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PERFORMANCE OF FATTENING BUFFALO CALVES FED DIFFERENT LEVELS OF DRIED POULTRY MANURE

(With 8 Tables)

By

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أداء عجول الجاموس المغذاة علي مستويات مختلفة من زرق الدواجن الجاف

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أجريت هذه الدراسة لبحث إمكانية إضافة زرق الدواجن الجاف إلي علائق عجول الجاموس بنسب مختلفة (١٠% , ٢٥% , ٤٠%) ودراسة مدي تأثيرها علي أداء الحيوان ومعامل هضم المواد الغذائية بالإضافة إلي صفات الكرش وبعض التغيرات البيوكيميائية في الدم. تم استخدام عدد ١٦ من عجول الجاموس متوسط الوزن الابتدائي لها ٢٠٠ كجم قسمت إلي أربع مجموعات كل مجموعة تحتوي علي ٤ عجول. غذيت المجموعة الأولي علي عليقة أساسية (مكونة من المركزات وتبن القمح) بينما غذيت المجموعات الثانية والثالثة والرابعة علي علائق تحتوي علي ١٠% و ٢٥% و ٤٠% من زرق الدواجن الجاف علي التوالي وقد خلصت الدراسة إلي الآتي: وجود نقص معنوي في أوزان الحيوانات ومعدل التحويل الغذائي في المجموعة المغذاة علي نسبة عالية من زرق الدواجن الجاف مقارنة بالمجموعات الاخري. عدم وجود أي اختلاف معنوي في كمية المادة الجافة المأكولة بين المجموعات المختلفة. مجموعة الحيوانات التي غذيت علي علائق تحتوي علي ١٠% , ٢٥% من زرق الدواجن الجاف أعطت نفس الزيادة في وزن الجسم مثل المجموعة الضابطة. أما بالنسبة لمعاملات هضم المواد الغذائية فقد وجد أن معدل هضم المادة الجافة والدهون لم يتأثر بإضافة زرق الدواجن إلي العلائق بينما زاد معامل هضم البروتين والألياف مقارنة بالمجموعة الضابطة. عدم وجود أي اختلاف معنوي في تركيز كل من البروتين الكلي والالبيومين والكرياتينين في مصل دم المجموعات المختبرة بينما زاد تركيز كل من الجلوبيولين واليوريا في المجموعات المغذاة علي نسبة عالية من زرق الدواجن الجاف. عدم تأثر قيمة الأس الهيدروجيني للكرش بينما وجد زيادة في كل من الأحماض الطيارة والعد الكلي للبكتريا ومستوي الامونيا في الكرش بإضافة زرق الدواجن الجاف إلي علائق الحيوانات. أما بالنسبة لصفات الذبيحة فلم تتأثر بإضافة زرق الدواجن الجاف إلي علائق الحيوانات فيما عدا وزن الكبد فقد زاد في المجموعة المغذاة علي نسبة عالية من زرق الدواجن الجاف. من هذه الدراسة نستخلص أنه يمكن إضافة زرق الدواجن الجاف إلي علائق عجول الجاموس حتى ٢٥% بدون أي ضرر أو تأثير سئ علي أداء الحيوانات وعامل هضم

المواد الغذائية وبالتالي يمكن التغلب علي مشكلة نقص المواد الغذائية بالإضافة إلـــي تقليـــل مشكلة التلوث البيئي الناتج عن الكميات الكبيرة من زرق الدواجن الناتجـــة عـــن مـــزارع الدواجن.

SUMMARY

Feeding of farm animals encounters many problems in Egypt as well as in many countries of similar conditions due to the limited availability of resources. The main objective of the experiment was to study the effect of incorporating dried cage poultry manure (DPM) at different levels (0, 10, 25 and 40%) into isonitrogenous rations fed to fattening buffalo calves (for 90 days) on the performance & digestibility of nutrients. Rumen liquor characteristics (pH, NH_3-N, total volatile fatty acids and bacterial counts) and blood parameters (total protein, albumin, globulin, urea & creatinine) were also studied. Sixteen buffalo calves of average initial body weight 200 Kg were divided randomly into four groups (4 calves in each). The first group (control) was fed on the basal ration. The second, third and fourth groups were fed on rations in which dried poultry manure replaced 10, 25 & 40% of the basal ration, respectively. Results indicated that the inclusion of high levels of dried poultry manure (40%) had significantly ($P<0.05$) decreased average daily gain & feed conversion compared to the other experimental groups. No significant differences in dry matter intake between different experimental groups were noticed. Calves fed on the 10 & 25% DPM had nearly the same average daily gain as the control one. Dry matter and ether extract digestibility coefficients were not affected by DPM incorporation. Digestibility coefficients of crude protein and crude fibre were higher in rations containing DPM compared to control one. Blood serum total protein, albumin and creatinine were not affected significantly, while there were significant increase ($P<0.05$) in globulin and urea values in the group fed ration containing the higher level of DPM. Ruminal pH was not affected by DPM addition, while there was significant differences ($P<0.05$) in the total volatile fatty acids & total bacterial counts between the experimental groups. Rumen NH_3-N was increased significantly ($P<0.05$) by increasing DPM levels in the rations of calves. It seems that carcass traits were not affected by the incorporation of DPM in the ration of fattening buffalo calve except slight increase in liver weight of the high level (DPM) groups. In general, it may be concluded that dried poultry manure can be utilized efficiently and safely in rations for fattening buffalo calves up to the

level of 25% without serious adverse effects on performance, digestibility, rumen and blood parameter and carcass traits. This result could be a useful mean to overcome feed shortage and minimize feed costs. Moreover, using DPM in animal feeds will alleviate pollution problems and considered a factor in the biosecurity of the animal production.

Key Words: *Evaluation, poultry manure, fattening, buffalo, calves*

INTRODUCTION

The commercial poultry industry produces significant amounts of poultry wastes. Disposal of poultry waste is the major problem for large scale & intensive poultry operations. Refeeding poultry wastes, particularly to ruminants may be a feasible solution of alleviating the poultry wastes disposal problem as well as a method for recovering some of the potentially valuable nutrients that it contains (Abd El-Ghani *et al.,* 1999). Feeding of farm animals encounters many problems in many countries due to the limited availability of resources. In Egypt, against background of a rapidly increasing population that demands protein, there is additional need to decrease cost of feed. It has been suggested that farmers make use of non conventional feeds in their animal's diets to reduce the need for purchasing of marketable feeds (Abd El-Ghani *et al.,* 1999). Numerous scientific studies showed that the utilization of poultry wastes (litter and manure) as a source of protein is considered to be the most strategic ingredients of the unconventional feeding system of ruminants (El-Ashry *et al.,* 1987 & 2000; Gabr *et al.,* 1991, 1993 & 2001). Many published reports indicated that poultry wastes could be used in ruminant rations owing to low cost ingredients and decreasing the cost of meat production (Gihad *et al.,* 1980). When processed by an acceptable method, poultry manure is an economical and safe source of protein, minerals and energy for many classes of ruminants (Kunkle *et al.,* 1997). Poultry waste is valuable mainly for its nitrogen content and fibre and several reports indicated that crude protein content ranged from 25.3 to 34.7% (Harmon *et al.,* 1975 & Caswell *et al.,* 1978). However, little attention has been focused on the effects of feeding rations containing dried poultry droppings on productive performance and meat quality of fattening buffalo calves and more knowledge and information are needed in this respect. Therefore, the main objective of the present work was to study the effect of replacing concentrate feed mixture with dried poultry manure at different

levels on productive performance and carcass traits of fattening buffalo calves. Nutrient digestibilities, some rumen parameters and blood constituents as affected by dietary treatments were also studied.

MATERIALS and METHODS

1-Animals & feeding:

Sixteen buffalo calves averaging 200kg were used in the experiment. The animals were clinically healthy and the parasitological examination revealed no gastrointestinal infestation. The calves were divided randomly into four groups (4 calves in each). The first group was fed on the basal ration and considered as control. The second, third and fourth groups were fed on rations in which dried poultry manure replaced 10, 25 & 40% of the basal ration. All the experimental rations were chemically analyzed and formulated to provide the recommended levels of crude protein (12.3 %) and metabolizable energy (2.7 Mcal/kg diet) according to the NRC (1984) as shown in Tables (1 and 2). The rations were composed of concentrate mixture and grinded wheat straw as roughage. The animals were offered each's quota of mixed ration. The rations were given twice daily and any residues were collected and weighed through the whole experiment (90 days) and all animals had free access to clean water. For estimating digestibility, chromic oxide was mixed with the ingredients at a rate of 0.5% as an indicator. At the end of the experimental period, calves were slaughtered for carcass traits evaluation.

2-Samples:

2.1-Feeds & fecal matter:

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 the experiment, then dried for 24 hours at 60°C, pooled together, mixed ground and stored till analysis.

2.2-Blood:

Blood samples were taken before the morning meal from the jugular vein in a dry, clean & sterile centrifuge tubes. The samples were allowed to be clotted at room temperature. The clotted blood samples were centrifuged at 3000 rpm for 20 minutes. A clear, non haemolyzed sera were separated by Pasteur-pipette and transferred into clean, dry and sterile stoppered glass vials till performing biochemical analysis.

3-Analysis:

Feed ingredients, rations and fecal samples were analyzed according to AOAC (1990).

4-Digestibility determination:

From the analysis of feed, fecal matter & tracing the concentration of chromic oxide (Williams *et al.,* 1962), digestibility was calculated.

5-Biochemical parameters:

Total serum protein, albumin, urea and creatinine were determined using standard kits supplied by Bio-Merieux (Baines/France).

6-Statistical analysis:

Statistical analysis of the collected data were carried out according to procedures of completely random design, SAS (1995).

RESULTS and DISCUSSION

Dry matter intake, average daily gain and feed conversion of the different experimental groups are shown in Table (3). No significant differences in the dry matter intake were observed between the experimental groups. This indicates that the palatability of the tested rations was not affected by the incorporation of dried poultry manure. This was agreed with that reported in the previous investigations with other animals (Kishan *et al.,* 1984; Lal *et al.,* 1986; Abdel-Gawad *et al.,* 1989 & Okeudo & Adegbola, 1993) who reported that incorporating dried poultry manure did not significantly affect dry matter intake. Calves fed the ration containing high level of DPM (40%) had decreased significantly ($P<0.05$) average daily gain (867.67 g/d) compared to the control (1000 g/d) and groups fed on 10 & 25% DPM (933.3 & 988.89 g/d, respectively). However, reduced calve performance recorded with high level of DPM may be attributed to energy dilution (Kishan *et al.,* 1984). Similar results were obtained in the previous studies with cattle, buffaloes & sheep (Hadjipanayiotou *et al.,* 1993; McCaskey *et al.,* 1994 & Helali *et al.,* 1995). At higher levels of poultry manure, growth rate was depressed as well, probably because dried poultry manure is low in the essential amino acids needed by the animal and because of excessive amount of calcium as reported by Okeudo & Adegbola (1993) and Bhattacharya (1996).

Results concerning the digestion coefficients of the nutrients are shown in Table (4). Digestibility coefficients of crude protein and crude fibre were significantly ($P<0.05$) higher in ration containing DPM. The

improvement in CP digestibility could be either due to increase microbial protein synthesis in the rumen caused by more degradable protein in the form of NH3-nitrogen being available to rumen microbes (Mehrez, 1992) and/or to the complementary effect of undegradable ration protein and microbial protein (Orskov, 1982). The improve in CF digestibility may came in agreement with El-Ashry *et al.* (1987) who stated that the inclusion of wastes may be associated with increased NPN intake which may have improve CF digestibility.

No significant differences were observed among different treatments in total protein, albumin and creatinine in the blood serum (Table, 5). These results are similar to those obtained by Cross *et al.* (1978) and Khattab *et al.* (1982 & 1995). Globulin concentration indicated that the experimental animals developed a kind of immunological status to infection with increasing levels of DPM, since globulin values expressed the immunity status of the animal (Kitchennham *et al.*, 1975). Urea concentration was significantly ($P<0.05$) higher in the serum of calves fed on high DPM levels. This may be due to the high non protein nitrogen of the DPM. These results are in accordance with those reported by Mabjeesh *et al.* (1996).

The obtained results revealed that DPM levels did not significantly affect ruminal pH values (Table, 6). Similar results reported by Yildiz *et al.* (1995) and Gabr *et al.* (2003). There was significant ($P<0.05$) differences in the total bacterial count and total volatile fatty acids (TVFAs) and the high level of DPM (40%) recorded the lowest value. These results agreed with that reported by Mudgal *et al.* (1983) who found gradual decrease in the rumen microbes with the increase of DPM level in the ration. The same was recorded by Chen & Jan (1992) and Gabr *et al.* (2001) who found that TVFAs concentrations were slightly decreased with increased level of DPM. Rumen NH3-N was increased significantly ($P<0.05$) with increasing DPM level in the ration and this may be attributed to the relatively high nitrogen content of the DPM (Bhattacharya & Taylor, 1975).

Results of the carcass traits (Table, 7) concluded that DPM exerted no significant effects on carcass traits except slight increase in the weight of liver at high level of DPM. This agreed with that reported by Ilian *et al.* (1988); Khattab *et al.* (1995) and Gabr *et al.* (2003). However, no signs of toxicity or impaired performance were observed in the experimental animal tissues.

Table (8) show feed costs of live body gain and economic feed efficiency. Feed cost of the ration containing DPM was significantly

($P<0.05$) lower than that of control one. Results obtained in the present study concluded that the use of rations containing 10%, 25% & 40% poultry litter for calves increased economic feed efficiency to 130.67%, 164.07 & 190.07%, respectively compared to control ration.

In general, it may be concluded that dried poultry manure can be utilized efficiently and safely in rations for fattening buffalo calves up to the level of 25% without serious adverse effects on performance, digestibility, rumen and blood parameter and carcass traits. This result could be a useful mean to overcome feed shortage and minimize feed costs. Moreover, using DPM in animal feeds will alleviate pollution problems and considered a factor in the biosecurity of the animal production.

Table 1: Chemical composition (%) of the feed ingredients used in diets.

Ingredients	DM	On DM basis							
		CP	EE	CF	Ash	NFE	ME Mcal / kg DM	Ca	p
Corn, ground	89.0	9.4	4.2	2.8	1.8	81.8	3.11	0.03	0.27
SBOM	89.6	45.1	1.4	7.6	6.3	39.6	3.15	0.35	0.68
Wheat bran	90.0	16.8	4.8	12.6	6.8	59.0	2.67	0.16	1.36
Wheat straw	93.0	3.4	0.5	35.2	18.0	42.9	1.60	0.16	0.04
Poultry litter	84.5	25.3	2.3	18.6	14.1	39.7	1.93	2.30	1.60
Molasses	73.7	4.3	0.4	-	10.0	85.3	2.76	-	-

Table 2: Physical & chemical composition of the experimental rations (%)

Ingredients	Experimental rations			
	1 Control	2 (10% DPM)	3 (25% DPM)	4 (40% DPM)
I-Physical composition (%):				
Corn, ground	41.33	36.19	29.20	18.1
Soybean meal	13.05	9.64	4.90	0.00
Dried poultry manure	00.00	10.00	25.00	40.00
Wheat bran	9.00	6.00	0.00	0.00
Dried fat	3.80	5.90	9.00	10.00
Limestone, ground	0.92	0.37	0.00	0.00
Common salt	1.00	1.00	1.00	1.00
Mineral mixture	0.15	0.15	0.15	0.15
Vitamin mixture	0.25	0.25	0.25	0.25
Chromic oxide	0.50	0.50	0.50	0.50
Wheat straw	30.00	30.00	30.00	30.00
II-Chemical composition (%):				
Crude protein	12.31	12.31	12.30	12.84
Calcium	0.47	0.47	0.66	0.98
Phosphorus	0.33	0.42	0.52	0.70
ME (Mcal/Kg DM)	2.71	2.71	2.70	2.57

Table 3: Performance and feed efficiency of fattening buffalo calves

Items	Experimental groups			
	1 Control	2 (10% DPM)	3 (25% DPM)	4 (40% DPM)
Initial body weight (kg)	200	201	199	202
Final body weight (kg):				
1st month	248	233	228	234
2nd month	268	262	257	253
3rd month	290± 6.15 a*	285± 8.31 a	288± 5.60 a	280± 7.13 b
Total weight gain (kg)	90	84	89	78
Average daily gain (g)	1000.0± 5.72 a	933.3± 7.16 a	988.89± 8.30 a	867.67±9.11 b
Growth rate (%)	45	41.97	44.72	38.61
Total dry matter intake (kg/h/d)	8.80	9.10	8.98	8.70
Feed conversion ratio	9.90	9.75	9.08	10.03

*Figures in the same row having the different superscripts are significantly different (P<0.05)

Table 4: Digestion coefficients of nutrients & nutritive value of the experimental rations.

Items	Experimental groups			
	1 Control	2 (10% DPM)	3 (25% DPM)	4 (40% DPM)
Dry matter (%)	70.15±0.28	71.02±2.21	69.33±1.26	68.10±0.88
Crude protein (%)	62.32±1.97 b	63.20±1.10 b	70.10±1.39 a	70.81±1.20 a
Ether extract (%)	67.13±0.79	66.73±0.74	65.12±0.93	65.30±0.67
Crude fibre (%)	57.51±1.20 b	59.12±1.01 b	64.33±1.50 a	62.43±1.03 a
Nitrogen-free extract	71.20±0.33	70.35±0.28	69.71±0.26	70.32±0.50

* Figures in the same row having the different superscripts are significantly different (P<0.05)

Table 5: Serum biochemical parameters of experimental groups

Items	Experimental groups			
	1 Control	2 (10% DPM)	3 (25% DPM)	4 (40% DPM)
Total protein (g/dl)	8.56±0.06	8.70±0.04	8.30±0.02	8.82±0.05
Albumin (g/dl)	4.75±0.01	4.82±0.03	4.30±0.05	4.51±0.01
Globulin (g/dl)	3.81±0.05 b	3.88±0.01 b	4.00±0.02 a	4.31±0.04 a
Urea-N (mg/dl)	30.66±0.50 b	31.50±0.56 b	35.79±0.40 a	36.47±0.37 a
Creatinine (mg/dl)	1.23±0.01	1.32±0.02	1.35±0.01	1.39±0.04

*Figures in the same row having the different superscripts are significantly different (P<0.05)

Table 6: Rumen liquor characteristics of experimental groups.

Items	Experimental groups			
	1 Control	2 (10% DPM)	3 (25% DPM)	4 (40% DPM)
pH of the rumen	5.98±0.04	5.94±0.20	5.88±0.10	6.01±0.15
VFA conc. (meq/100ml R.L)	12.57±0.25 [a]	12.67±0.20 [a]	12.49±0.46 [a]	10.01±0.50 [b]
Ammonia (meq/100 ml R.L)	21.22±0.62 [b]	23.15±0.55 [b]	27.32±0.68 [a]	29.40±0.47 [a]
Total bacterial count (/ ml)	10.38×10^{9} [a]	12.1×10^{8} [a]	13.2×10^{7} [b]	8.32×10^{7} [b]

*Figures in the same row having the different superscripts are significantly different ($P<0.05$)

Table 7: Carcass traits of the experimental groups.

Items	Experimental groups			
	1 Control	2 (10% DPM)	3 (25% DPM)	4 (40% DPM)
Fasting body weight (kg)	281.7	275.1	269.7	255.5
Empty body weight (kg)	246.1	239.5	225.2	220.3
Hot carcass weight (kg)	143.0	137.0	133.0	132.0
Dressing % based on fasting wt	50.76	49.8	49.31	51.66
Dressing % based on empty wt	58.1	57.2	59.06	59.92
Head weight (kg)	16.51	15.72	14.83	14.10
Heart (kg)	1.05	1.05	1.07	1.07
Liver (kg)	2.80 [b]	3.01 [a]	3.25 [a]	3.36 [a]
Kidney (kg)	0.65	0.60	0.59	0.66

*Figures in the same row having the different superscripts are significantly different ($P<0.05$)

Table 8: Economic evaluation of calves body weight gain in the different experimental groups.

Items	Experimental groups			
	1 Control	2 (10% DPM)	3 (25% DPM)	4 (40% DPM)
Feed cost (L.E)	792	639	590	470
Body weight gain (kg)	90	84	89	78
Price of weight gain (L.E)	1620	1512	1602	1404
Net revenue (L.E)	828	873	1012	934
Economic feed efficiency (%)	104.55	136.62	171.53	198.72
Relative economic feed efficiency	100	130.67	164.07	190.07

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