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Research Article

Mesquite (*Prosopis juliflora*) Pods as a Local Alternative to Feed Poultry

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Abstract

This research was aimed to investigate the possibility of using *Prosopis juliflora* pods as a fodder source for poultry. The study have shown that the inclusion of ground prosopis pods in a broiler diet added some positive effects on broiler performance such as improving carcasses weight and reducing the weights of the inedible parts. The obtained results encourage repeating the experiment with increasing the percentage of prosopis supplementation to the broiler diets with using some treatments on the prosopis pods to reduce the undesirable effects of the antinutritional factors in the pods and to increase the percentage of the essential amino acids present in the pods Lysine, Methionine, Argenine, Histadine, Isoleucine, Leucine and Phenylealanine to the limits recommended for broilers by NRC 1990.

Keywords: *Prosopis juliflora*, Feed Poultry, antinutritional factors

INTRODUCTION

Prosopis juliflora is a leguminous tree that is native to arid and semi-arid regions of the world (Harris et al., 2003). It is present in North America, Africa and Asia, having multi-seeded curved pods with hardened pericarp (Habit and Saavedra, 1988). Mehar 2011, reported that mesquite (*Prosopis juliflora*), is widespread in Saudi Arabia. Eradication of the plant by cutting as well as burning has proven to be extremely difficult and its exploitation as a resource and better management were proposed as approach reduce its invasiveness (Pasiecznik, 2002). As a result, the use of the pod with the seed after grinding as animal feed was planned as one of the strategy to reduce its propagation (Girma et al., 2012). The leaves and pods of mesquite have been used as forage for cattle, goats, sheep, and camels in countries throughout the world.

Ripe pods are highly palatable with a moderate level of digestible protein and high energy content (Yadav et al., 2004; Mahgoub et al., 2005). The pods of *P. juliflora* are rich in crude protein (CP), minerals and amino acids (Pasiecznik et al., 2001).

Although, *Prosopis juliflora* pods have been used in livestock as well as poultry diets and produced encouraging results in many countries and for different species of poultry (Yusuf et al., 2008; AL-Beitawi et al., 2010; Lemma, 2011; Meseret et al., 2011a; b), few reports indicated that *Prosopis juliflora* consumption has an adverse effect on livestock product quality (Beruk, 2003; Dawit, 2010).

P. juliflora pods provided good fodder without causing any digestive adverse effect. For cattle and buffaloes, the pods were not regarded as good fodder because of the high sugar content and indigestibility of raw seeds. (Shukla et al., 1984). When fed in the dried and crushed state in the form of powder, the pods did not show any deleterious effect on cattle and, in fact, resulted in good animal performance. It is also used as a fodder for dairy cows, the flour may make up

40-60% of concentrate rations. In South Africa, it is fed unmixed to sheep. Ripe pods contain 12-14% crude protein. The short-fibred parts are also suitable for pigs and poultry. *P. juliflora* pods are used in Sudan mainly as livestock fodder, which is normally browsed directly from the trees. In the Tokar delta of Red Sea Province prosopis pods have been collected on a large scale and ground in a mill for livestock feed. Individual households everywhere in Sudan where prosopis is growing also collect the pods, which are directly given to fenced-in livestock as fodder (ElSiddig et al., 1998).

AL Dobaib et al.(2006) studied the chemical composition of the *P. juliflora* ripe pods and reported that the pods contain 21% of protein which might be successfully used to formulate livestock diets. The objective of this research is to investigate the possibility of use *Prosopis juliflora* pods as a fodder source for poultry.

MATERIALS AND METHODS

The experiment was carried out in cooperation between the department of Animal Production and the department of Plant at the poultry farm of the college of Agriculture and Veterinary Medicine, Qassim University KSA. From March to May 2011.Pods of *Prosopi juliflora* were harvested from many parts of Qassim area, sun-dried, cleaned and broken in an electric mill, then again sun-dried to less than 10% moisture content. A sample of the ground prosopi pods was subjected to proximate analysis (Table1) and to amino acids analysis Table (2) in the laboratories of IDAC Company at Riyadh KSA.

Experimental Diets

Based on the results of the proximate analysis of the ground Prosopis pods, 4 experimental nutritional diets were formulated by replacing 0, 1, 2 and 3 % of the basal diet diets by ground Prosopi pods respectively Table(1). The composition and the calculated analysis of experimental diets were shown in Table (1)

Experimental Birds:

Eight hundred (800) one-day old unsexed (308 Ross) broiler chicks were randomly divided into 4 equal nutritional groups each of equal 4 replicates (50 chicks). Feed and water were provided freely. All recommended vaccines and prevention medication were administered accordingly.

Parameters:

Live Body Weight Chicks in each treatment were weighed individually at weekly intervals until 6 week of age. Average body weight in grams for each nutritional group was corded.

Carcass and Blood Preparation:

At 42 days of age, 5 birds, were selected from each group, weighed individually after an overnight fasting except from water then slaughtered. The body weight averages of the selected birds for each group were approximately equal Table (5). Blood samples, from each bird were collected into hebarinized test tube and centrifuged at 6000 rpm for 3 minutes. Separated plasma were transferred to dry and clean test tube and stored at -20^{o}C for chemical analysis. Slaughtered birds were feather removed. Heads, legs and viscera were eviscerated then carcasses weighed and chilled at 4^{o}C for carcass characteristics. Heart, gizzard, and liver were weighed to the nearest 0.1 g. The carcasses were sawed into two halves, and then divided into the commercial cuts (breast, drumstick and thigh). Each cut was weighed individually.

Blood parameters:

Total protein, albumin and T3, T4 parameters were estimated in the collected plasma samples using commercial Kits.

Statistical Analysis:

Data were analyzed using GLM procedure of SAS program (SAS, 2000) followed by testing of significant differences among treatments using LSR method (Duncan).

Table 1. Proximate composition and ME energy of the experimental diets

Escription	Ground Pros.(P)*	Basal diet(P0)	P1%	P2%	P3%	Method Ref.
Moisture %	8.84	9.00	8.53	8.58	8.42	AOAC 2010
Crude protein %	11.90	23.44	22.48	22.56	22.94	AOAC 2010
Ether extract%	0.80	5.14	4.53	4.73	4.66	AOAC 2010
Crude fiber	10.72	3.73	3.71	3.86	3.81	AOAC 2010
Ash%	6.12	6.04	5.5	5.84	5.68	AOAC 2010
ME Kcal/kg	2661	2930	2942	2935	2942	Calculation

*(P) Ground prosopi pods, (P0): basal diet, (P1): basal diet+1%ground prosopi pods, (P2): basal diet+2% ground prosopi pods and (P3): basal diet+ 3% ground prosopi pods.

Remarks: Energy as poultry (MJ/kg) =14.30 +0.17EE – 0.02 CP – 0.09 CF – 0.14 (TA +Moisture) where EE= ether extract, CP = crude protein, CF = crude fiber, TA = total ash. MJ = 0.2389 ×1000 Kcal. Al results are as is basis.

Table 2. Amino acids profile of ground prosopi pods

0.72	Glycine
0.79	Alanine
1.32	Valine
0.08	Methionine
0.14	Isoleucine
0.19	Leucine
0.13	Tyrosine
0.17	Phenyl alanine
0.18	Histadine
0.45	Lysine
0.97	Argenine
11.76	Amino acids total (15)only

Table 3. Effect of ground Prosopis pods supplementation to broilers diet on body weight (Mean ± SE Means in the same row with different letter are significantly different (p≥0.05)

Age wks	P0	P1	P2	P3
1	123.23± 1.26 ^{B}	126.36±1.12^{A}	126.71±1.15^{A}	125.60±1.18$^{A\,B}$
2	293.69± 2.57^{A}	297.58±2.37^{A}	294.24±2.10^{A}	292.61±2.51^{A}
3	594.34± 4.54^{AB}	589.75±4.44^{B}	604.60±6.00^{A}	575.67±4.85^{C}
4	926.97±12.26^{A}	899.71±13.17^{A}	928.55±10.06^{A}	894.60±10.58^{A}
5	1446.48±31.12^{A}	1365.81±73.83^{A}	1442.30±22.67^{A}	1322.92±23.12^{A}
6	2206.08±42.30^{A}	2017.66±35.91^{B}	2069.68±39.68^{B}	1885.18±31.23^{C}

Table 4. Effect of ground Prosopi pods supplementation to broiler diet on some blood parameters (Mean ± SE). Means in the same row with different letter are significantly different (p≥0.05)

Parameter	P0	P1	P2	P3
Total Protein	3.23 ± 0.15^{A}	3.25 ± 0.21^{A}	3.20 ± 0.22^{A}	2.74 ± 0.18^{A}
Albumin.	1.59 ± 0.14^{AB}	2.11 ± 0.66^{A}	1.00 ± 20.15^{C}	1.39 ± 0.16^{BC}
T3	1.86 ±0.07^{A}	1.60 ± 0.10^{B}	1.98 ± 0.50^{A}	1.76 ± 0.07A^{B}
T4	16.32± 1.10 ^{A}	16.43 ± 0.80^{A}	15.64 ± 1.04^{A}	17.47 ± 0.95^{A}

Table 5. Effect of ground Prosopi pods supplementation to broiler diet on carcass and carcass cuts weight (Mean±SE) Means in the same row with different letter are significantly different (p≥0.05)

P3	P2	P1	P0	Parameter
1428.00 ± 157.89^{A}	1387.46 ± 160.72^{A}	1533.38 ± 101.25^{A}	1539.46 ± 200.56^{A}	Bird wt.
197.08 ± 21.07^{A}	205.10 ± 21.19^{A}	239.92 ± 23.23^{A}	257.34 ± 25.35^{A}	Offals
957.30 ± 49.68^{AB}	851.55 ± 30.45^{BC}	997.71 ±44.65^{A}	717.57 ± 59.52^{C}	Carcass
97.06 ± 7.18^{B}	84.45 ± 4.91^{AB}	98.75 ± 4.83^{A}	79.57 ± 4.77^{B}	Small M
18.64 ± 1.20^{AB}	17.36 ± 1.01^{B}	21.05 ± 0.77^{A}	18.60 ± 1.39^{AB}	Large M
67.68 ± 2.81^{AB}	62.55 ± 3.01^{B}	74.28 ± 4.16^{A}	61.44 ± 3.13^{B}	Dabos
393.34 ± 20.03^{AB}	358.51 ± 14.93^{AB}	416.24 ± 23.51^{A}	346.74 ± 28.05^{B}	Hind Q
7.75 ± 0.43^{A}	7.25 ± 0.30^{A}	8.50 ± 0.53^{A}	7.85 ± 0.20^{A}	Heart
36.31 ± 2.03^{A}	38.69 ± 1.55^{A}	37.74 ± 1.22^{A}	37.22 ± 3.75^{A}	Liver
2.00A ± 0.16^{A}	1.95 ± 0.22^{A}	2.07 ± 0.14^{A}	1.51 ± 0.13^{A}	Spleen

RESULTS AND DISCUSSION

Proximate composition and ME energy of the experimental diets are presented in Table (1).The ground prosopi pods has11.90% crude protein, 0.80% ether extract, 10.72% crude fiber, 6.12% Ash and2661 ME Kcal/kg. These results means that the ground prosopi pods has high fiber content so it must be added to the experimental diets at low levels since chicken's gastrointestinal tract has low numbers of micro flora which can analysis the fibers to produce energy, moreover, chickens don't produce celluolase enzyme which digest cellulose.

Examination of the data in Table 1 clearly showed that after one week of age, chicks fed diets supplemented with 1% and 2% ground prosopi pods increased significantly (P≥0.o5) than the control group. At two weeks of age, there were no significant differences in body weight between the control group and the prosopi supplemented groups. At the third week of age, chicks fed on diets supplemented with 2% ground prosopi pods showed the highest body weight (604.60 gm), while chicks fed diet supplemented with 3 % ground prosopi pods showed the lowest body weight (575.67 gm). This reduction in body weight was not significant as compared with the body weight of the control group (594.34 gm).At the 4th and the 5th week of age, no significant differences were observed between all the treatment groups. At the 6th week of age, the control group, showed significant increase in body weight than the other treatment groups. The obtained results indicate that, after 5 weeks of age, the chicks eat more feeds with more fiber content. The high dietary fiber intake is often associated with slower rate of passage and may inhibit optimal digestion. In agreement with this general reality, nutrient intake of broilers in the present study decreased at the rations which fed ground prosopi pods.

The observed reduction in body weight in the chickens fed ground prosopi pods at the 6th week of age may be due to the deficient in the essential amino acids such as lysine, methionine and cystine in the ground prosopi pods Table 2. These essential amino acids are known to enhance feed intake and growth rate (Melesse et al., 2011). Moreover, antinutritional factors in prosopi juliflora such as trypsin and hemagglutinin (Del Valle et al., 1983) might have also depressed fed intake and thereafter body weight gain (Shahidi, 1997) and may also induce adverse effects on animal performance and health (Apata, 2003). Blood is a very good medium of assessing the health status of animals (Taiwo and Anosa, 1995). According to Karesh and Cook (1995) level of blood constituents help to evaluate disease prognosis of animals.

The chemical composition of the blood is presented in Table 4. Graded levels of ground prosopi pods inclusion in broiler ration did not significantly (P≥ 0.05) affect plasma total protein and T4 as compared to the control group, The value of serum albumin was lower (P ≥0.05) for the ration containing the level 2% of ground prosopi pods than the control group . The percent 1% and 3% of ground prosopi pods in the broiler diets reduced T3 significantly (P ≥0.05) than the control group.

Examination of the data in Table 5 clearly showed that there was no significant difference between the body weight averages of all the treatment groups. Ground prosopi pods supplementation to broilers diet has no significant effects on offal's, heart and spleen weights. Moreover, supplementation with 1%, 2% and 3% ground prosopi pods increased hind quarter and carcasses weight significantly (P ≥0.05) than the control group. The significant increase in the carcasses weight of the ground prosopi pods supplemented groups than the control group mean that the control group has access weight in the inedible parts (feather, legs, heads, viscera and blood) than the prosopi supplemented groups.

CONCLUSION

This study have shown that the inclusion of ground prosopi pods in a broiler diet added some positive effects on broiler performance such as improving carcasses weight and reducing the weights of the inedible parts. The obtained results encourage repeating the experiment with increasing the percentage of prosopi supplementation to the broiler diets with using some treatments on the prosopi pods to reduce the undesirable effects of the antinutritional factors in the pods and to increase the percentage of the essential amino acids present in the pods Lysine, Methionine, Argenine, Histadine, Isoleucine, Leucine and Phenylealanine to the limits recommended for broilers by NRC 1990.

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