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USING A NEW PROTEIN SOURCES IN FEEDING OF RUMINANTS
1- EFFECT OF FEEDING DIFFERENT LEVELS OF GUAR KORMA AS A SOURCE OF PROTEIN ON THE PRODUCTIVE PERFORMANCE OF EGYPTIAN BUFFALOES.

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ABSTRACT

This work aimed to use guar korma meal in concentrate feed mixture(CFM) for growing buffalo calves rations.The trial was carried out at Animal House of Animal production Research Institute and Al-Manar Company Station. Thirty male buffalo calves averaging 176.9 Kg LBW were chosen and divided into six similar groups. The groups of animals were randomly assigned to receive six experimental rations containing CFM which included guar Korma at the rate of 0, 3.3, 6.7, 10.0, 13.3 and 16.7% in rations A,B,C,D,E and F, respectively. These percentages of guar korma cover 0,10,20,30,40 and 50% of CFM protein content. All animals received CFM, berseem hay (BH) and wheat straw (WS) at the rate of 70:20:10, respectively.

The feeding trial lasted 210 days, during which live body weights were recorded beside feed intake. Economical efficiencies were calculated for each ration. In addition, six digestibility trials were conducted to determine digestibility and nutritive values of the experimental rations. Samples of blood were taken to measure some blood parameters.

The results obtained can be summarize as follows:

1) The chemical composition of different experimental rations were almost similar in DM, OM, CF,CP and NFE contents, with somewhat higher percentage of EE and Ash associated with increasing guar korma levels.
2) Increasing guar korma level in the experimental rations tended to significantly ($P<0.05$) increase DM, OM, CP,EE and CF digestibilities, while the difference in NFE digestibility was not statistically significant. In addition, there were significant ($P<0.05$) increase in TDN and DCP with increasing guar korma levels in the rations, especially in ration F, which had 70.82% TDN and 10.99% DCP.
3) Average total protein and albumin were significantly ($P<0.05$) higher for ration D,E, and F, while differences in globulin were not significant. Also, AST (Aspartate amino transferase) and ALT (Alanin amino transferase) concentrations significantly ($P<0.05$) increase for ration E and F, while differences in kidney functions parameters were not significant.
4) Average daily LBW gains significantly ($P<0.05$) increased with increasing guar korma levels in the rations, being 1.296,1.325,1.357,1.392,1.425 and 1.475 kg for animals given rations A,B,C,D, E and F, respectively. At the same time, the best improvement in feed utilization efficiency expressed as kg DM or TDN per kg gain was recorded for ration F which contain the highest level of guar korma, being 7.935 and 5.620, respectively.
5) Average feed cost/kg weight gain decreased with increasing guar korma levels in the rations, being 18.870, 18.227, 17.429, 16.650, 15.822 and 15.249 LE with rations A, B, C, D,E and F, respectively. Moreover, revenue, gross margin above feed cost, profit and economical efficiency showed the highest values for ration F,

being 9.958 LE, 0.443 LE, 44.27% and 1.443, respectively. The highest improvement in economical efficiency was recorded also for ration F (23.76%) which contained the highest level of guar korma.

From the previous results it could be concluded that , guar korma meal can be used as a source of protein in ration formulation of growing buffalo calves. Using guar korma meal to cover 50% protein of CFM of growing buffalo calves rations increased digestibility of most of nutrients, daily gain, and decreased feed cost/kg gain, in addition to revenue and economical efficiency. Blood parameters were not affected by guar korma and they within normal ranges without any side effects.

INTRODUCTION

Guar korma is a by-product obtained after processing guar seeds. The processed guar korma is usually rich in protein and carbohydrate and thus forms a high protein feed for ruminants and other animals. It is used mainly to feed the milking animals to increase milk and milk fat percentage of fat in milk, beside being a good feed of beef animals.

Guar korma is generally cheaper feed ingredient than soybean meal, dried distiller grains and cotton seed cake and therefore used as substitute for those traditional meals in feeding animals.

The by-product of guar gum industry consisting of the outer seed coat and germ material is called guar meal. The guar meal after gum extraction is a potential source of protein and contains about 35 to 47 % crude protein, which is one and a half times the level of protein in guar seed (Altrafine gum, 2011).

Guar meal is a 100% natural agricultural product and is rich in protein and carbohydrate suitable for feeding ruminants and livestock. It has high-protein content and is produced during extraction of galactomannan gum from the guar beans. During the extraction process, two fractions are produced (germ and hull). The germ and hull fractions are usually combined to form the marketed product which called guar meal. Guar meal typically comes in two forms :(a) Guar meal churi, which is a powder and (b) Guar korma meal which is a granular form and their average composition is 38% CP, 7% EE,10% moisture, 6% CF and 1% silica for guar meal churi, while the corresponding values for guar korma meal are 50%CP, 7%EE, 8%moisture, 5% CF and 1% silica (Srivastava et al.,2011).

The objective of this work was to study the effect of using different levels of guar korma meal in ration formulation of growing buffalo calves on nutrient digestibility, productive performance and economical efficiency.

MATERIALS AND METHODS

The experiment work was carried out at Animal House of Animal Production Research Institute, Agriculture Research Center and Al-Manar company station, Masr-Alex. Desert road. Thirty male buffalo calves averaging 176.9 kg LBW were chosen and divided into six similar groups (5 in each). The groups of animals were randomly assigned to receive six experimental rations containing concentrate feed mixture which included guar

korma at the rate of 0,3.3,6.7,10.0,13.3 and 16.7% in rations A,B,C,D,E and F, respectively. The previous percentage of guar korma covered 0,10,20,30,40 and 50% of protein for CFM of the respective rations. All animals received CFM, berseem hay and wheat straw at the rate of 70:20:10, respectively according to Abou Raya (1967). CFM were given to animals at 8.00 a.m. and 3.00 p.m. followed by berseem hay, while wheat straws were available all day. All experimental rations were isonitrogenous and isoenergetic. The feeding trial lasted 210 day during which changes in live body weight and feed intake were recorded. At the middle of feeding trial, six digestibility trials were carried out using 3 calves in each treatment to determine digestibility coefficients and feeding values of the experimental rations. Samples of feed and excreta were collected to be analyzed according to A.O.A.C. (2000). At the same time, blood samples were taken from animals in the digestibility trials to determine total protein and albumin according to Cornell et al., (1949) and Drupt (1974), respectively, while globulins were determine by differences. Creatinine and urea-N were determined for kidney function as described by Young (1990) and Fawcett and Scott (1960). On the other hand, AST and ALT concentrations were determined according to Reitman and Frankel (1957) for liver function. Data were statistically analyzed by using general linear model (GLM) procedure according to Statistical Analysis System (SAS, 2000), while differences among means were tested using Duncan Multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Large number of feedstuffs could be used as protein source in ruminant feeding such as decorticated and undecorticated cotton seed meals, undecorticated sunflower meal, corn gluten feed, dried distiller grain with solubles (DDGS) and soybean meal. There feedstuffs had high protein contents, being 41, 26, 28, 62, 29.1 and 44%, respectively, while guar korma had higher protein content (50%CP) except for corn gluten which contains 60% protein, as shown in Table (1). Moreover, guar korma contain lower CF content (6.7%) with somewhat higher NDF content (42%). Also, guar korma had higher calcium, total phosphorus and available phosphorus percentages, being 1.8, 0.74 and 0.23%, respectively, as showed in Table (1).

Also, guar korma had the highest lysine percentage, being 3.00% versus 1.60, 1.00, 1.00, 1.00, 0.20 and 2.95% for decorticated, undecorticated cotton seed meal, undecorticated sunflower meal, corn gluten feed , dried distiller grain with soluble and soybean, respectively. Also, amino acid tryptophan content of guar korma showed the same previous trend, recording the highest percent (0.90%) compared to the others. In addition, the energy values expressed as DE (kcal/kg) and TDN (%) were the highest values of guar korma, showing 3880 kcal/kg as DE and 86% as TDN.

Additionally , guar korma had higher value of methionine compared to those of other feedstuffs, being 2.96% while lysine, glycine, arginine and tryptophan were 2.56, 5.85, 9.96 and 0.52%, respectively.

Table (1): Feed composition of some different protein sources used in animal feeding*.

Items	Different protein sources						
	Decorti-cated Cotton seed meal	Undecorti-cated cotton seed meal	Undecor-ticated sunflower meal	Corn gluten feed (60%)	Dried distiller grain with soluble (DDGS)	Guar korma meal	Soy bean meal (44%)
Proximate analysis (%):							
DM	91	90	89	90	90	90	87
CP	41	26	28	62	29.1	50	44
EE	1.5	1.5	2.0	2.2	9.8	6	1.5
Fiber (%):							
CF	14	24	25	2.0	8.5	6.7	7.3
ADF	18	28	30	5.0	21	22	10
NDF	27	40	40	13	46	42	15
Ash	6.4	5.0	6.2	1.6	4.5	5.0	6.5
Minerals (%):							
Ca	0.20	0.27	0.34	0.07	0.21	1.80	0.30
Total P	1.00	0.76	1.00	0.48	0.83	0.74	0.65
Avi P	0.29	0.18	0.28	0.19	0.56	0.23	0.27
Amino Acids (%):							
Lysine	1.60	1.00	1.00	1.00	0.20	3.00	2.95
Methionine	0.55	0.26	0.65	1.70	0.51	0.60	0.65
Methionine +Cys.	1.20	0.59	1.35	2.80	0.60	1.02	1.34
Thrionine	1.20	0.79	1.00	2.20	0.92	1.80	1.80
Tryptophane	0.50	0.35	0.40	0.30	0.20	0.90	0.56
Energy Value :							
GE (kcal/kg)	4280	3487	4180	4900	4415	4050	4150
DE (kcal/kg)	3170	2650	2200	3570	3620	3880	3200
TDN (%)	72	60	50	81	82	86	75

*Cited from : (1)Technical Bulletin, Central Lab for Food and Feed, NO.1, 2001, Egypt
(2)Church (1984)

Generally, using guar korma as a source of protein in ruminant feeding might be attributed to its high palatability and high CP content. Moreover, it contains Ca%, total phosphorus, available phosphorus and lysine beside its higher DE (kcal/kg) and TDN% values. Therefore guar korma might improve its intake and digestibility to become more efficiently be utilized by the animals. Some authors used guar korma meal in feeding animals, Turki et al., (2011), Farkhanda et al., (2006), Ahmed et al., (2000), Sehgal and Makker (1994) and Saleh pour et al., (2012). They showed that the guar korma could be used as an ingredient in animal rations with no adverse effect.

Incorporation of guar korma in concentrate feed mixture of experimental rations:

Data presented in Table (2) showed the ingredients of concentrate feed mixture of different experimental rations, which included guar korma with rate of 0, 3.3, 6.7, 10.0, 13.3 and 16.7% in 1, 2, 3, 4, 5 and 6 concentrate feed mixture (CFM), respectively. Guar korma was as a source of protein and covered 0,10,20,30,40 and 50% crude protein of CFM for rations A,B,C,D,E and F, respectively. It could be noticed that, the guar korma amounts were

replaced partially of totally both cotton seed cake and soyabean meal as a source of protein in different CFM.

Table (2): Ingredients of concentrate feed mixtures containing different levels of guar korma in experimental rations.

Items	*CFM of experimental rations					
	A	B	C	D	E	F
Ingredients (%):						
Guar korma**	-	3.3	6.7	10.0	13.3	16.7
Yellow corn	32	28	28	29	28	26
Rice bran	18	18.7	19.3	20	28.7	30.3
Cotton Seed Cake	17	15	14	13	5	--
Wheat bran	15	21	21	20	17	15
Soybean Meal (44%)	10	6	3	-	-	-
Molasses	5	5	5	5	5	9
Limestone	2	2	2	2	2	2
Salt	1	1	1	1	1	1

*** CFM: Concentrate feed mixture.**

**** Guar korma is used as a source of protein with rate of 0,10,20,30,40 and 50% from protein of concentrate feed mixture (CFM) of experimental rations.**

All CFM containing different levels of guar korma had almost equal DM,OM and CP contents. Increasing guar korma percentages in CFM tended to increase EE and Ash contents and decreased CF and NFE contents (Table 3).

Table (3):Chemical composition of concentrate feed mixtures containing different levels of Guar korma, berseem hay and wheat straw.

Items	DM (%)	Chemical Composition On DM bases (%)					OM (%)
		CP	EE	CF	NFE	Ash	
Berseem hay (BH)	90.20	15.80	3.02	24.65	47.13	9.40	90.60
Wheat straw (WS)	91.38	3.17	1.86	43.26	40.89	10.82	89.18
Guar Korma (GK)	89.82	48.01	3.10	14.08	27.61	7.20	92.80
* CFM containing 0% GK	88.50	16.04	4.69	9.28	61.74	8.25	91.75
CFM containing 3.3% GK	88.54	16.02	4.88	9.65	60.95	8.50	91.50
CFM containing 6.7% GK	88.59	16.15	5.00	9.77	60.52	8.56	91.44
CFM containing 10.0% GK	88.63	16.17	5.14	9.80	60.31	8.58	91.42
CFM containing 13.3% GK	88.68	16.25	6.15	9.03	59.34	9.23	90.77
CFM containing 16.7% GK	88.72	16.47	6.25	8.26	59.37	9.65	90.35

*** CFM: Six Concentrate feed mixtures of different experimental rations.**

Data presented in Table (3) showed that the incorporation of guar korma meal at the rate of 0,3.3 ,6.7 ,10.0 ,13.3 and 16.7% to cover 0, 10, 20, 30, 40 and 50% protein of CFM, respectively. However, most of nutrients of different CFM were almost equal.

In addition, chemical composition of berseem hay and wheat straw werewithin the same range which reported by Etman et al., (2014) and El-Nahas (2010).

Effect of feeding guar korma on digestibility and nutritive values:

Data presented in Table (4) showed that the average daily feed intake in terms of concentrate feed mixture, berseem hay and wheat straw increased with increasing guar korma percentages in experimental rations.

Average total DM intake were 10.801, 11.032, 11.141, 11.400, 11.438 and 11.704 kg/head for rations A,B,C,D,E and F, respectively. It could be noticed that increasing guar korma from zero (ration A) to 16.7% (ration F) tended to increase total DM intake by 8.33%. So, increasing guar korma percentage in experimental rations increased CFM, berseem hay and wheat straw intakes as shown in Table 4). Kholif (1999), Saleh pour et al., (2012) and Turki et al., (2011) were agreement with our results.

The calculated chemical composition of experimental rations showed that the DM% ranged between 89.13 to 89.28%, CP% ranged between 14.69 to 15.01% while CF ranged between 15.04 to 16.12% (Table 4). All of the experimental rations were iso-nitrogenous and iso-energetic. The digestibility coefficients of all nutrients for experimental rations are shown in Table (4). The data showed that the digestibility coefficients of DM was significantly ($p<0.05$)higher for ration F (85.79%), while differences in DM digestibility among other rations were not significant. Also, high significant difference was observed for DM digestibility with ration F being 93.78%. Differences in OM digestibility between both rations D and E or between E and F were not statistically significant. Also, differences in OM digestibility among the 1st three rations (A, B and C) were not statistically significant. On the other hand, increasing guar korma percentage to 16.7% (ration F) significantly ($p<0.05$) increased in CP digestibility, being 73.20% versus 65.25, 65.97, 67.18, 67.44 and 69.43% with rations A,B,C, D and E, respectively. At the time, differences in CP digestibility between rations A and B or among C, D and E rations were not statistically significant ($P<0.05$; Table 4). However, increasing guar korma in experimental rations to cover 50% of CP of CFM increased significantly ($P<0.05$) CP digestibility by 12.18%. Also, digestibility of EE significantly ($P<0.05$) increased with increasing guar korma percentages, but differences in EE digestibility between rations E and F or among B,C and D rations were not statistically significant. Similar trend was observed for CF digestibility, which increased with increasing guar korma percentages. The CF digestibility recorded 58.81, 60.17, 61.21, 62.23, 65.34 and 65.59% for rations A,B,C,D,E and F, respectively. Differences in NFE digestibilities among different experimental rations were not significant (Table 4).

4

The nutritive values of different experimental rations expressed as TDN (%), DCP (%) and DE (kcal/kg DM) are shown in Table (4). The TDN were 68.02, 68.87, 69.06, 69.27, 70.78 and 70.82% for rations A, B, C, D, E and F, respectively. Corresponding values of DCP were 9.60, 9.84, 9.94, 9.98, 10.32 and 10.99%, respectively. The DE values were 3.00, 3.04, 3.04, 3.05, 3.12 and 3.12 (kcal/kg DM) for the respective rations. The data revealed that increasing guar korma percentage to cover 50% CP of CFM for experimental ration (ration F) significantly ($P<0.05$) increased TDN(%), DCP(%) and DE (kcal/kg DM), while differences with increasing guar korma from 40% to 50% were not significant ($P<0.05$) .

Generally, guar korma improved and increased digestibility coefficients for most of nutrients and nutritive values especially up to the rate of 50% as a source of protein of CFM. These results were agreement with those reported by Farkhanda et al.,(2006) and Saleh pour et al., (2012). In addition, Shwerab et al., (2010)showed higher digestibility coefficients and nutritive value with increasing DDGS in sheep rations. The same results were obtained with Etman et al., (2011). They found that using DDGS as a source of protein in rations formulation of buffalo calves increased digestibility coefficients of all nutrients and feeding values.

Effect of feeding guar korma on feed intakes:

Data illustrated in Table (5) showed average daily feed intakes per head, 100 kg LBW and $W^{0.75}$. Results revealed that average daily kg DM intake/head increased with increasing guar korma in the experimental rations. Increasing in DM intake with increasing guar korma up to 50% in CFM up to 8.36%. The increase in kg TDN intake/head was 13.13% versus 24.10% for kg DCP/head

Table (5): Averages daily feed unite intake for different experimental rations.

Items	Experimental rations					
	A	B	C	D	E	F
AV. Daily feed intake expressed as:						
Kg DM/head	10.801	11.032	11.141	11.400	11.438	11.704
Kg TDN/head	7.347	7.598	7.694	7.897	8.096	8.289
Kg DCP/head	1.037	1.086	1.107	1.138	1.180	1.286
Kg DM/100Kg LBW	3.460	3.470	3.475	3.484	3.485	3.500
Kg TDN/100Kg LBW	2.374	2.411	2.417	2.425	2.477	2.479
Kg DCP/ 100Kg LBW	0.336	0.345	0.348	0.349	0.361	0.385
Kg DM/kg $W^{0.75}$	2.548	2.600	2.616	2.671	2.679	2.737
Kg TDN/ kg $W^{0.75}$	1.748	1.806	1.820	1.859	1.904	1.939
Kg DCP/ kg $W^{0.75}$	0.247	0.258	0.262	0.268	0.277	0.301

It could be noticed that, average kg DM intake/100kg LBW ranged between 3.460 to 3.500kg, while kg TDN intake/100kg LBW ranged between 2.374 to 2.479 kg, while it ranged between 0.336 to 0.385kg as kg DCP/100kg LBW. When average daily feed unite calculated as kg intake/kg $W^{0.75}$, it was found that increasing guar korma at 50% experimental ration increased feed intake by 7.42, 10.93 and 21.86% as kg DM, TDN and DCP/kg $W^{0.75}$, respectively (Table 5).

Data presented in Table (5) showed that the average daily feed unite intakes increased with increasing guar korma percentages in CFM owing due to its high palatability and higher both digestibility and feeding values of guar korma. Such results were agreement with those reported by Etman et al., 2011 and 2014; Turki et al., 2011; Shwerab et al., 2010 and Sehgal and Makker, 1994.

Effect of feeding guar korma on blood parameters:

Data presented in Table (6) revealed that the serum total protein ranged between 6.34 to 7.12 gm/100ml, showing significant differences among different treatments. Concentrations of serum albumin ranged between 3.82 to 4.38 gm/100ml with also significant ($P<0.05$) differences among different treatments, while concentrations of serum globulin ranged between 2.52 to 2.74 gm/100ml showing no significant differences among treatments. It could be noticed that albumin and globulin concentrations increased with increasing guar korma levels, while albumin/globulin ratio was almost similar in all treatments, as shown in Table (6).

The ratio between albumin and globulin (A/G ratio) were reflected to the values of both. The results also revealed that the Aspartate Amino Transferase (AST) concentrations increased with increasing guar korma level, showing significantly ($P<0.05$) higher concentration with ration F (45.35 IU/L). The same significant trend was observed with Alanin Amino Transferas (ALT) with ration F, recording 25.15 IU/L. Increasing guar korma level up to 30% as a source of protein of CFM tended to increase in both AST and ALT concentrations with no significant differences. However, increasing guar korma level up to 40 or 50 % of CFM resulted in significantly ($P<0.05$) higher AST and ALT concentrations, as shown in Table (6). On the other hand, the kidney function was measured as creatinine and blood urea-N (BUN) activities. Creatinine is a natural product of muscle breakdown that occurs at a low level in the body. Both BUN and creatinine are filtered by kidney and excreted in the urine. For this reason, BUN and creatinine are used together to measure kidney function. It could be noticed that the creatinine concentration ranged between 1.12 to 1.20 mg/d, while blood urea-N concentration ranged between 17.74 to 20.94 mg/100ml. Both creatinine and blood urea-N concentrations decreased with increasing guar korma levels. There differences were not statistically significant. Also, the ratio between BUN and creatinine ranged between 15.84 to 17.76 and these rations were within the normal range .

Generally, all values and concentrations of different items obtained in Table (6) were within the normal range. This mean that all experimental animals were in a good health and guar korma were better material as a source of protein for ruminant feedstuffs. The results obtained in Table (6) were in agreement with those reported by Ojha et al.,(2013), Saleh pour et al., (2012), Etman *et al.,* (2014) and Shwerab *et al.,* (2010).

Effect of feeding guar korma on daily gain and feed efficiency:

Data presented in Table (7) revealed that averages total live body weight gains were 272.2, 278.3, 284.9, 292.3, 299.2 and 309.8 kg for animals fed rations A, B, C, D, E and F, respectively. Corresponding, values of daily gains were 1.296, 1.325, 1.357, 1.392, 1.425 and 1.475 kg/day, respectively. It could be noticed that both total and daily gains increased with increasing guar korma levels in experimental rations. The improvements in daily gains were 2.24, 4.71, 7.41, 9.95 and 13.81% with animals fed rations B, C, D, E and F, respectively. Increasing in both total body weight and daily gains with increasing guar korma levels might be attributed to increase TDN and DCP intake of experimental rations. Also, might be due to the higher digestibility and nutritive values of guar korma. Generally, experimental rations containing guar korma had significantly ($P<0.05$) higher daily gains. Moreover, ration containing 16.7% guar korma (ration F) showed the highest total and daily gain (309.8 and 1.475 kg) with the best improvements (13.81%). It could be noticed that, increasing total and daily gain with increasing guar korma levels might be due to higher digestibility and nutritive values of the rations containing guar korma and also higher feed intake of those rations. The feed utilization efficiency values expressed as the amounts of DM, TDN or DCP consumed per kg gain, are shown in Table (7). It could be noticed that animals fed ration F containing the highest level of guar korma had the highest feed utilization efficiency expressed as kg DM and TDN consumed per kg gains, being 7.935 and 5.620kg, respectively. Moreover, animals fed ration F had the highest ($P<0.05$) feed utilization efficiency, while the feed utilization of DCP showed significantly($P<0.05$) the lowest efficiency. The data revealed that increasing guar korma level increased feed utilization efficiency as kg DM/kg gain and decreased feed utilization efficiency as kg DCP/kg gain. However, increasing guar korma level up to 40% of CFM had no effect on feed utilization efficiency as kg TDN/kg gain, while increasing level up to 50% of CFM (ration F) gave the highest feed utilization efficiency (5.620), as shown in Table (7). The results were in agreement with those reported by Etman et al., (2014), Turki et al., (2011), Ahmed et al., (2000), Sehgal and Makker (1994). In addition, Ojha et al., (2013) reported that inclusion of guar meal at 10% level in concentrate feed mixture of growing crossbred calves significantly improved average daily gain.

Feed cost and economical efficiency:

Data presented in Table (8) showed that the feed cost/kg weight gain decreased with increasing guar korma levels, being 18.870, 18.227, 17.429,16.650, 15.822 and 15.249 LE with rations A, B, C, D, E and F, respectively. Corresponding values of revenue expressed as LE/head /day were 4.057, 4.977, 6.203, 7.447, 8.803 and 9.958, respectively. The results showed that the animals fed ration F containing the highest level of guar korma (16.7%) had the highest revenue, being 0.443 LE as a gross margin above feed cost. It could be noticed that the profit percentage recorded 16.59, 20.70, 26.23, 32.13, 39.04 and 44.27% with rations A, B, C, D, E and F, respectively, showing the animals fed ration containing the highest guar korma level (ration F) had the highest profit.

7

8

Almost similar trend, was recorded with increasing guar korma level in experimental rations increased economical efficiency, being 1.166, 1.207, 1.262, 1.321, 1.390 and 1.443 with rations A, B, C, D, E and F, respectively. Also, there were improvements in economical efficiency with increasing guar korma level in experimental rations, being 3.52, 8.23, 13.29, 19.21 and 23.76% with rations B, C, D, E and F, respectively.

From the previous results, it may be shown that the animals fed rations containing the highest level of guar korma (16.7%) which represent 50% as a source of protein of CFM appeared to have the lowest feed cost/kg gain with the highest revenue, profit and economical efficiency. The results were agreement with those reported by Turki et al., (2011), Saleh pour et al.(2012),TarunaKhanna et al., (2010) and Etman et al., (2011 and 2014)

CONCLUSION

Guar korma meal could be used as a source of protein to partially or totally replace cotton seed cake and soybean meal in concentrate feed mixture of growing buffalo calves rations. Moreover, guar korma meal could be used at the rate of 50% in CFM instead of both cotton seed cake and soybean meal in ration formulation of buffalo calves. Increasing guar korma at the rate of 50% in CFM in buffalo calves rations significantly increased nutrients digestibility, nutritive values as TDN and DCP, daily LBW gain, improved feed utilization efficiency, decreased feed cost/kg weight gain and increased both the revenue and economical efficiency. Moreover, using guar korma in ration formulation of buffalo calves had not affected liver and kidney functions. However, further work is needed to determine the optimum level of guar korma to be used in rations of growing buffalo calves, to achieve maximum performance.

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إستخدام مصادر بروتينية جديدة فى تغذية المجترات

١- تأثير إستخدام نسب مختلفة من جوار الكورما كمصدر بروتينى على الأداء الانتاجى للجاموس المصرى

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يهدف هذا البحث إلى دراسة إستخدام كسب جوار الكورما كمصدر بروتينى بدلا" من كسب القطن وكسب فول الصويا فى علائق عجول الجاموس النامية. أجريت هذه التجربة فى معهد بحوث الإنتاج الحيوانى التابع لمركز البحوث الزراعية بجمهورية مصر العربية.

تم إختبار عدد ثلاثون عجل جاموسى بمتوسط وزن ١٧٦,٩ كجم وقسمت عشوائيا" إلى ستة مجموعات متماثلة (٥ حيوانات فى كل مجموعة) وغذيت على علف مركز يحتوى على كسب جوار الكورما بنسب صفر ، ٣,٣، ٦,٧، ١٠,٠، ١٣,٣، ١٦,٧% حتى تغطى صفر، ١٠، ٢٠، ٣٠، ٤٠، ٥٠% من بروتين العلف المركز على التوالى. هذا وقد تمت تغذية جميع الحيوانات من المجموعات الستة على العلف المركز ودريس البرسيم وتبن القمح بنسب ٧٠:٢٠:١٠ على التوالى وأستمرت تجربة التغذية ٢١٠ يوما" وفى أثناء تجربة التغذية تم إجراء ستة تجارب هضم لتقدير القيمة الغذائية والهضمية للعلائق التجريبية.

وكان ملخص النتائج المتحصل عليها ما يلى:

١- كان التركيب الكيماوى للعلائق التجريبية متقاربا" خاصة فى نسب كل من المادة الجافة والمادة العضوية والألياف الخام والبروتين الخام وكذلك المستخلص الخالى من الآزوت مع إرتفاع بسيط فى نسب مستخلص الدهن والرماد وذلك مع زيادة نسب كسب جوار الكورما.

٢- زيادة نسب كسب جوار الكورما فى العلائق التجريبية أدت إلى زيادة معنوية (عند مستوى ٥ %) فى معاملات هضم كل من المادة الجافة والمادة العضوية والبروتين الخام والدهن الخام وكذلك الألياف الخام مع عدم وجود فروق معنوية فى معامل هضم المستخلص الخالى من الآزوت. وقد وجد أيضا إرتفاع معنوى فى قيم كل من مجموع المركبات الكلية المهضومة والبروتين المهضوم مع زيادة نسب كسب جوار الكورما فى العلائق التجريبية وقد سجلت المجموعة (و) ٧٠,٨٢% مركبات كلية مهضومة ، ١٠,٩٩% بروتين مهضوم.

٣- أظهرت المجموعات (د،هـ،و) إرتفاعا" معنويا فى تركيز نسب بروتين والبيومين الدم مع عدم وجود فروق معنوية فى تركيز نسب الجلوبيولين ،أيضا كان تركيزAST, ALT مرتفعا معنويا (عند مستوى ٥ ٪) مع العلائق (هـ،و)، بينما كانت الفروق فى قيم نشاط الكلي غير معنوية.

٤- أظهرت النتائج زيادة متوسط وزن الزيادة اليومية زيادة معنوية (عند مستوى٥٪) مع زيادة نسب كسب جوار الكورما فى العلائق التجريبية وقد سجلت الزيادة اليومية ١,٢٦٩ ، ١,٣٢٥ ، ١,٣٥٧ ، ١,٣٩٢ ، ١,٤٢٥ ، ١,٤٧٥ كجم للمجموعات التى تغذت على العلائق أ،ب،ج،د،هـ،و،على التوالى .مع ملاحظة أن أفضل تحسن فى الكفاءة الغذائية معبرا عنه بكمية المادة الجافة او المركبات الكلية المهضومة المأكولة لكل كجم نمو حيث سجلت ٧,٩٣٥ ، ٥,٦٢٠ على التوالى مع المجموعة التى تغذت على العليقة (و) التى تحتوى على أعلى نسبة من كسب جوار الكورما.

٥- إنخفضت تكاليف التغذية لكل كيلوجرام نمو مع زيادة نسب كسب جوار الكورما فى العلائق التجريبية مسجلا قيم ١٨,٨٧٠ ، ١٨,٢٢٧ ، ١٧,٤٢٩، ١٦,٦٥٠ ، ١٥,٨٢٢ ، ١٥,٢٤٩جنيها للمجموعات التى تغذت على العلائق أ،ب،ج،د،هـ،و،على التوالى.

٦- أيضا لوحظ زيادة قيم العائد، الأرباح، الكفاءة الإقتصادية مع العليقة (و) المحتوية على أعلى نسبة من كسب جوار الكورما وقد تحسنت الكفاءة الإقتصادية فى هذه المجموعة وقدرت بنسبة ٢٣,٧٦%

مما سبق يتضح أنه يمكن إستخدام كسب جوار الكورما كمصدر بروتينى فى علائق عجول الجاموس النامية ليغطى ٥٠% من بروتين العلف المركز لهذه العلائق حيث أظهرت هذه العلائق إرتفاعاً فى معاملات هضم معظم المركبات الغذائية مع زيادة معدل النمو اليومى وإنخفاض تكاليف التغذية لكل كيلوجرام نمو مع زيادة العائد وزيادة الكفاءة الإقتصادية بجانب عدم تأثر بعض قيم الدم وكانت تقديراتها فى نطاق المعدل الطبيعى وعدم وجود أى تأثير جانبى. ويلزم دراسات أخرى لتحديد المستوى المناسب من الجوار كورما كمصدر للبروتين والطاقة فى علائق الجاموس النامى.

Table (4):Average daily feed intake, calculate composition, digestibility coefficients and nutritive values of different experimental rations.

Items	Experimental rations						Significant levels
	A	B	C	D	E	F	
AV. Daily feed intake (Kg DM/Head):							
Concentrate feed mixture	7.561	7.722	7.799	7.980	8.007	8.193	
Berseem hay	2.160	2.207	2.228	2.280	2.287	2.341	
Wheat straw	1.080	1.103	1.114	1.140	1.144	1.170	
Total DM intake	10.801	11.032	11.141	11.400	11.438	11.704	
Calculated composition of experimental rations:							
DM	89.13	89.16	89.19	89.22	89.26	89.28	
OM	91.26	91.09	91.05	91.05	90.58	90.28	
CP	14.71	14.69	14.79	14.80	14.86	15.01	
EE	4.07	4.21	4.29	4.39	5.10	5.17	
CF	15.76	16.02	16.10	16.12	15.58	15.04	
NFE	56.72	56.17	55.87	55.72	55.04	55.06	
Ash	8.74	8.91	8.95	8.97	9.42	9.72	
Digestibility Coefficients of experimental rations:							
DM	83.72^{b}	84.80^{b}	84.85^{b}	84.95^{b}	85.05^{ab}	85.79^{a}	(P<0.05)
OM	89.93^{c}	91.30^{c}	91.34^{c}	92.32^{b}	92.59^{ab}	93.78^{a}	(P<0.05)
CP	65.25^{c}	65.97^{c}	67.18^{b}	67.44^{b}	69.43^{b}	73.20^{a}	(P<0.05)
EE	67.01^{c}	68.79^{b}	68.57^{b}	68.19^{b}	70.80^{a}	70.78^{a}	(P<0.05)
CF	58.81^{c}	60.17^{b}	61.21^{b}	62.23^{b}	65.34^{a}	65.59^{a}	(P<0.05)
NFE	75.83	76.30	76.34	76.32	76.59	75.78	NS
Nutritive values:							
TDN (%)	68.02^{c}	68.87^{bc}	69.06^{b}	69.27^{b}	70.78^{a}	70.82^{a}	(P<0.05)
DCP (%)	9.60^{b}	9.84^{b}	9.94^{b}	9.98^{b}	10.32^{a}	10.99^{a}	(P<0.05)
* DE (Mcal/Kg DM)	3.00^{b}	3.04^{b}	3.04^{b}	3.05^{b}	3.12^{a}	3.12^{a}	(P<0.05)

a, b and c : Means in the same raw with different superscripts are significant (P<0.05) differed.

*** DE was calculated according to Pond *et al.,* (1995).**

Table (6): Some blood parameters of animals fed different experimental rations.

Items	Experimental rations						Significant levels
	A	B	C	D	E	F	
Serum protein (gm/100ml)							
Total protein	6.34^{b}	6.55^{b}	6.65^{b}	6.91^{a}	6.98^{a}	7.12^{a}	(P<0.05)
Albumin (A)	3.82^{b}	3.94^{b}	4.01^{b}	4.26^{a}	4.30^{a}	4.38^{a}	(P<0.05)
Globulin (G)	2.52	2.61	2.64	2.65	2.68	2.74	NS
A/G ratio	1.52	1.51	1.52	1.61	1.60	1.60	
Liver functions (IU/L):							
GOT (AST)	40.21^{b}	40.86^{b}	41.24^{b}	41.80^{b}	45.10^{a}	45.35^{a}	(P<0.05)
GPT (ALT)	20.42^{b}	20.51^{b}	20.68^{b}	21.25^{b}	24.64^{a}	25.15^{a}	(P<0.05)
Kidney functions:							
Creatinine (mg/dl)	1.20	1.18	1.17	1.17	1.14	1.12	NS
Urea-N (mg/100ml)	20.94	20.16	19.61	19.60	18.92	17.74	NS
BUN/Creatinine	17.45	17.08	16.76	16.75	16.60	15.84	

a and b: Means in the same raw with different superscripts are significant (P<0.05) differed.
NS: Not significant

Table (7): Averages daily, total gains and feed utilization efficiency of animals fed different experimental rations.

Items	Experimental rations*						Significant levels
	A	B	C	D	E	F	
No. of animals	5	5	5	5	5	5	
Experimental period, day	210	210	210	210	210	210	
Av. initial LBW, Kg	172.5	176.7	175.8	179.5	177.2	179.5	
Av. final LBW, Kg	444.7	455.0	460.7	471.8	476.4	489.3	
Av. total LBW gain, Kg	272.2	278.3	284.9	292.3	299.2	309.8	
Av. daily LBW gain, Kg	1.296^{c}	1.325^{bc}	1.357^{b}	1.392^{b}	1.425^{ab}	1.475^{a}	(P<0.05)
Improvement, (%)	-	2.24	4.71	7.41	9.95	13.81	
AV. Daily feed intake:							
Kg DM/head	10.801	11.032	11.141	11.400	11.438	11.704	
Kg TDN/head	7.347	7.598	7.694	7.897	8.096	8.289	
Kg DCP/head	1.037	1.086	1.107	1.138	1.180	1.286	
Feed utilization efficiency:							
Kg DM/Kg gain	8.334^{a}	8.326^{a}	8.210^{b}	8.190^{b}	8.027^{c}	7.935^{c}	(P<0.05)
Kg TDN/Kg gain	5.669^{a}	5.734^{a}	5.670^{b}	5.673^{b}	5.681^{c}	5.620^{c}	(P<0.05)
Kg DCP/ Kg gain	0.800^{c}	0.820^{b}	0.816^{b}	0.818^{b}	0.828^{b}	0.872^{a}	(P<0.05)

a, b and c : Means in the same raw with different superscripts are significant (P<0.05) differed.

*** concentrate feed mixture (CFM) of experimental rations containing guar korma with rate of 0,10,20,30,40 and 50% as a source of protein in A,B,C,D,E and F rations, respectively.**

Table (8): Averages daily feed intake as fed, daily gain, feed cost and economical efficiency of animals fed different experimental rations.

Items	Experimental rations					
	A	B	C	D	E	F
AV. daily feed intake, as fed (Kg):						
Concentrate feed mixture	8.544	8.721	8.803	9.004	9.029	9.235
Berseem hay	2.395	2.447	2.470	2.528	2.535	2.595
Wheat straw	1.182	1.207	1.219	1.248	1.252	1.280
Av. daily L.B.W. gains (Kg)	1.296	1.319	1.357	1.392	1.425	1.475
Feed cost and economical efficiency:						
* Cost of feed consumed/head (LE)	24.455	24.041	23.651	23.177	22.547	22.492
Price of L.B.W. gain (LE)	28.512	29.018	29.854	30.624	31.350	32.450
Feed cost/Kg weight gain (LE)	18.870	18.227	17.429	16.650	15.822	15.249
Revenue (LE/head/day)	4.057	4.977	6.203	7.447	8.803	9.958
Gross margin above feed cost (LE)	0.166	0.207	0.262	0.321	0.390	0.443
Profit (%)	16.59	20.70	26.23	32.13	39.04	44.27
Economical efficiency	1.166	1.207	1.262	1.321	1.390	1.443
Improvement of economical efficiency (%)	--	3.52	8.23	13.29	19.21	23.76

* **Based on the assumption that the price of one ton of berseem hay, wheat straw, concentrate feed mixtures containing guar kormawith rate of 0, 3.3, 6.7, 10.0, 13.3 and 16.7% was 1600, 800, 2303,2197, 2127, 2014, 1937 and 1875 LE, respectively, and the price of one Kg body weight in selling was 22.00 L.E.**