J. Agric. Sci. Mansoura Univ., 27 (2): 833 - 840, 2002

EFFECT OF FEEDING LACTATING BUFFALOES ON DIETS CONTAINING DIFFERENT LEVELS AND CONCENTRATE FEED MIXTURE OF GROUNDNUT VINES HAY ON MILK PRODUCTION.

Talha, M. H.; R. I. Moawad; A. A. H El-Tahan and M. Marghany
Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Egypt.

ABSTRACT

Six lactating buffaloes, about 530 kg body weight in the 3rd - 5th parity were selected randomly at their peak of lactation to study the effect of groundnut vines hay as a substitution of berseem hay at two levels on performance of lactating buffaloes using "Swing over method to evaluate the following experimental rations: 1) Control ration (CR) 40% concentrate mixture (CM) of total DM requirements and berseem hay (BH) *ad. lib*. 2) 1st tested ration (TR1) 40% CM of total DM requirements and groundnut vines hay (GVH) *ad. lib*. 3) 2nd tested ration (TR2) 25% CM of total DM requirements and groundnut vines hay (GVH) *ad. lib*. The digestibilities of DM, OM and CF were higher for TR1 and TR2 compared to CR with no significant difference. While CP digestibility of CR was significantly ($p<0.05$) higher than those of TR1 and TR2. The digestibilities of EE and NFE of CR were significantly ($p<0.5$) lower than both of tested rations. The TDN of TR1 and TR2 were significantly ($p<0.05$) higher than that of CR, while DCP were significantly ($p<0.05$) lower. Milk, fat corrected milk production and milk fat percent of animals fed either TR1 or TR2 were higher than those of animals fed CR with no significant difference.

From foregoing results, Integration of GVH at 60% or 75% from required DM reduced feeding cost for producing either kg milk or kg butter. it could be concluded that, GVH can be used as a substitution to BH in lactating buffalo rations at 60% or 75% from DM required and hence reduced feeding cost of milk yield.

Keywords: Groundnut – vines – berseem - hay – buffalo – dairy - digestibility.

INTRODUCTION

Feed costs the single largest expense in animal production, may be reduced by including locally grown crops and by-products into animals diet especially for ruminants. Since ruminants are essentially recyclers, the use of by products are suited to dairy animals that produce a high quality product (milk) from crop by-products. So, environmentally, as well as economically, by-products will continue to become more important as ingredients in ruminant diets.

Groundnut-vines hay is one of the most important crop by-products especially in the reclaimed sandy soil lands. It has been evaluated as a substitution for either alfalfa or berseem hay in sheep or goats diets by Gelaye *et al.*, (1990), Etman and Soliman (1999), Mostafa *et al.* (1999), Talha, *et al.* (2001) and Talha (2001). With growing goats, Gelaye *et al.*, (1990) reported that daily gain and feed utilization efficiency were better for goats fed peanut vines hay than those fed alfalfa hay. Etman and Soliman (1999) found that best daily gain was recorded when lambs fed peanut vines

hay with concentrate mixture at 2.5% of their live body weight. Moreover, their data showed high digestibilities for DM and OM% in all rations containing peanut vines hay with different levels of concentrate mixture. Talha (2001) reported that groundnut vines hay can be used as a good quality roughage for growing lambs at 60 or 40% from their DM requirements during the growing period and 20% during finishing period.

There is no available data about the effect of integration of groundnut vines hay into diets of lactating buffaloes on their performance. So, this work was carried out to study the effect of groundnut vines hay as substitution of clover hay and concentrate feed mixture at two levels on productive performance of dairy buffaloes in terms of feed intake, nutrients digestibility, milk production and composition and economic impact.

MATERIALS AND METHODS

This work was conducted at EL-Gemmeza Experimental Station, Animal Production Research Institute, Agriculture Research Center, to study the effect of complete replacing of berseem hay (BH) in dairy buffalo rations by groundnut vines hay (GVH) on their performance.

Six lactating buffaloes, about 530 kg body weight in the 3rd - 5th parity were selected randomly at their peak of lactation to conduct this work. The "Swing over" method described by Abou-Hussein (1958) was used to conduct this study. Milk production experiment extended for 20 weeks including four experimental periods. Each period consisted of three weeks transition period followed by two weeks for milk recording, sampling and digestibility trails. The animals were individually fed the following experimental rations 1) Control ration (CR) consists of 40% concentrate mixture (CM) of total DM requirements and berseem hay (BH) *ad. lib.* 2) 1st tested ration (TR1) consists of 40% CM of total DM requirements and groundnut vines hay (GVH) *ad. Lib.* 3) 2nd tested ration (TR2) consists of 25% CM of total DM requirements and groundnut vines hay (GVH) *ad. lib.* Feed was offered near the theoretical requirements of lactating animals calculated from expected production (10 kg/ day) according to NRC (1989). The CR (ration 1) was fed in the first and last periods, while the two tested rations (TR1 &TR2) were given in the two medium periods. Concentrate mixture consisted of: 39 % yellow corn + 29% undecorticated cotton seed meal + 14% rice bran +9% soybean meal (44% crude protein) + 5% vinas + 3% limestone + 1% sodium chloride.

Three digestibility trails were carried out on the animals of feeding trail (three per each) during collection period of each experimental period. Fecal grab samples of about 500g were taken from the rectum three times daily for five days as collection period. Acid insoluble ash (AIA) was used as natural marker for nutrients digestibility determination (Van Keuleun and Young, 1977). Representative samples of feeds and feces were analyzed according to A. O. A. C. (1980).

Milk yield was recorded daily and individually for all animals during the collection period. Milk samples were taken in the middle day of each

experimental period (29, 65, 101 and 137 days) from each buffalo individually. Milk samples were analyzed for protein (CP), total solids (TS) and ash according to A. O. A. C. (1980) while lactose was estimated by difference. Milk fat was determined according to Gerber's method as described by Ling (1963).

The data were statistically analyzed according to Steel and Torrie (1980). The differences among means were tested for significance by Duncan's multiple range test (1955).

RESULTS AND DISCUSSION

Chemical composition of GVH and BH and the tested diets is given in Table 1 were within the normal ranges reported by Etman and Soliman (1999), Mostafa, *et al.* (1999) and Talha (2001) for GVH and El-Ayek (1996), Talha (1996) and Talha *et al.* (2001) for BH prepared from the 3rd cut of berseem. Data cleared that CP and CF content of GVH were lower than those of BH by 20.98% and 8.77% respectively. While tested roughages both were nearly similar in other nutrients (Table 1).

As a result of complete replacing BH by GVH, CP content of tested rations 1 (TR1) and 2 (TR2) were lower than that of control ration (CR). This result would be expected since CP content of BH is higher than that of GVH (14.11% vs. 11.15%) as shown in table (1). Highest CF content was recorded with TR2 due to its higher content of GVH (75% of DM intake) (75% GVH) compared to CR (60% BH) and TR1 (60% GVH).

Table (1): Chemical composition of experimental ingredients and tested diets on DM basis.

Item	DM %	Chemical composition on DM basis %					
		OM	CP	EE	CF	NFE	Ash
Concentrate feed mixture	92.13	87.65	16.50	3.74	12.10	55.30	12.35
Berseem hay	86.38	87.80	14.11	2.30	32.15	39.23	12.20
Groundnut vine hay	89.40	88.48	11.15	2.40	29.33	45.59	11.52
Calculated chemical composition of tested rations on DM basis %							
CR	88.68	87.74	15.10	2.90	23.82	45.91	12.26
TR1,	90.41	88.16	13.18	2.91	22.81	49.27	11.84
TR2	90.02	88.29	12.39	2.71	25.35	47.84	11.71

Data in table (2) show that DM, OM and CF digestibilities were higher for animals fed TR1 or TR2 compared with those fed CR with no significant difference. On the other hand CP digestibility of CR was significantly ($p<0.05$) higher than those of TR1 and TR2. The results obtained here with respect to CF and CP digestibilities may be due to higher CF digestibility of GVH and

lower its CP digestibility compared by corresponding values of BH as reported by Talha *et al.* (2001). Moreover, lower CP content of TR1 and TR2 as shown in table (1), may reduce the CP digestibility of these rations compared to CR, since Fonnesback *et al.* (1981) reported that CP digestibility was closely related to dietary CP level and source. Digestion coefficients of EE and NFE of CR was significantly ($p<0.5$) lower than both of tested rations. Similar results had been reported by Gelaye *et al.* (1990); Mostafa *et al.* (1999) and Talha *et al.* (2001) with goats or sheep fed alfalfa hay or berseem hay compared with groundnut vines hay. Concerning nutritive values, TDN of TR1 and TR2 were significantly ($p<0.05$) higher than that of CR, while DCP were significantly ($p<0.05$) lower. These results might be a reflection of higher TDN content and lower DCP of GVH compared to BH content as reported by Talha *et al* (2001). Similar trend had been reported by Awadalla et al., (1997) and Mostafa *et al.* (1999) with sheep fed either clover hay or alfalfa hay compared to groundnut vines hay.

Table (2): Mean values and their standard error (SE) of nutrients digestibility and feeding values of experimental diets.

Treatments / Criteria	CR	TR1	TR2	Significance
No. of animals	3	3	3	--
DMI kg/ head/ day				-
CM	5.53	5.07	3.22	-
BH	7.77	-	-	-
GVH	-	8.31	10.73	-
Total DMI	13.30	13.38	13.95	
Nutrients digestibility, %				
DM	68.79 ± 0.64	70.72 ± 0.44	69.66 ± 0.94	NS
OM	70.39 ± 0.39	73.37 ± 0.73	72.01 ± 0.98	NS
CP	76.12^{a} ± 0.15	72.56^{b} ± 0.50	70.82^{b} ± 1.03	*
EE	75.64^{c} ± 0.81	82.12^{a} ± 0.48	79.01^{b} ± 1.16	*
NFE	71.83^{c} ± 0.10	76.52^{a} ± 0.77	74.18^{b} ± 0.87	*
CF	63.36 ± 1.10	65.88 ± 1.80	67.72 ± 1.25	NS
Nutritive values, %				
TDN	64.50^{b} ± 0.36	67.67^{a} ± 0.65	66.50^{ab} ± 0.89	*
DCP	11.49^{a} ± 0.00	9.56^{b} ± 0.01	9.33^{b} ± 0.14	*

N.S. : Non significant . * : Significant at 5% probability

A, b, c means in the same raw with different superscripts are significantly different at $P<0.05$.

Data in Table (3) show that both of milk and fat corrected milk production of animals fed either TR1 or TR2 were higher than those of animals fed CR with no significant difference. Milk fat percent followed the same trend of milk production, this result may be due to higher CF content and digestibility of both of TR1 and TR2 compared to CR. Similar trend has been reported by

Marghany *et al.* (2001) with buffaloes fed diets based on cotton stalks silage with higher CF content and digestibility than that of control diet.

Total DM intake was 14.17, 14.74 and 15.07 kg/ h/ day for animals fed CR, TR1 and TR2 respectively (Table 4). Feed conversion expressed as kg DM or kg gross TDN/ kg milk yield were better for animals fed BH compared to those fed rations containing GVH at 60% or 75%. Similar trend has been reported by Gelaye *et al.*, (1990) with goat; Awadalla, *et al.*, (1997) and Talha, *et al.*, (2001) with lambs when they compared peanut hay with alfalfa hay or berseem hay. Animals fed TR1 or TR2 showed better utilization of DCP of the diet compared to those fed CR (0.15 vs. 0.17 kg gross DCP/ kg milk yield). This result may support the observation of Romero, *et al.*, (1987) that more CP by-pass from peanut hay than alfalfa hay. The performed protein could be digested post-ruminally to supply essential amino acids needed for growth.

Table (3): Effect of substituting of BH by GVH on milk yield, milk fat percent and milk composition.

Item	Initial CR	TR1 adjusted to initial CR	TR2 adjusted to initial CR	Significance
Milk yield kg/ h/ d.	9.57 ± 0.18	9.69 ± 0.25	9.61 ± 0.25	NS
FCM (7%) yield kg/ h/ d.	8.86 ± 0.33	9.29 ± 0.53	9.18 ± 0.44	NS
Fat %	6.30 ± 0.31	6.62 ± 0.33	6.59 ± 0.36	NS
Fat yield kg/ h/ d.	0.602 ± 0.03	0.611 ± 0.03	0.571 ± 0.03	NS
Protein %	3.92 ± 0.28	4.04 ± 0.29	3.93 ± 0.32	NS
Protein yield kg/ h/ d.	0.376 ± 0.03	0.389 ± .04	0.377 ± 0.03	NS
Total solids %	16.94 ± 0.18	16.43 ± 0.24	16.79 ± 0.04	NS
TS yield kg/ h/ d.	1.62 ± 0.03	1.59 ± 0.03	1.61 ± 0.05	NS
Solids not fat %	10.64 ± 0.32	9.81 ± 0.54	10.20 ± 0.76	NS
SNF yield kg/ h/ d.	1.02 ± 0.04	0.944 ± 0.04	0.979 ± 0.07	NS
Lactose %	5.92 ± 0.43	4.76 ± 0.46	5.96 ± 0.62	NS
Lactose yield kg/ h/ d.	0.565 ± 0.04	0.457 ± 0.04	0.570 ± 0.05	NS
Ash%	0.92 ± 0.00	0.88 ± 0.00	0.86 ± 0.00	NS

N.S. : Non significant .

Data in table (4) showed that integration of GVH at 60% or 75% from required DM reduced feeding cost for producing either kg milk or kg butter.

Table (4): Effect of tested rations on feed consumption and efficiency and economic evaluation.

Item	Treatments		
	CR	TR1	TR2
Average of body weight (kg).	535	539	542
Feed intake (kg DM/ animal / day)			
Concentrate mix.	5.53	5.53	3.45
Berseem hay	8.64	-	-
Groundnut vines hay	-	9.21	11.62
Total feed intake (kg DM/ animal/ day)	14.17	14.74	15.07
Nutrients intake kg/ animal / day			
TDN	9.14	9.97	10.02
DCP	1.63	1.41	1.41
Feed efficiency			
Kg DM/ kg milk yield	1.48	1.52	1.57
Kg DM/ kg 7% FCM	1.60	1.87	1.64
Kg gross TDN/ kg milk yield	0.95	1.03	1.04
Kg gross TDN/ kg 7% FCM	1.03	1.07	1.09
Kg gross DCP/ kg milk yield	0.17	0.15	0.15
Kg gross DCP/ kg 7% FCM	0.18	0.15	0.15
Economical evaluation			
Total feed cost, LE/cow/day	7.30	5.05	4.27
Feed cost, LE/ kg milk yield	0.76	0.52	0.44
Feed cost, LE/ kg FCM milk	0.82	0.54	0.47
Feed cost, LE/ kg butter	12.12	8.26	7.48

*** Calculation of feeding cost was based on the following prices of feed ingredients (LE/ kg): CM 0.55, GVH 0.17, BH 0.40**

REFERENCES

Abou-Hussein, E.R.M.(1958). Economical feeding of dairy cows and buffaloes for milk production in Egypt, Ph. D. Thesis, Fac. of Agric. Cairo Univ.

Association of Official Agricultural Chemists (A.O.A.C)(1980). Official Methods of Analysis. 13th Ed. Washington, D. C.

Awadalla I. M.; M. I. Mohamed; M. A. M. Ibrahim and Amal K. El-Asheeri (1997). Efficiency of using groundnut hay in rations of Rahmany lambs. Egyptian J. Anim. Prod., 34: 125 – 134.

Duncan, D.B.(1955). Multiple Range and Multiple F-Test. Biometrics, 11: 1-55

El-Ayek M.Y. (1996). Influence of protein supplementation on intake, digestibility and nutritive value of berseem hay and its straw diets fed to sheep and goats. Egyptian J. Anim. Prod., 33. Suppl. Issue, 137 – 147.

Etman K. E. I. and E. S. Soliman. (1999). Effect of feeding peanut (*Arachis hypogaea L.*) tops with different levels of concentrate on performance of growing lambs. Egyptian J. Nutrition and Feeds 2 (Special Issue): 223 – 231.

Fonnesback P.V., J. L. Christiansen and L. E. Harris, (1981). Factors affecting digestibility of nutrients by sheep. J. Anim. Sci., 52:363-376.

Gelaye S., E. A Amoah and P. Guthrie (1990). Performance of yearling goats fed alfalfa and florigraze rhizoma peanut hay. Small Rumin. Res., 3: 353 – 361.

Ling, E. R. (1963). A Textbook of Dairy Chemistry. Vol. 2, 3rd ed. Chapman and Hall, London. U. K.

Marghany, M., A. A. H. El-Tahan; R. I. Moawd; A.A. Zaki and H. Ghanem (2001). Effect of cotton plant silage supplementation on digestbility and milk production by dairy buffaloes. Egyptian J. Nutrition and Feeds, 4 (Special Issue): 365 – 375.

Mostafa M. R. M., M. F. El-Sayes; M. K. Hathout and K. E. I. Etman. (1999). Nutritional studies on conserved peanut tops as silage and hay using sheep. Egyptian J. Nutrition and Feeds, 2 (Special Issue): 253 – 263.

NRC, National Research Council 6th Ed. (1989). Nutrient Requirements of Dairy Cattle Academic Press. Washington DC.

Romero P.; H. H. Van Horn; G. M. Prine and E. C. French. (1987). Effect of cutting interval upon yield, composition and digestibility of Florida 77 alfalfa and florigraze rhizoma peanut. J. Anim. Sci., 65: 786 – 796.

Steel, R. G. D. and J. H. Torrie. (1980). Principles and Procedures of Statistics. Mc. Grow Hill book company, Inc., New York.

Talha M. H. (1996). Nutritional studies on green forage. Ph. D. Thesis, Fac. of Agric. Ain Shams Univ.

Talha M. H. (2001).Effect of feeding rations containing different levels of groundnut vines hay on performance of growing lambs. Egyptian J. Nutrition and Feeds, 4: (Special Issue): 275 – 284.

Talha, M. H., R. I. Moawad; M. Marghany and K. E. I. Etman (2001). Some nutritional studies on groundnut vines hay in sheep rations. Egyptian J. Nutrition and Feeds, 4: (Special Issue): 677 – 684.

Van Keulen, J. and B. A Young (1977). Evaluation of acid – insoluble ash as a natural marker in ruminants digestibility studies. J. Anim. Sci., 44: 282 – 287.

تأثير تغذية الجاموس الحلاب على علائق تحتوي على مستويات مختلفة من دريس عرش الفول السوداني والعلف المصنع على إنتاج اللبن.

مصطفى حسين طلحة – رأفت إبراهيم معوض – علاء حسن الطحان – مصطفى ميرغني
معهد بحوث الإنتاج الحيواني – مركز البحوث الزراعية – وزارة الزراعة – مصر

يهدف هذا البحث إلى دراسة إمكانية إحلال دريس عرش فول السوداني محل دريس البرسيم في علائق الجاموس الحلاب وتأثير ذلك على إنتاج وتركيب اللبن؛ استخدمت في هذه التجربة ٦ جاموسات في مواسم حليب ٣ – ٥ مواسم بعد الولادة بحوالي ٦ أسابيع باستخدام طريقة عودة لذي بدء لمدة ١٤٠ يوم قسمت إلى ٤ مراحل تجريبية طول كل منها ٣٥ يوم غذيت عليقة المقارنة خلال المرحلة التجريبية الأولى والأخيرة بينما غذيت العليقة المختبرة الأولى في المرحلة الثانية و العليقة المختبرة الثانية في المرحلة الثالثة، وقد غذيت الحيوانات تغذية فردية على العلائق التجريبية التالية:-

١) علف مركز بنسبة ٤٠% من احتياجات الحيوانات من المادة الجافة + دريس برسيم للشبع (عليقة مقارنة).
٢) علف مركز بنسبة ٤٠% من احتياجات الحيوانات من المادة الجافة + دريس عرش فول سوداني للشبع (عليقة مختبرة أولى) .
٣) علف مركز بنسبة ٢٥% من احتياجات الحيوانات من المادة الجافة + دريس عرش فول سوداني للشبع (عليقة مختبرة ثانية).

وقد قدرت الاحتياجات الغذائية للحيوانات وفقا لمقررات الـ NRC 1989.
اعتبرت الـ ٣ أسابيع الأولى من كل مرحلة تجريبية كفترة أقلمة بينما تم تسجيل اللبن وأخذ عينات اللبن وإجراء تجارب الهضم خلال الأسبوعين التاليين (فترة الجمع) وقد تم أخذ عينات اللبن في اليوم الأوسط من فترة الجمع لكل مرحلة (في أيام ٢٩ – ٦٥ – ١٠١ – ١٣٧). كانت أهم النتائج المتحصل عليها كما يلي:-

- كانت معاملات هضم المادة الجافة والعضوية والألياف الخام لكل من العليقة (٢) ، (٣) أعلى منها للعليقة (١) ولكن بدون معنوية.
- كان معامل هضم البروتين الخام للعليقة (١) أعلى معنويا منه في لكل من العليقة (٢) ، (٣)، بينما كانت قيم مستخلص الإثير والمستخلص الخالي من النيتروجين لكل من العليقة (٢) ، (٣) أعلى معنويا من القيم المقابلة للعليقة (١) وذلك عند مستوى ٥% معنوية.
- كانت قيم المركبات الكلية المهضومة لكل من العليقة (٢) ، (٣) أعلى معنويا من القيم المقابلة للعليقة (١) بينما كانت قيم البروتين الخام المهضوم أقل معنويا وذلك عند مستوى ٥% معنوية.
- زاد إنتاج اللبن المعدل لـ ٧% دهن في حالة الحيوانات المغذاة على كل من العليقة (٢) ، (٣) بالمقارنة بتلك المغذاة على العليقة (١) ولكن بدون معنوية.
- لا توجد اختلافات معنوية في تركيب اللبن الناتج من التغذية على العلائق الثلاثة.
- أظهرت النتائج أن استخدام دريس عرش فول السوداني بنسبة ٦٠% أو ٧٥% من المادة الجافة المقررة أدى إلى خفض تكلفة التغذية لإنتاج ١ كجم لبن.
- نستنتج من النتائج السابقة أنه يمكن استخدام عرش فول السوداني كبديل لدريس البرسيم وجزء من المركزات وذلك عند استخدامه في علائق الجاموس الحلاب بنسبة ٦٠% أو ٧٥% من المادة الجافة المقررة.