IMPACT OF EXOGENOUS FIBROLYTIC ENZYMES ONI-NUTRITIONAL EVALUATION AND PRODUCTIVE PERFORMANCE OF GROWING BUFFALO CALVES

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(Received 7/6/2022, accepted 26/7/2022)

SUMMARY

Fifteen male buffalo calves with an average of initial live body weight 181 kg ±0. 2 were used to study the effect of fibrolytic enzymes (EFE) supplementation on growth performance, nutrients digestibility of growing male buffalo calves. Calves were randomly assigned into three nutritional groups (each of five animals) to receive one of the following experimental rations: the first group served as a control (T1) were received the basal ration (without fibrolytic enzymes); second (T2) and third (T3) groups were received the basal ration plus 10 g and 20g EFE /h /d., respectively. Results indicated that different experimental rations had in general almost similar chemical composition. Adding EFE to basal ration of buffalo calves, led to significant improvement (P <0.05) in experimental rations digestibility and nutritive values (TDN and DCP). Data obtained pointed out also to positive insignificant impact of EFE supplementation on accelerating calves daily gain and feed conversion ratio (FCR). Efficiency of feed utilization (FCR) was highest in T3 followed by T2 in compare with T1, however, differences were statistically non-significant (P<0.05).

Keywords: *Exogenous fibrolytic enzymes, productive performance and buffalo calves.*

INTRODUCTION

A large amount of agricultural residues such as (rice straw) is lost without being used well, and it is possible to benefit from it in feeding ruminants as a way to fill the shortage in animal feed and prevent human competition for food. But the problem is that these agricultural wastes contain in their structural composition a high percentage of fiber, of which when used in feeding ruminants, about 20-70% of it is lost in dung (feces), because of its not being optimally digested in ruminants. Adding fibrolytic enzymes to ruminant diets containing a high percentage of fiber, the digestion process of fiber can be improved by increasing the numbers of ruminal fibrolytic microbes to increase of rate digestion of fiber in the rumen, (Yang *et al*. 1999) thus providing the energy available to the animal, increasing microbial protein synthesis, and also improving the digestibility of nutrients (Khattab *et al*. 2011; Kholif *et al*. 2012)**.** Therefore, the aim of this study was to investigate the effect of using fibrolytic enzymes in rations of growing buffalo calves on nutrients digestibility and growth performance.

MATERIALS AND METHODES

The present study was carried out at the experimental farm station belongs to the Faculty of Agriculture, Al-Azhar University, Mostorod, Qalyubia Governorate, Egypt, through the period from February 2018 to September 2018 (212 days) .Animals in different groups were fed a basal ration (15.2 % CP), according to NRC recommendation (NRC 1981). The basal ration was composition of concentrate feed mixture (CFM) and wheat strew (65:35, respectively). CFM consists of decorticated cotton seed meal, yellow corn, wheat bran, molasses, limestone and salt. Chemical composition of CFM and wheat strew presented in Table (1).

Fifteen male buffalo calves with an initial live body weight 181 kg ± 0.2 were randomly assigned into three nutritional groups (each of five animals / group) to receive one of the following experimental rations; the first group served as a control (T1); the second group (T2) received the basal ration (T1) which was supplemented with 10 g EFE / head/ day; (T3) received the basal ration plus 20 g EFE /head/day. Rations were offered *ad lib* and residuals were daily weighed and recorded. A digestibility trail was conducted according to Abou-Akkada and El-Shazly (1958). Samples of rations offered and residuals if any were daily weighed during the collection period for further chemical analysis. Samples of feeds and faeces, were analyzed for dry matter (DM), crude protein (CP), crude fiber (CF), ether extract (EE), ash contents according to A.O.A.C. (1990).

Statistical analysis:

Data were subjected to statistical analysis using one-way analysis of variance (ANOVA), using the general linear Models procedure adopted. Differences between means were tested for significancy using the L.S.D test, according to Duncan (1955). Analysis of variance and least square means was carried out using the following equation: $Y_{ij} = \mu + T_i + E_{ij}$

Where: *Yij*= the observation of the parameter measured, μ= overall means, *Ti*= the effect of dietary treatment and *Eij*= the random error term.

RESULTS AND DISCUSSION

Chemical composition of the experimental rations (DM basis %):

Data of chemical composition concentrate feed mixture and weight strew (on dry matter basis) are presented in Table (1).

Table (1): Chemical composition of CFM and weight strew (on dry matter).

Ration	Chemical composition %						
	DM	OM	CP	EE	CF	NFE	Ash
CFM	90	89.7	15.2	4.5	18	52	10.3
Wheat straw	91	89.5	3	1.5	41	44	10.5

Digestibility coefficients and nutritive values of the experimental rations (DM basis %)

Digestibility Coefficients (%):

Results obtained in Table (2) showed digestibility coefficients for different experimental rations. As shown, DM, EE and NFE digestibility were improved (P<0.05) from 61.58 , 70,74 and 64.45 for (T1) to as high as 64.16,74.97 and 67.78 for (T3) respectively, with differences insignificant between T2 and T3.

Analysis of variance indicated that significantly (P<0.05) gradually positive increase in OM digestibility was observed with increasing of EFE levels. Crude protein and crud fiber digestibility coefficients recorded for calves of T3 were significantly higher (P<0.05) than those of T1, while differences between values of T1and T2 or T2 and T3 were not significant .

Table (2): Digestibility coefficients and nutritive values of the experimental rations.

Item	Experimental ration		
	T1	T2	T3
Digestibility Coefficients %			
DM	61.58^{b} ±0.56	63.00^{a} ± 0.10	64.16^{a} ± 0.16
OM	62.94^{c} ±0.05	64.99^{b} ± 0.25	65.74^{a} ± 0.05
CP	59.84^{b} ±0.64	61.54^{ab} ±0.82	62.83^{a} ±0.06
EE	70.74^{b} ±0.18	73.15^{a} ±1.05	74.97^{a} ±0.37
CF	60.35^{b} ±0.11	61.42^{ab} ±0.67	61.88^{a} ±0.10
NFE	64.45^{b} ±0.18	67.07a ±0.48	67.78^{a} ±0.07
Nutritive values %			
TDN	59.49^{c} ±0.05	61.42^{b} ±0.26	62.18^{a} ±0.04
DCP	6.55^{b} ±0.08	6.76^{ab} ±0.08	6.92^{a} ±0.05
C/P ratio	9.09 ±0.11	9.08 ±0.11	8.99 ±0.07

a, b, and c ; means with different superscripts in the same row are significantly different from each other (P >0.05).

It was noticeable that, the improvement in nutrients digestibility of the two supplemented rations (T2 and T3) was clearly correlated with the increasing level of (EFE) supplementation, *i.e.*, from 10 to 20 g/h/d to the control ration. The improvements in nutrients digestibility due to adding EFE (Table 2) are consistent, with those obtained by Adel and El-Metwaly (2012) who reported that (EFE) supplementation showed the best response in DM and OM digestibility. Results of the present study are in a good agreement also, with those obtained by (Gado and Salem, 2008) who found that increased in DM, particularly fiber, digestibility with fibrolytic enzyme supplementation. In addition, (Salem *et al*., 2007) noted that digestibility of DM was increased (P <0.01) by 5 and 11%, in sheep and goats by addition of EFE, respectively. On the contrarily, Salem *et al*. (2013) used of exogenous enzymes addition to feed for beef steers. They found that EFE addition did not affect DM intake.

Nutritive values (%):

Data of nutritive of different experimental rations (Table2) indicate that values for different supplemented rations with EFE, in general, had higher (P<0.05) values than that of the control one. The highest TDN value was observed with diet contained 20 g fibrolytic enzymes /head/d (T3, 62.18 %) followed by T2 (61.42 %). While the lowest TDN value was recorded by the control group (59.49 %). All differences among the three groups were significantly (P<0.05). Similar improvement (P<0.05) in DCP was also detected due to EFE supplementation, i.e. 6.92 and 6.76 % for T3 and T2, respectively, in compare with the basal ration (EFE free supplement). The improvement in TDN and DCP contents of the two supplemented rations was coincide with the corresponding improvement occurred in nutrients digestibility values, and tended to be more obvious with the parallel increase in EFE supplement, i.e. from 10 to 20 g/h/d. These results agreed with those obtained by Adel and El-Metwaly (2012) who reported that supplementation of EFE to the rations, resulted in significant increases (P<0.05) in TDN and DCP values for

fibrolytic enzymes supplement groups compared with that of the control group. Calorie to protein ratio (Table 2) indicated, in general proper percentages (8.99 to 9.08), which covers the daily requirements of growing buffalo calves DCP and TDN demands at such age and live body weight. The improvement in digestibility coefficients could be attributed to the fibrolytic enzymes may play an indirect role in the stimulation of anaerobic fermentation of organic matter, which improves the efficiency of nutrients utilization and had a direct role in the improvement of rumen digestion.

Effect of fibrolytic enzymes supplementation on calves performance:

Animal growth performance:

Results of mean daily feed intake (Table, 3) showed insignificant difference among the experimental ration groups in values of DM intake. However, calves of T3 had the highest value (7.96 kg/h/d), followed by those of T2, (7.89 kg/h/d), while the lowest value of DM intake was recorded for T1, (7.59 kg/h/d). Many studies reported that use of fibrolytic enzymes increased DM intake. (Soliman, 2006; Gado *et al.,* 2007; Salem *et al.,* 2007; El-Adawy *et al*., 2008; Gado and Salem, 2008).

Data in Table (3) indicated insignificant differences in final live body weight (Kg), and percentage of growth rate among different experimental groups. Values of total body weight gain (kg) and average daily body weight gain (kg/ day) during the experiment period (212 days) were significantly differe among treatments. Moreover, mean values for group (T3) were the highest followed by those of group (T2). While values of the control group (T1) were the lowest.

Many studies on enzyme addition to animal's diets have shown increased gain (Beauchemin *et al*., 1995; Lewis *et al*., 1996, Krause *et al*., 1998, ZoBell *et al*., 2000, Krueger *et al*., 2008), likely due to increased digestibility and energy available for growth and production (Yang *et al*., 1999; ZoBell *et al*., 2000, Tricarico *et al*., 2005).

Results obtained in the present study are similar to those observed by Adel and El-Metwaly.,(2012) who reported that adding fibrolytic enzymes for animal's diet was slight significant between supplemented group for final body weight gain compare the control group.

Table (3): Effect of fibrolytic enzymes supplementation on growth performance and feed conversion ratio of growing buffalo calves.

Item	Experimental ration			± SE
	T1	T2	T3	
	Average body weight gain			
Initial weight, kg	181.20	181.20	181.40	181.27 ±5.11
Final weight, kg	333.00	338.20	361.00	344.07±6.19
Total gain, kg	151.80^{b}	157.00^{b}	179.60^{a}	162.80±4.37
Average daily gain, kg	0.72^{b}	0.74^{b}	0.85^{a}	0.77 ±0.02
Growth rate %*	84.62	87.47	100.73	90.94±3.84
	Daily feed intake (kg)\h\d			
Roughages(kg)\h\d	2.52	2.56	2.66	2.58±0.05
CFM (kg)\h\d	5.06	5.33	5.31	5.23±0.10
Total DM intake (kg)\h\d	7.59	7.89	7.96	7.81±0.14
TDN (kg)\h\d	4.52	4.85	4.95	4.77±0.10
DCP (kg)\h\d	0.50	0.53	0.55	0.53±0.01
	Feed conversion (kg intake \ kg gain)			
DM (kg) \ Kg gain	10.62	10.69	9.47	10.26±0.29
TDN (kg) \ Kg gain	0.05	0.06	0.05	0.05±0.00
DCP (kg)\ Kg gain	0.70	0.72	0.65	0.69±0.02

a, b, and c ; means with different superscripts in the same row are significantly different from each other (P >0.05).
**: % growth rate = Total body gain/ Initial LBW x100.*
Feed conversion = kg of feed consumed per kg of live weight gain.

These results are in agreement with those of Beauchemin et al., (1995), who reported significant improved growth and body weight gain by adding an enzyme product containing xylanase and cellulase activities to alfalfa hay of growing beef cattle up to 30% or high concentrate ration (Beauchemin et al., 1999). McAllister *et al*., (1999) observed that average daily gain was related to the enzyme concentration. Dong *et al*., (1995) reported that direct fed cellulases had the ability to improve the growth of Holstein calves when administrated orally. However, improving the growth performance of buffalo calves with addition of EFE suggested to have a marked effect on increasing the total microbial population in the rumen (Yang *et al.,* 1999), and increased microbial protein synthesis (Gado *et al.,* 2009). Yang et al., (1999) and Beauchemin et al., (2000) reported that the increase in nutrient digestibility (Table 2) is due to the increase or stimulation in the total microbial population. However, Beauchemin *et al.* (1995) and Lewis *et al.,* (1996) indicated that the improved performance might be due to increased digestibility which yields more energy and/or nutrient availability to rumen microbes because of enzyme feeding. Beauchemin *et al.,* (1997) and Yang *et al.,* (1999) concluded that fibrolytic enzymes can be used to improve the digestibility of treated diets and provide more nutrients for production. Fibrolytic enzymes contain a wide variety of polysaccharidase enzymes that solubilize fiber and provide some essential nutrients or growth factors to rumen microorganisms.

feed conversion:

Feed conversion ratio was calculated as kg dry matter required to produce one kg of body weight gain. Feed conversion for different experimental groups as a good indicator to animal performance indicated that the efficiency of feed utilization was the highest for calves of T3 followed by that of T1 and T2, although differences were not statistically significant ($P < 0.05$). Values of feed conversion were 10.62, 10.69 and 9.47 Kg DMI/kg gain for T1, T2 and T3, respectively. These findings are in agreement with similar results, that evaluated the effect of fibrolytic enzymes in camel by Adel and El-Metwaly (2012) noted that feed conversion indicated that addition of ZADO® in camel ration gives best feed conversion as DM (8.68 g DM/g gain). Results recorded herein agree with those reported by (Gado and Salem, 2008; Salem *et al.,* 2007), who pointed out a commercial exogenous enzyme mixture (ZADO®), prepared from anaerobic bacterium, has been shown to improve live weight gain and feed conversion of wheat straw in sheep and goats. Titi and Lubbadeh (2004) noted that exogenous fibrolytic enzyme resulted in improved feed conversion of fattened Awassi sheep. The same author also, indicated that fibrolytic enzymes could enhance the growth of fattened lambs and improve their conversion rations mainly through improving digestibility.

CONCLUSION

It can be concluded that the use of fibrolytic enzymes and their addition to ruminant feed leads to increased daily gain due to enhance nutrient intake, and nutrient digestibility, as well as increased feed conversation.

REFERENCES

AOAC (1990). Association of official, chemists, official methods of analysis.15th Edition, Washington DC, USA.

Abou-Akkada, A. R., and K. El-Shazly (1958). Studies on the nutritive value of some common Egyptian feed ingstuffs. II. Effect of concentrates rich in proteins on cellulose and dry-matter digestion. The Journal of Agricultural Science, 51(2), 157-163.

Adel, E. M and H. El-Metwaly (2012). Effect of feed additive "Exogenous Enzymes" on growth performance of Maghraby Camels. Life Science Journal, 9(4), 4830-4835.

Beauchemin, K. A., L.M. Rode., M. Maekawa., D.P. Morgavi and R. Kampen (2000). Evaluation of anon-starch polysaccharidase feed enzyme in dairy cow diets. J. Dairy Sci., 83: 543.

Beauchemin, K. A., S.D.M. Jones., L. M. Rode and V.J.H. Sewal (1997). Effects of fibrolytic enzymes in corn or barley diets on performance and carcass characteristics of feedlot cattle. Can. J. Anim. Sci., 77: 645–653.

Beauchemin, K. A., W. Z. Yang and L. M. Rode (1999). Effect of grain source and enzyme additive on site and extent of nutrients digestion in dairy cows. J. Dairy Sci., 82:378–390.

Beauchemin, K.A., L.M. Rode and V.J.H. Sewaltm (1995). Fibrolytic enzymes increase fiber digestibility and growth rate of steers fed dry forages. Can. J. Anim. Sci. 75, 641–644.

Dong, Y., H.D. Bae., T.A. McAllister., G.W. Mathison and K.J. Cheng (1995). The effect of supplementary fibrolytic enzymes, bromoethelenesulfunate and monensin on digestibility of grass hay and methane production. J. Anim. Sci., 46: 434.

Duncan, D. B. (1955). Multiple range and multiple F test. Biometrics. 11: 1.

Gado, H. M and A. Z. M. Salem (2008). Influence of exogenous enzymes from anaerobic source on growth performance, digestibility, ruminal fermentation and blood metabolites in lambs fed of orange pulp silage in total mixed ration. In: 59th Annual Meeting of the European Association for Animal Production, Vilnius, Lithuania, August 24–27, p. 228 (Abstract).

Gado, H. M., H. M. Metwally., H. Soliman., A. Z. L. Basiony and E.R. El Galil (2007). Enzymatic treatments of bagasse by different sources of cellulase enzymes. In: The 11th Conf. Animal Nutr., Al-Aqsor-Aswan, Egypt on 2 November, 13–18, vol. 10, p. 607.

Gado, H.M., A.Z.M. Salem., P.H. Robinson and M. Hassan (2009). Influence of exogenous enzymes on nutrient digestibility, extent of ruminal fermentation as well as milk production and composition in dairy cows. Anim .Feed Sci .Technol;154:36–46.

Khattab, H. M., H. M. Gado., A. E. Kholif., A M. Mansour and A M. Kholif (2011). The potential of feeding goats sun dried rumen contents with or without bacterial inoculums as replacement for berseem clover and the effects on milk production and animal health. International Journal of Dairy Science, 6, 267–277.

Kholif, S.M., H. Gado, T. A. Morsy., N. El-Bordeny and A.A. Abedo (2012). Influence of exogenous enzymes on nutrient digestibility, blood composition, milk production and its composition as well as milk fatty acids profile in dairy buffaloes. Egyptian J. Nutr. & Feeds, 15: 13-22.

Krause, M., K.A. Beauchemin., L.M. Rode., B.I. Farr and P. Nrgaard (1998). Fibrolytic enzyme treatment of barley grain and source of forage in high-grain diets fed to growing cattle. J. Anim. Sci. 76, 2912–2920.

Krueger, N.A., A.T. Adesogan., C.R. Staples., W.K. Krueger., S.C. Kim., R.C. Littell and L.E. Sollenberger (2008). Effect of method of applying fibrolytic enzymes or ammonia to Bermuda grass hay on feed intake, digestion, and growth of beef steers. J. Anim. Sci. 86, 882–889.

Lewis, G.E., C.W. Hunt., W.K. Sanchez., R. Treacher., G.T. Pritchar and P. Fen (1996). Effect of direct-fed fibrolytic enzymes on the digestive characteristics of a forage-based diet fed to beef steers. J. Anim. Sci. 74, 3020–3028.

McAllister, T.A., S.J. Oosting., J.D. Popp., Z. Mir., L.J. Yanke., A.N. Hristov., R.J. Treacher and K. J. Cheng (1999). Effect of exogenous enzymes on digestibility of barley silage and growth performance of feedlot cattle. Can. J. Anim. Sci., 79: 353–360.

NRC (1981). Nutrient requirements of goats, Angora. Dairy and meat goats in Temperate and Tropical Countries. 15 Ed., National Academy Press. Washington. D.C.

Salem, A. Z. M., H. M. Gado., D. Colombatto and M. M. Y. Elghandour (2013). Effects of exogenous enzymes on nutrient digestibility, ruminal fermentation and growth performance in beef steers. Livestock Science, 154(1-3), 69-73.

Salem, A.Z.M., M.M. El-Adawy., H. Gado and M.S.M. Khalil (2007). Feed intake, nutrient digestibility and animal growth performance\ in sheep and goats fed wheat straw. ADSA PSA AMPA ASAS Joint Annual Meeting, San Antonio, TX, USA, July 8–12. J. Anim. Sci. 85 (Suppl. 1), 107 (Abstract).

Soliman, M.S (2006). Utilization of peanut hay in ruminant feeding. Ph.D. Thesis. Alexandria University, Alexandria, Egypt.

Titi, H and W.F. Lubbadeh (2004). Effect of feeding cellulase enzyme on productive responses of pregnant and lactating ewes and goats. Small Rumin. Res. 52, 137–143.

Tricarico, J. M., J. D. Johnston., K.A. Dawson., K.C. Hanson., K.R. McLeod and D.L. Harmon (2005). The effects of an Asperogillus oryyzae extract containing alpha-amylase activity on ruminal fermentation and milk production in lactating Holstein cows. Anim. Sci., 81: 365-374.

Yang, W.Z., K.A. Beauchemin and L.M. Rode (1999). Effects of an enzyme feed additive on extent of digestion and milk production of lactating dairy cows. J. Dairy Sci. 82, 391–403.

ZoBell, D.R., R.D. Weidmeier., K.C. Olson and R. Treacher (2000). The effect of an exogenous enzyme treatment on production and carcass characteristics of growing and finishing steers. Anim. Feed Sci. Technol. 87, 279–285**.**

تأثير المعاملة بالإنزيمات المحللة للألياف على :1. التقييم الغذائي و الأداء الإنتاجي لعجول الجاموس النامية

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أُجريت هذه الدراسة بمحطة البحوث الزراعية التابعة لقسم الانتاج الحيواني بكلية الزراعة جامعة الأزهر - مسطرد محافظة القليوبية خلال الفترة من فبراير حتى سبتمبر 2018م. كان الهدف من هذه الدراسة هو الوقوف على مدى تأثير إضافة الانزيمات المحللة للألياف على تحسين القيمة الغذائية للعليقة وتحسين الأداء الإنتاجي للعجول المغذاة عليها مقارنة بالعجول المغذاة على العليقة الضابطة (الكنترول). غُذيت الحيوانات أثناء فترة الدراسة على عليقة أساسية (15.2 % بروتين خام) طبقا للتوصيات القياسية. استخدم في هذه الدراسة 15 عجل جاموسي بمتوسط وزن بداية (181 ± 0.2 كجم). ثم تقسيم الحيوانات عشوائيا الى 3 مجاميع غذائية (5 حيوانات للمجموعة) وتمت تغذيتها على العلائق التالية: المعاملة الأولى (T1) وفيها غُذيت الحيوانات على العليقة الأساسية للمزرعة بدون أية إضافات، والمعاملة الثانية (T2) وفيها غُذيت الحيوانات على العليقة الأساسية للمزرعة بالإضافة الى (10 جمZADO® /حيوان/يوم)، والمعاملة الثالثة (T3) وفيها غُذيت الحيوانات على العليقة الأساسية للمزرعة بالإضافة الى (20 جمZADO® /حيوان/يوم). تم إجراء تجربة هضم في فترة الدراسة على الحيوانات المعاملة وبمعدل 3 حيوانات لكل معاملة غذائية لتقدير القيمة الهضمية للعلائق المختبرة.

أظهرت نتائج التحليل الغذائي للعلائق المستخدمة في هذه الدراسة تشابها في عناصر التحليل الكيماوي لمكونات الغذاء كنسب مئوية وإن أظهرت النتائج المتحصل عليها من تجارب الهضم وجود اختلافات معنوية عند مستوى (5%) في معاملات هضم مكونات العلائق المختبرة نتيجة الإضافة المذكورة بالأعلى. كما أظهرت العلائق التي تمت اضافة الإنزيمات المحللة للألياف اليها تحسنا معنويا (5%) في القيم الغذائية للعلائق متمثلاً في محتواها من المركبات الكلية المهضومة (TDN) والبروتين الخام المهضوم (DCP) مقارنة بالعليقة الكنترول (بدون اضافة). وقد أظهرت النتائج ايضا وجود تحسن معنوي في كفاءة النمو والانتاج لهذه الحيوانات، مع وجود تحسن، وان كان غير معنوي في كفاءة التحويل الغذائي لعجول الجاموس المضاف لعلائقها الانزيمات المحللة للألياف.

بناء على النتائج المتحصل عليها فإنه يمكن القول بأن: استخدام الانزيمات المحللة للألياف (ZADO®) بمستويين (10 ، 20 جم/رأس/يوم) كإضافات غذائية في علائق عجول الجاموس النامية أدى إلى تحسين معاملات الهضم لمركبات العليقة وتحسين قيمتها الغذائية ، كما ظهر تحسن معنوي في معدلات النمو اليومية وتحسن (وإن كان غير معنويا) في كفاءة التحويل الغذائي للحيوانات النامية.