Veterinary Research Forum
Vol: 1, No: 2, September, 2010, 65 - 71

Study on the Use of Dried Poultry Litter in the Camel's Ration

Abdel-Baset Nasr Sayed[1*]
Abbas Seif.Fathy[2]

[1]Department of Animal and Clinical Nutrition, Faculty of Veterinary Medicine, Assiut University, Egypt
[2]Department of Animal Production, Faculty of Agriculture, Assiut University, Egypt

Received: 14 June 2010, Accepted: 17 August 2010

Abstract

A feeding trial of 120 days duration was conducted to study the effect of replacing 20 and 25 % of camel ration by poultry litter (PL) on the performance and some blood biochemical parameters. Fifteen healthy one–humped camels were allotted into three groups (5 animals / group). The first group was fed a basal ration and considered as control, while the second and third groups were fed rations in which poultry litter replaced 20 and 25 % of the basal ration. There was no significant differences in the dry matter intake and digestion coefficients of dry matter and ether extract between the different groups and camels fed on ration containing poultry litter had significantly ($P < 0.05$) decreased daily gain and feed conversion compared to the control. The apparent digestibility of crude protein by camels increased with 20 % poultry litter in the ration compared with other treatments. Digestibility of crude fibre was higher in rations containing poultry litter compared to control one. No significant differences were observed in blood biochemical parameters except urea and uric acid concentrations were significantly ($P < 0.05$) higher in the serum of animals fed on poultry litter.

In general, it could be concluded that, dried poultry litter can be utilized efficiently and safely in rations of camels up to a level of 25 % without adversely effect on performance.

Key words: Performance, Poultry litter, Camel

[*]**Corresponding author:**
Abdel-Baset Nasr Sayed, DVSc
Department of Animal and Clinical Nutrition, Faculty of Veterinary Medicine, Assiut University, Egypt
E-mail address: baset61@yahoo.com

Introduction

Shortage of concentrates and its ingredients in Egypt, and the relatively high prices are the major problem in animal production. The available feedstuffs cover less than 60 % of the total requirements of ruminants.[1] Although broiler litter can be used efficiently and effectively as a fertilizer, its greatest potential economic impact is as a feed ingredient for ruminants. When processed by an acceptable method, poultry litter is an economical and safe source of protein, minerals and energy for many classes of ruminants. Also, it has a total digestible nutrients value similar to average quality hay and can provide a major portion of the energy to maintain ruminant if it is readily consumed.[2] Uric acid can be utilized by rumen microbes for protein production. As uric acid is not easily dissolved in the rumen fluid and the ammonia is only slowly released, it is therefore more efficiently utilized than other non-protein nitrogenous sources. The rumen micro flora seems to take about 3 weeks to adapt before it can fully utilize uric acid.[3] Probably the best place for litter in the ruminant feeding is as a forage substitute during drought or other forage shortage. To determine the feasibility of its use, an economic analysis should be run to determine its cost effectiveness given land and forage costs, expected animal performance, and additional labor and equipment needs.[4] Thus, the main objective of this study to investigate the efficiency of utilization of dried poultry litter by camels and its effect on the performance and digestion coefficient of nutrients.

Materials and Methods

Animals. Fifteen healthy one-humped growing camels aged 2 - 2.5 years and weighed about 385 - 390 kg were used in this investigation. The animals were clinically healthy and the parasitological examination revealed no gastrointestinal infestation. The animals were allotted into three groups (5 animals / group).

Housing and feeding. The first group was fed on a basal ration and considered as control, while the second and third groups were fed rations in which dried poultry litter (PL) replaced 20 % and 25 % of the basal ration. All experimental rations were formulated to provide the recommended levels of metabolizable energy (2.53 Mcal kg^{-1} diet) and crude protein (13 %) according to Gihad and El - Bedawy (1995) [5] for camels as shown in Tables 1 and 2. The rations were formulated and composed of a concentrate mixture and the roughage wheat straw. The animals were offered each quota of concentrates and roughage mixed altogether. Camels were housed individually under the prevalent environmental conditions in separate pens where feed intake was recorded and fecal matter collected. The diets were given twice daily at 9.00 a.m and 5.00 p.m and any residues were collected and weighed through the whole experiment (120 days) and all animals had free access to clean water. For estimating digestibility, chromic oxide was mixed with the diet ingredients at a rate of 0.5 % as an indicator.

Samples.

Feeds and fecal matter samples. Feed ingredients used in the experimental rations were sampled, dried, ground and analyzed for different nutrients. Representative samples of fecal matter were taken over 6 days at the end of experiment, then dried for 24 hours at 60 ºC, pooled together, mixed ground and stored till analysis.

Blood samples. Blood samples were taken before the morning meal from the jugular vein in a dry, clean and sterile centrifuge tubes. The samples were allowed to be clotted at room temperature. The clotted blood was centrifuged at 3000 rpm for 20 minutes. A clear, non- haemolysed serum were separated by Pasteur-pipette and transferred into a clean, dry and sterile

stoppered glass vials till biochemical analysis.

Chemical analysis. Feed ingredients and fecal samples were analyzed according to AOAC (1990).[6]

Digestibility determination. From the analysis of feed and fecal matter and tracing the concentration of chromic oxide, digestibility could be calculated.[7]

Biochemical parameters. Total serum protein, albumin, globulin, glucose, urea, uric acid and total cholesterol were determined using standard kits supplied by Bio–Merieux (Baines / France).

Statistical analysis. Statistical analyses of the collected data were carried out according to procedures of completely random design.[8]

Results

The performance, total dry matter intake and feed conversion of the different experimental groups are presented in Table 3. The incorporation of poultry litter in the ration of camel did not affect the total dry matter intake although the control group consumed slightly more dry matter (6.42 kg/head/day) compared to groups fed on ration containing 25 % (6.10 kg/head/day) or 40% poultry litter (5.87 kg/head/day). The average daily gain of animals were affected by the poultry litter replacement in the rations where the daily gain of the control group (985 g) was higher than other treated groups fed on 25 % (850 g) or 40 % poultry litter (833 g). Feed conversion values were higher in groups

Table 1. Physical composition of the experimental rations (%)

Composition	Poultry litter levels		
	0	20	25
Corn, ground	44.7	30.0	27.0
Soybean meal	14.2	8.0	6.0
Poultry litter	0.0	20.0	25.0
Molasses	0.0	6.0	6.0
Wheat bran	8.0	0.0	0.0
Wheat straw	30.0	34.1	34.1
Limestone, ground	1.20	0.0	0.0
Common salt	1.0	1.0	1.0
Mineral mixtures [a]	0.15	0.15	0.15
AD_3E [b]	0.25	0.25	0.25
Chromic oxide	0.50	0.50	0.50

[a] Mineral mixtures: Each 100 g contains; 25.6 g Na, 1.6 g K, 4.6 g Ca, 1.8 g P, 4 g Mg, 300 mg Fe, 32 mg Mn, 1.5 mg Cu, 15 mg I, 5 mg Zn, 1 mg Co, 1 mg Se.

[b] AD_3E: Each gram contains; 20.000 IU vitamin A, 2000 IU vitamin D, 400 IU vitamin E.

Table 2. Chemical composition of the experimental rations (%)

Composition	Poultry litter levels		
	0	20	25
Dry matter	90.72	88.78	88.54
Crude Protein	12.97	12.91	12.99
Ether extract	2.61	2.03	1.99
Crude Fibre	13.90	17.17	17.87
Ash	7.64	10.60	11.13
Nitrogen free-extract	62.88	55.39	54.14
Calcium	0.56	0.56	0.66
Phosphorus	0.34	0.46	0.44
ME Mcal /kg DM [a]	2.53	2.28	2.22

[a] ME: Metabolizable energy calculated.

fed on rations containing poultry litter (7.18, 7.05) compared to control group (6.70). Results concerning the digestibility of nutrients for different experimental rations are presented in Table 4. The incorporation of poultry litter in the rations of camel had no effect on the digestion coefficients of dry matter (65.31 %, 64.81 %) and ether extract (67.51 %, 66.13 %) compared to the control group (66.15%, 68.30 %). The digestion coefficients of crude protein (72.23 %, 71.10 %) and crude fibre (66.87 %, 62.87 %) were increased in the rations containing poultry litter compared to control ration (68.52 %, 59.12 %). Table 5 cleared the serum biochemical parameters of the experimental groups. The incorporation of poultry litter in the rations of camel did not affect the level of total protein (6.10, 6.30 g %), glucose (91.15, 90.22 mg %), and cholesterol (112.3, 110.7 mg %), while increased urea (18.32, 20.11 mg %) and uric acid (0.55, 0.67 mg %) compared to control one (6.82 g %, 93.65, 115, 16.1, 0.35 mg %, respectively).

Table 3. Performance and feed efficiency of camels during experimental period

Items	Poultry litter levels		
	0	20	25
Initial body weight (kg)	385 ± 10.20	387 ± 8.13	6.75 ± 3.90
Final body weight (kg)	500 ± 8.52[a]	489 ± 9.15[b]	490 ± 11.12[b]
Total weight gain (kg)	115 ± 3.18[a]	102 ± 4.27[b]	100 ± 4.00[b]
AV. Daily gain (g)	985 ± 6.57[a]	850 ± 8.30[b]	833 ± 7.15[b]
Growth rate (%)	29.87	26.36	25.64
Average daily feed intake:			
TDMI (kg / h / d)	6.42 ± 0.41	6.10 ± 0.32	5.87 ± 0.38
DCP (g / h / d)	585.12 ± 6.12	573.67 ± 5.98	535.34 ± 7.10
Feed conversion ratio:			
Kg DM / kg gain	6.70	7.18	7.05
Kg D C P / kg gain	0.611	0.675	0.643

Figures in the same row having the same superscripts are not significantly different ($P > 0.05$).

Table 4. Digestion coefficient of nutrients of experimental rations

Items	Poultry litter levels		
	0	20	25
Dry matter	66.15 ± 1.50	65.31 ± 0.74	64.81 ± 1.93
Crude protein	68.52 ± 1.26[b]	72.23 ± 0.82[a]	71.10 ± 0.28[a]
Ether extracts	68.30 ± 0.98	67.51 ± 0.79	66.13 ± 0.50
Crude fibre	59.12 ± 1.32[b]	66.87 ± 1.97[a]	62.87 ± 1.01[ab]

Figures in the same row having the same superscripts are not significantly different ($P > 0.05$).

Table 5. Serum biochemical parameters of the experimental groups

Items	Poultry litter levels		
	0	20	25
Total protein (g %)	6.82 ± 0.22	6.10 ± 0.15	6.30 ± 0.10
Albumin (g %)	3.70 ± 0.10	3.73 ± 0.08	3.60 ± 0.05
Globulin (g %)	3.12 ± 0.07	2.37 ± 0.05	2.70 ± 0.08
Glucose (mg %)	93.65 ± 2.17	91.15 ± 1.98	90.22 ± 1.50
Urea (mg %)	16.1 ± 1.35^{b}	18.32 ± 1.50^{ab}	20.11 ± 1.18^{a}
Cholesterol (mg %)	115 ± 4.75	112.3 ± 4.10	110.7 ± 3.50
Uric acid (mg %)	0.35 ± 0.03^{c}	0.55 ± 0.01^{b}	0.67 ± 0.05^{a}

Figures in the same row having the same superscripts are not significantly different ($P > 0.05$)

Discussion

The poultry litter is high in its fibre and ash so is the rations containing poultry litter. Chauhan (1993) attributed the higher ash content to the excretion of minerals in the litter.[9] No significant differences were observed in the dry matter intake between camel groups. The previous investigations with sheep found that incorporating dried poultry litter did not significantly affect daily dry matter intake.[10, 11, 12, 13] Camels fed the ration containing poultry litter had decreased significantly ($P < 0.05$**)** average daily gain compared to the control one. These results showed that total or daily body gain of camels fed on rations containing poultry litter, in generally, were lighter than that of control one. However, reduced animal performance recorded with poultry litter rations may attributed to energy dilution.[10] Similar results were obtained in the previous studies with cattle and buffalos.[14,15] At higher levels of poultry litter, growth rate was depressed as well, probably because dried poultry litter is low in the essential amino acid needed by animal and also because of excessive amount of calcium. [3,13] Feed conversion ratio was better in the control group compared to tested groups. These agreed with that reported by Matter *et al*. (1995) who found that feed conversion of the control ration gave the best feed conversion compared to tested ration containing poultry litter.[16] The economic efficiency was increased. There were no significant differences between the experimental rations in the digestion coefficient of dry matter and ether extract. It was found that the apparent digestibility of crude protein by camels increased with 20 % poultry litter in the ration compared with other treatments. It seemed that the moderate level of ash and organic matter in the experimental ration improved the digestibility of crude protein.[17] The improvement in crude protein digestibility in the tested ration could be either due to increased microbial protein synthesis in the rumen caused by more degradable protein in the form of NH_3–nitrogen being available to rumen microbes and/or the complementary effect of undegradable ration protein and microbial protein.[18,19] Digestibility of crude fibre was higher in rations containing poultry litter compared to the control one. This may be due to the exposure of poultry litter fibre to the enzymes and organisms in the digestive tract of the poultry making it more available and efficiently utilized by the microorganisms in the rumen.[20,21,22] Blood parameters (total protein, albumin, globulin, glucose and cholesterol) were not significantly ($P > 0.05$) affected by poultry litter incorporation of camel's rations. Similar results were obtained by Khattab *et al*. (1995) with buffalo calves and Gabr *et al*. (2003) with sheep.[23,24] Urea and uric acid concentrations were significantly ($P < 0.05$) higher in the serum of camels fed on poultry litter rations compared with control. This may due to the high non–protein nitrogen of broiler litter. These results are in agreement with those

obtained by Mabjeesh *et al*. (1996) with dairy cattle and Gabr *et al*. (2001) who reported significant increase for both of urea–N and NH_3–N concentrations in the goats fed on poultry manure.[25,26] In addition, Caswell *et al*. (1978) and Rude *et al*. (1994) noted that blood urea nitrogen was higher in sheep fed the poultry litter than in sheep fed control rations.[27,28]

It could be concluded that incorporating poultry litter up to 25 % in the rations of camels not only have any adverse effects, but it can be used as an efficient replacement to the routine ration overcoming feed shortage and minimizing feed costs while alleviating pollution problems.

Acknowledgments

We would like to thank all staff members of Department of Nutrition and Clinical Nutrition, Faculty of Veterinary Medicine, and Department of Animal Production, Faculty of Agriculture, Assiut University for their support and help.

References

1. Ahmed MAB. Use of farm by– products in animal nutrition. M.Sc. Thesis, Fac. of Agric., Al-Azhar Univ 1995.
2. Kunkle WE, Jacob JP, Tervola RS, et al. Broiler litter: Feeding to ruminants. Inst of Food and Agricultural Science, Univ of Florida 1997.
3. Bhattacharya AN. Poultry manure. J Animal Sci 1996; 25:367.
4. Smith SC, Enis JD. Poultry litter: Forage and livestock considerations. Okla Agr Exp Sta Res Rep 1995; 8111.
5. Gihad EA, El-Bedawy TM. Camel production and nutritional Studies in Cairo University. A review. Proc 5th Sci Conf Animal Nutrition 1995; 2: 19-39.
6. AOAC, Association of Official Analytical Chemists. Official Methods of Analysis. Vol. I. 14th ed., AOAC, Arlington. VA 1990.
7. Williams D, David S, Iismaa F. Chrom-Bestimmung durch Atomabsorption-spektrophotometrie. J Agric Sci 1962; 59: 381-383.
8. SAS: User's Guide: Statistics, V.7.SAS Inst., Cary, NC 1995.
9. Chauhan TR. Nutritional evaluation of urea/poultry litter enriched wheat straw-based rations to adult buffaloes. Buffalo J 1993; 9(3): 187-194.
10. Kishan J, Lall D, Negi SS. Poultry litter based complete ration for sheep. Ind J Anim Sci 1984; 54: 267.
11. Lal D, Saraswat ML, Negi SS , et al. Effect of energy supplement on poultry litter based ration of sheep. Ind J Anim Nutr 1986; 3(1): 17-20.
12. Abd EL-Gawad AM, Hanafy MA, Shousha MA, et.al. Digestibility and blood palambeters for sheep fed rations containing poultry manure. 3rd Egypt-British Conf on Animal, Fish and Poultry Production 1989; 431-440.
13. Okeudo NJ, Adegbola AA. Utilization of dried caged-hen manure and cassava peels for intensive sheep production. Trop Anim Health Prod 1993; 25(4): 234-238.
14. McCaskey TA, Britt SN, Ruffin BG, et al. Feed value of poultry litter for stocker cattle. Highlights of Alabama Agric Res 1994; 41(1): 12.
15. Helali EA, Mohamed AA, EL Khimsawy KA, et al. Use of some farm by-products in buffalo calves feeding. Proc 5th Sci Conf Animal Nutrition 1995; 1: 129-136.
16. Matter BB, Mahmoud AM, Kuoret IS, et al. Effect of feeding various sources of non protein nitrogen on the performance of lactating Friesian cows. Proc 5th Sci Conf of Animal Nutrition 1995; 1: 1-10.
17. Anderson MJ, Lamb RC. Predicting digestible protein from crude protein. Proc West Sect, Amer Soc An Sci 1963; 18:81.
18. Mehrez AZ. Influence of roughage: concentrate ratio on N requirements of rumen microbes for maximal rate of

fermentation. Proc of Int Conf on Manipulation of Rumen Micro-organisms to Improve Efficiency of Fermentation and Ruminant Production. Alex Egypt 1992; pp.234.
19. Orskov ER. Protein nutrition in Ruminants. 2nd ed Academic press Inc, London. 1982
20. Gabr AA, EL-Ayek MY, Mehrez AZ. Effect of long term feeding of ration containing dried poultry litter on digestibility and growing lamb performance. . J Agric Sci Mansoura Univ 1993; 18: 3437.
21. Chauhan TR. Comparative feeding value of urea / dried poultry excreta supplemented sugarcane tops silage to buffaloes. Ind J Dairy Sci 1994; 47:11
22. EL-Ashry MA, Saleh HM, EL-Fouly HA, et al. The effect of different levels of caged layer dropping in male lamb rations on growth performance and semen characteristics. Egypt J Nutr and Feeds 2000; 3:1
23. Khattab HM, EL-Sayed HM, Elwan KM, et al. Poultry litter incorporation in the fattening rations of male buffalo calves. Proc 5th Sci Conf Animal Nutrition 1995; 1: 145-151.
24. Gabr AA, Shehata EL, Ahmed ME, et al. Performance and carcass traits of Rahmani lambs fed rations containing dried poultry manure with addition of bentonit clay. Egypt J Nutr and Feeds 2003; 6(2): 163-188.
25. Mabjeesh SJ, Arieli A, Bruckental I, et al. Effect of type of protein supplementation on duodenal amino acid flow and absorption in lactating dairy cows. J Dairy Sci 1996; 79: 1792.
26. Gabr AA, Mehrez AZ, Abd EL-Khabir AM, et al. Performance and some blood plasma constituents of lactating goats fed rations containing formaldehyde treated dried poultry manure. Egypt J Nutr and Feeds 2001; 4: 46-61
27. Caswell LF, Fontenot JP, Weeb KE. Fermentation and utilization on poultry litter ensiled at different moisture levels. J Anim Sci 1968; 46: 803.
28. Rude BJ, Rankins DL, Dozier WA. Nitrogen and energy metabolism and serum constituents in lambs given poultry litter processed by three deep-stacking methods. Anim Prod 1994; 58(1): 95-101.