati Matin *et al.*, 2013). According to *et al.*, (2005b) calcium requirements determined for 0- to 16-day-old chicks suggest that current NRC (1994) recommendations (1.0% Ca) are adequate for maximum bone ash but excessive for all other measured variables. Both, BWG and FCR were optimized at or below 0.625% dietary Ca, which may suggest that a lower total Calcium concentration in general is desirable.

The differences among the dietary treatment for, the overall feed intake, body weight gain, feed conversion ratio and dressing percentage, were significant except feed conversion ratio (Table 8).

Table (5): weekly feed intake (g/bird) for Ross broiler chicks

Purslane meal %	Age in weeks					
	1	2	3	4	5	6
0.0	104.3 ^{a}	203.55 ^{b}	597.38^{a}	655.00^{a}	753.33a	750.83^{a}
2	95.1 ^{ab}	174.08 ^{c}	448.33^{b}	512.50^{b}	692.50b	677.50^{b}
4	63.0 ^{c}	103.61^{d}	174.17^{c}	301.67^{d}	494.17c	518.33^{c}
6	87.4 ^{b}	227.97 ^{a}	440.67^{b}	475.83^{c}	709.17^{b}	671.67^{b}
8	95.7 ^{ab}	207.33 ^{b}	445.83^{b}	511.67^{b}	769.17^{a}	744.33^{a}
LSD $_{0.05}$	11.8	20.61	39.577	30.801	36.443	35.782
SE	5.7	10.00	19.216	14.955	17.695	17.374

Any two means within a column having a common letter (s) are not significantly different (P<0.05), according to LSD.
SE denotes standard error of the mean

Table (6): Body weight gain (g/bird) for Ross broiler chicks

Purslane meal %	Age in weeks					
	1	2	3	4	5	6
0	45.273 ^{b}	74.162 ^{b}	230.83^{a}	264.67^{a}	506.67^{a}	473.33^{a}
2	38.608 ^{b}	61.108 ^{c}	177.50^{c}	220.83^{b}	448.33^{b}	449.67^{a}
4	22.722 ^{c}	24.800 ^{d}	87.667^{d}	127.17^{c}	294.00^{c}	315.67^{c}
6	39.025 ^{b}	64.970 ^{c}	174.33^{c}	215.83^{b}	484.17^{ab}	408.33^{b}
8	53.467^{a}	82.917 ^{a}	187.83^{b}	231.00^{b}	492.67^{a}	446.17^{a}
LSD $_{0.05}$	7.9	7.6	9.3744	20.998	44.269	27.836
SE	3.8	3.7	4.5517	10.195	21.494	13.516

Any two means within a column having a common letter (s) are not significantly different at 5% level, according to LSD.
SE denotes standard error of the mean.

Table (7): The mean Feed conversion ratio for Ross broiler chicks

Purslane meal %	Age in weeks					
	1	2	3	4	5	6
0	2.37 ^{b}	2.77 ^{b}	2.59^{a}	2.48^{a}	1.49^{b}	1.6^{ab}
2	2.487 ^{ab}	2.86 ^{ab}	2.53^{a}	2.51^{a}	1.54^{ab}	1.51^{b}
4	2.80 ^{a}	4.19 ^{a}	2.16^{b}	2.38^{ab}	1.74^{a}	1.64^{a}
6	2.25 ^{b}	3.50 ^{b}	2.53^{a}	2.37^{ab}	1.46^{b}	1.64^{a}
8	1.805^{c}	2.50 ^{d}	2.37^{ab}	2.21^{b}	1.56^{ab}	1.67^{a}
LSD $_{0.05}$	0.32	0.36	0.30	0.26	0.22	0.10
SE	0.16	0.17	0.14	0.13	0.10	0.05

Any two means within a column having a common letter (s) are not significantly different at 5% level, according to LSD.
SE denotes standard error of the mean.

Table (8): Overall performance and dressing percentage for Ross broiler chicks

Purslane meal %	Feed intake (g/bird)	Body weight gain (g/bird)	Feed conversion Ratio	Dressing percentage
0	3064.4^{a}	1594.9^{a}	1.92^{a}	68.55^{ab}
2	2600.1^{c}	1396.1^{c}	1.87^{a}	68.55^{ab}
4	1654.9^{d}	872.02^{d}	1.91^{a}	66.65^{c}
6	2612.7^{c}	1386.7^{c}	1.89^{a}	69.56^{a}
8	2774.0^{b}	1494.1^{b}	1.86^{a}	68.12^{b}
LSD $_{0.05}$	83.920	64.173	0.0954	1.2011
SE	40.747	31.159	0.0463	0.5832

Any two means within a column having a common letter (s) are not significantly different at 5% level, according to LSD.
SE denotes standard error of the mean.

Feed intake and body weight gain were significantly different with various trends among dietary groups, generally, chicks fed 4% Purslane meal consumed the lowest amount of feed and gained the lowest weight throughout the experiment. These results were similar to that obtained by Teguia *et al*., (1993). They reported that the leaves of sweet potato have some adverse effects on weight gain and feed consumption in broilers. Furthermore, D'Mello *et al*., (1987), Ash *et al*., (1992), Teguia *et al*., (1993), Opara (1996), Esonu (2001) and Elhussein (2007) concluded that at high leaf meal inclusion levels in poultry diets, the growth is depressed. The non-significant effect purslane meal supplementation on overall feed conversion ratio is in accordance with the results of Ghorbani *et al.*, (2014) when they fed 1% and 2% dried purslane to broiler chicks.

CONCLUSIONS

From the present study It may concluded that the use of 4% is not suitable for broiler feeding and more studies are advocated to acertain this result.

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