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REDUCING ENVIRONMETAL POLLUTION OF MANURE BY ADDING TAFLA AND YEAST TO DAIRY BUFFALO RATION

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ABSTRACT: *This study was carried out at the Experimental Buffalo Unit of the Animal Production Department, Faculty of Agriculture, Minufiya University, Shebin El-Kom, Egypt. Nine dairy buffalo cow at 2nd to 4th lactation with an average body weight 614 ± 24.08 kg were randomly assigned among three experimental tested rations (three animals each). The experimental rations were Control ration (42% commercial concentrate feed mixture + 33% berseem hay + 25% rice straw), Control ration + 3% Tafla/animal/day and Control ration + 20 g Baker's yeast/animal/day (on dry matter basis). Fresh manure sample was collected from each animal daily and physical, chemical and biological analyze were applied.*

Manure from animals fed tafla supplemented ration had the lowest (P<0.01) odor intensity followed by manure from animals fed yeast additive ration, while manure from animals fed control ration had the highest odor intensity (1.83±0.058, 2.42±0.048 and 2.68±0.064, respectively). The similar differences were evident for moisture percentage (78.90±0.23, 80.60±0.26 and 84.38±0.26 % respectively). The effect of adding tafla and yeast on manure pH value was highly significant (P<0.01) but within normal range. Manure from animals fed tafla supplemented ration was lower in nitrogen, phosphorus and potassium % (P<0.01) than either manure from animals fed yeast additive ration or manure from animals fed control ration (0.433- 0.105- 0.377, 0.467- 0.108- 0.374 and 0.498- 0.121- 0.395 %, respectively). After 6, 12, 24h of incubation manure from animals fed tafla supplemented ration had the lowest gas production followed by manure from animals fed yeast additive ration, while manure from animals fed control ration had the highest gas production (0.633- 1.485- 2.767, 0.674- 1.570- 3.093 and 0.893- 1.903- 4.341 ml/g manure, respectively). Manure from animals fed tafla supplemented had the lowest (P<0.01) coliforms count followed by manure from animals fed yeast additive, while manure from animals fed control ration had the highest coliforms count (5.31±0.020, 5.44±0.012 and 6.46±0.015 cfu Log10/g manure, respectively).

Keywords: *Environmental pollution, Buffalo, Manure, Tafla, yeast.*

INTRODUCTION

Large concentrations of animals in relatively small areas create difficult challenges in terms of odor and nutrient management (Satter *et al.*, 2002). On the other hand, livestock wastes can provide valuable organic material and nutrients for crop and pasture growth. However, nutrients contained in animal manure (a mixture of animal's feces, urine and bedding materials) can degrade water quality if they are over-applied to land and enter water resources through runoff or leaching. The nutrients of greatest water quality concern are nitrogen and phosphorus, animal waste is a source of both (Ribaudo *et al.*, 2004).

Emissions of ammonia (NH3-N), as well as other gases and particulates, to the atmosphere are a growing concern of livestock producers, the general public, and regulators. Concentrated animal feeding operations have been implicated as a major contributor to these emissions (Cole *et al.*, 2005).

Microorganisms associated with manure may present a significant risk to health. The population of several known pathogens may be quite high in manure. Runoff from land application sites may carry large numbers of organisms into streams. Recreational use of the streams may then bring people into direct exposure to large numbers of potentially pathogenic microorganisms. Several disease outbreaks have been associated with manure contamination of water or food that has been contacted by manure (USEPA, 2004). Coliforms bacteria may not cause disease, but may indicate the presence of pathogenic organisms. These organisms may cause: intestinal infections, dysentry, hepatitis, typhoid fever, and cholera in humans (Fleming and Ford, 2001).

Animal feeding operations have been shown to cause significant environmental and public health problems, including nutrient enrichment of surface and ground waters, contamination of drinking water supplies, fish kills, and odors (Copeland and Zinn, 1998).

The objectives of this study were attempting to reduce the harmful effects of farm animal manure on environmental pollution by adding some available feed additive or supplements.

MATERIALS AND METHODS

This experiment was carried out to investigate the effect of adding tafla and yeast on environmental pollution of dairy buffalo manure. Nine lactating buffalo cow at 2nd to 4th lactation with an average body weight 614 ± 24.08 kg were used. The animals were randomly assigned among three experimental tested rations (three animals each) using latin square design. The period of this trial extended for 39 days divided into three experimental periods of (13 days each). Each period consisted of 10 days preliminary period followed by a 3 days as collecting period. The experimental rations were:

1. Control ration: 42% commercial concentrate feed mixture (CFM) + 33% berseem hay + 25% rice straw (on dry matter basis).

2. Tafla supplemented ration: Control ration + 3% Tafla/animal/day (on dry matter basis).
3. Yeast additive ration: Control ration + 20 g Baker's yeast/animal/day (on dry matter basis).

Table (1) shows daily intake of N, P and K (on dry matter basis) of three experimental rations, there are no differences between rations in daily intake of N, P and K.

Table (1): Daily intake of Nitrogen (N), Phosphorus (P) and Potassium (K) of three experimental rations (on dry matter basis).

Experimental rations	N	P	K
		g/ head/ day	
Control ration	188.55	84.77	164.70
Tafla supplemented ration	188.55	84.83	167.50
Yeast additive ration	188.56	84.90	164.90
		Percentage (%)	
Control ration	1.78	0.80	1.55
Tafla supplemented ration	1.72	0.78	1.53
Yeast additive ration	1.77	0.80	1.55

Animals were housed in tie stall pen and CFM were presented twice daily at 6:00 AM and 6:00 PM. Tafla and Yeast additive for treated groups were divided into two equal parts and mixed with CFM. Berseem hay was fed twice daily at 9.00 AM and 7.00 PM. Rice straw was fed once daily at 9.00 PM. Water was available ad lib from automatic drinkers.

Fresh manure sample were collected from each animal daily and making physical and biological analyze before stored in plastic bags for chemical analyze.

Twenty six person were shared in human panel test which conducted to measure and quantify manure samples color grade and odor intensity. Manure color grades used in panel sheet were Brown-Olive, Dark-Green and Yellow-Olive. Human assessors estimate the odor intensity by sniffing the manure samples and choice one odor category from the three categories in panel sheet (Offensive, Faint or Strong).

The recommended methods of manure analysis by Peters *et al.* (2003) were used for the determination manure moisture, pH, N, P and K. In vitro total gas production was determined according to Tilley and Terry (1963).

Bacterial populations in manure were evaluated by weighing 10 g of manure sample into 90 mL of sterile PBS at pH 7.2 in sterile bags, then mixing for 1 min. A serial dilution of 1:10 was aspirated with 1 mL of solution into 9 mL of sterile PBS per tube. Each dilution starting at 1×10^3 to 1×10^7 was plated in each of 2 duplicate plates on the surface of the medium. MacCkonkey agar spread plates were incubated at 37°C for 24 h , after which colony forming units were counted and recorded as (cfu/ g manure) of fresh weight (Panivivat *et al.*, 2004).

Statistical analyses were conducted using General Liner Model (GLM) procedure of SPSS (2001). Duncan's new multiple range test was used to compare means. The following models were used:

$$Y_{ij} = \mu + T_i + e_{ij}$$

Where:

Y_{ij} = The environmental pollution of farm animal waste

μ = general mean.

T_i = The fixed effect of the *ith* treatment, (i = 1, 2, 3).

eij = Random residual error.

RESULTS AND DISCUSSION

Influence of adding tafla and yeast on manure physical pollution

Results from Table (2) and Fig (1) elucidate the effects of tafla supplemented and yeast additive used in this experiment on manure physical characteristics. Differences in color grade were not affected by adding. The color score for control, tafla additive and yeast additive were 2.48±0.098, 2.33±0.092 and 2.37±0.095 respectively.

The effect of adding tafla and yeast on manure odor was highly significant (P<0.01). Table (2) shows that manure from animals fed tafla supplemented ration had the lowest odor intensity followed by manure from animals fed yeast additive ration, while manure from animals fed control ration had the highest odor intensity (1.83±0.058, 2.42±0.048 and 2.68±0.064 respectively). This modification may be due to a masking effect directly associated with the excreted urine fraction. Similar findings were obtained by Anonymous (1972) and Kellems *et al.* (1979) who reported that rations supplemented reduced the offensiveness of odors associated with the feedlot manure. On the other hand, Ingram *et al.* (1973) and Powers *et. al.* (1999) found that rations supplemented and additive with Lactobacillus acidophilus, yeast, activated charcoal and sagebrush had no effect on olfactory evaluation of the waste subsequently produced.

The manure moisture percentage were affected significantly by adding tafla and yeast, manure from animals fed tafla supplemented ration had the lowest moisture percentage followed by manure from animals fed yeast additive ration, while manure from animals fed control ration had the highest moisture percentage (78.90±0.23, 80.60±0.26 and 84.38±0.26 % respectively) (Table 2). The present result was in agreement with those observed by Kellems *et al.* (1979) who reported that moisture content of the waste was the most highly correlated with volatilization of nitrogenous gases from animal waste.

Table (2): Influence of adding tafla or yeast to dairy buffalo ration on physical characteristics of fresh manure (on dry matter basis) (Means±SE).

Rations (Σn =162)	No.	Color NS	Odor **	Moisture **	pH **
Control ration	54	2.48±0.098	2.68^a ±0.064	84.38^a ±0.26	6.75^b ±0.01
Tafla supplemented ration	54	2.33±0.092	1.83^c ±0.058	78.90^c ±0.23	7.02^a ±0.02
Yeast additive ration	54	2.37±0.095	2.42^b ±0.048	80.60^b ±0.26	6.99^a ±0.02

Means within the same raw with different superscript are significantly different
NS = Not significant ** = Highly significant

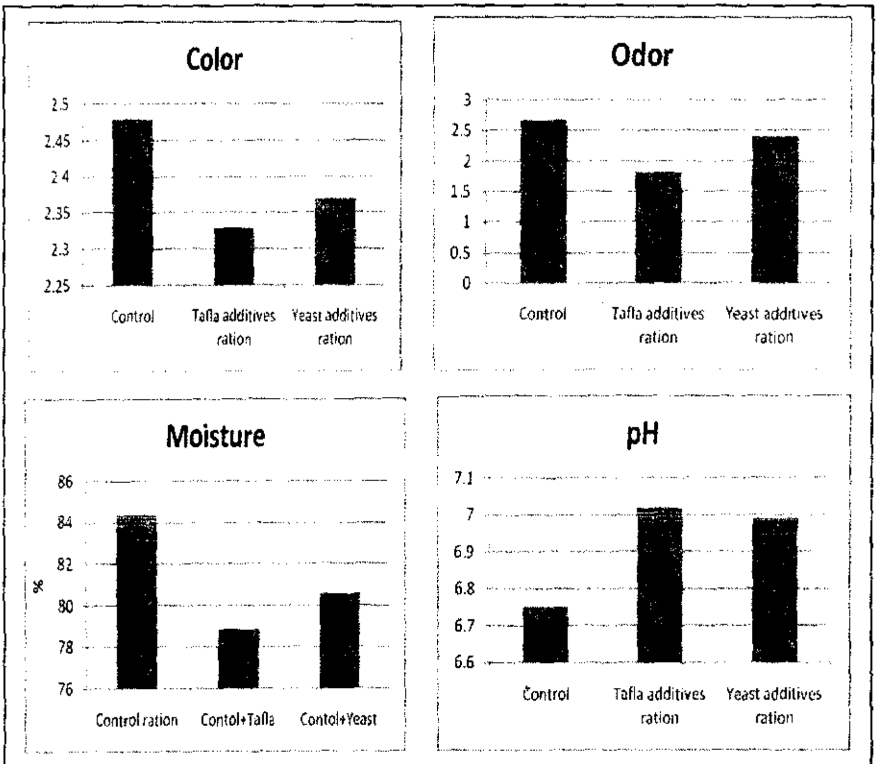

Fig (1): Influence of adding tafla or yeast to dairy buffalo ration on physical characteristics of fresh manure

The effect of adding tafla and yeast on manure pH value was highly significant (P<0.01) but within normal range. Manure from either animals fed tafla supplemented ration or animals fed yeast additive ration had the highest pH value than manure from animals fed control ration (7.02±0.02, 6.99±0.02 and 6.75±0.01respectively) (Table 2). Highest pH value of manure from animals fed tafla supplemented ration may be due to reduced in microorganism activity because of tafla clays binding effect on nutrients mainly nitrogen which lead to reduced ammonia releasing rate. Also, highest pH value of manure from animals fed yeast additive ration may be due to improvement in nutrients digestibility mainly nitrogen and reduced ammonia releasing rate. Similar findings were obtained by Mahender *et al.,* (2006) and Srinivas Kumar *et al.* (2010).

Influence of adding tafla or yeast on manure chemical pollution

The effects of adding tafla and yeast on manure chemical characteristics are shown in Table (3) and Fig (2). Manure from animals fed tafla supplemented ration was lower in nitrogen percentage (P<0.01) than either manure from animals fed yeast additive ration or manure from animals fed control ration (0.433±0.011, 0.467±0.012 and 0.498±0.013 % respectively). Differences in manure nitrogen percentage between manure from animals fed yeast additive ration and manure from animals fed control ration were significant (Table 3).

Manure from animals fed tafla supplemented ration had the lowest phosphorus percentage (P<0.01) followed by manure from animals fed yeast additive ration, while manure from control ration had the highest phosphorus percentage (0.105 ± 0.001, 0.108 ± 0.001 and 0.121 ± 0.001% respectively) (Table 3).

Manure from animals fed tafla supplemented ration and animals fed yeast additive ration were lower in potassium percentage (P<0.01) than manure from animals fed control ration (0.377 ± 0.004, 0.374 ± 0.003 and 0.395 ± 0.006 % respectively) (Table 3).

Table (3): Influence of adding tafla or yeast to dairy buffalo ration on chemical characteristics of fresh manure (on dry matter basis) (Means±SE).

Rations (Σn =162)	No.	N % **	P % **	K % **
Control ration	54	0.498^{a} ±0.013	0.121^{a} ±0.001	0.395^{a} ±0.006
Tafla supplemented ration	54	0.433^{b} ±0.011	0.105^{c} ±0.001	0.377^{b} ±0.004
Yeast additive ration	54	0.467^{a} ±0.012	0.108^{b} ±0.001	0.374^{b} ±0.003

Means within the same raw with different superscript are significantly different
** = Highly significant

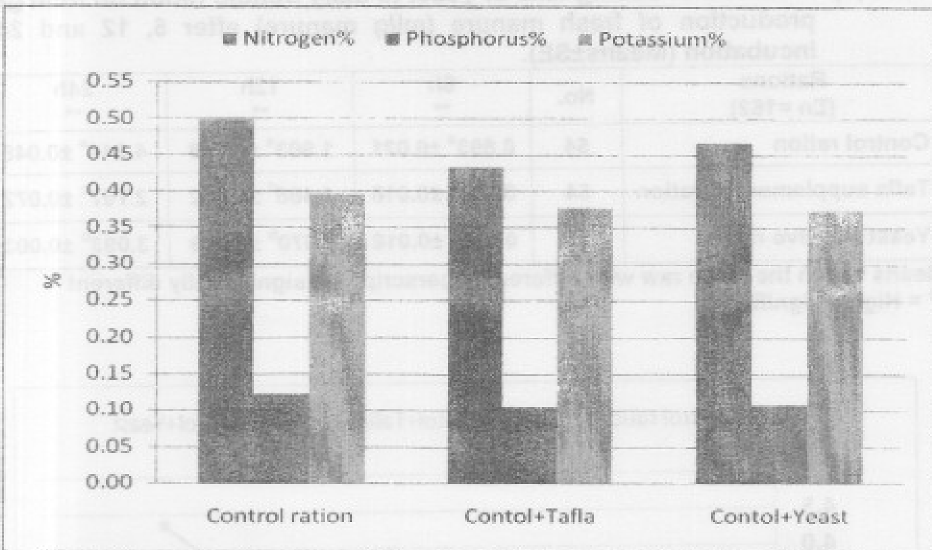

Fig (2): Influence of adding tafla or yeast to dairy buffalo ration on fresh manure N, P and K %

Similar findings were obtained by Mahender *et al.* (2006) and Srinivas Kumar *et al.* (2010) they found that N and P excreted in manure (as percent of intake) decreased significantly with yeast culture supplementation (*Saccharomyces cerevisiae*) in the diet compared to control group. Also, (Abd El-Baki, *et al.,* 2001;2003, El-Tahan, *et al.,* 2005 and Kattab, *et al.,* 2009) reported that natural clays (Bentonite, Kaolin and Tafla) are crystalline alumino-silicates characterized by their ably to exchange cations, adsorption and binding without major changes in structure.

Table (4) and Fig (3) illustrate that the effects of adding tafla and yeast on manure total gas production after 6, 12 and 24h of incubation were highly significant ($P<0.01$). After 6h of incubation, manure from animals fed tafla supplemented ration and animals fed yeast additive ration were lower in total gas production than manure from animals fed control ration (0.633±0.018, 0.674±0.016 and 0.893±0.021 ml/g manure, respectively).

After 12h of incubation, manure from animals fed tafla supplemented ration had the lowest gas production followed by manure from animals fed yeast additive ration, while manure from animals fed control ration had the highest gas production (1.485±0.032, 1.570±0.029 and 1.903±0.028 ml/g manure, respectively). Similar results were evident after 24h of incubation (2.767±0.072, 3.093±0.003 and 4.341±0.048 ml/g manure, respectively).

Table (4): Influence of adding tafla or yeast to dairy buffalo ration on total gas production of fresh manure (ml/g manure) after 6, 12 and 24h incubation (Means±SE).

Rations (Σn =162)	No.	6h **	12h **	24h **
Control ration	54	0.893[a] ±0.021	1.903[a] ±0.028	4.341[a] ±0.048
Tafla supplemented ration	54	0.633[b] ±0.018	1.485[c] ±0.032	2.767[c] ±0.072
Yeast additive ration	54	0.674[b] ±0.016	1.570[b] ±0.029	3.093[b] ±0.003

Means within the same raw with different superscript are significantly different
**** = Highly significant**

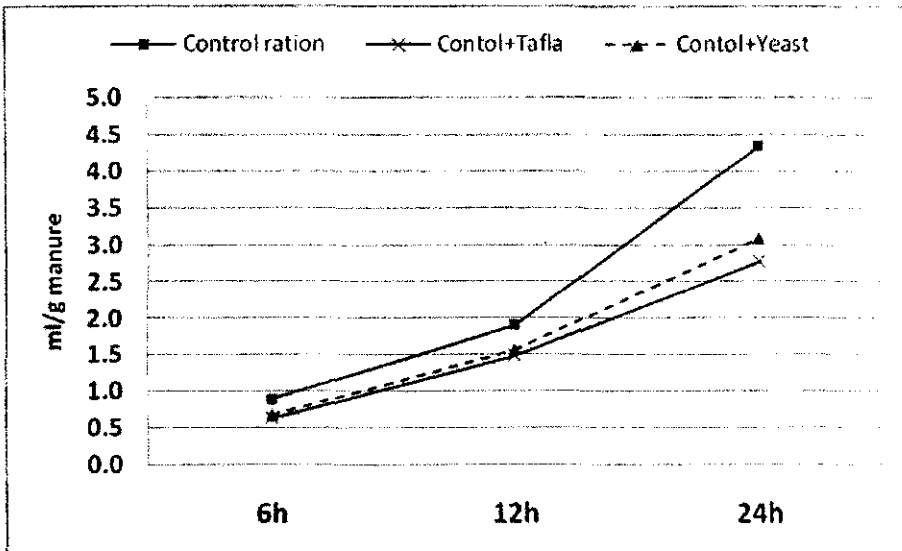

Fig (3): Influence of adding tafla or yeast to dairy buffalo ration on fresh manure total gas production after 6, 12 and 24h of incubation

Reduction in total gas production for manure from animals fed tafla supplemented ration and animals fed yeast additive ration than manure from animals fed control ration through different incubation times may be due to the reduction in manure nutrients content mainly nitrogen which causer gaseous N emissions from manure. Similar findings were noticed by Korevaar, (1992) and Smits *et al.* (1997); Paul *et al.* (1998); James *et al.* (1999) and Spiehs and Varel (2009) who reported that Release of ammonia from manure was reduced when dietary crude protein content was reduced.

Influence of adding tafla or yeast on manure biological pollution

The effects of adding tafla and yeast on manure coliforms count are shown in Table (5) and Fig (4). Manure from animals fed tafla supplemented ration had the lowest (P<0.01) coliforms count followed by manure from animals fed yeast additive ration, while manure from animals fed control ration had the highest coliforms count (5.31±0.020, 5.44±0.012 and 6.46±0.015 cfu Log10/g manure, respectively). The reduction of manure coliforms count from animals fed tafla supplemented ration and animals fed yeast additive ration than animals fed control ration may be due to the reduction in manure moisture percentage and nutrients content (mainly nitrogen which play mainly role in manure coliforms activity). Similar findings were observed by Van Vliet *et al.* (2007) who found that fecal bacteria biomass concentration was highest in high-protein, high-energy diets.

Table (5): Influence of adding tafla or yeast to dairy buffalo ration on coliforms count in fresh manure (cfu Log10/g manure) (Means±SE).

Rations (Σn =162)	No.	coliforms count cfu Log10/g **
Control ration	54	$6.46^{a} \pm 0.015$
Tafla supplemented ration	54	$5.31^{c} \pm 0.020$
Yeast additive ration	54	$5.44^{b} \pm 0.012$

Means within the same raw with different superscript are significantly different
** = Highly significant

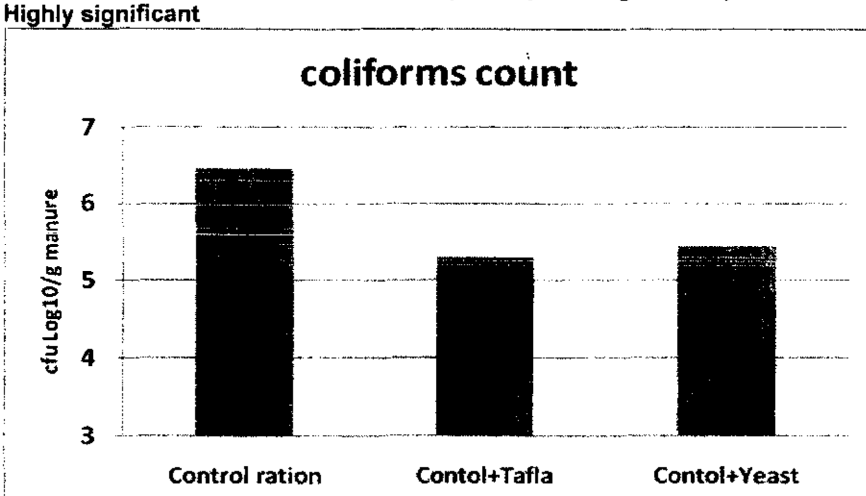

Fig (4): Influence of adding tafla or yeast to dairy buffalo ration on fresh manure coliforms count

This experiment was conduct to study the possibility of reducing the impact of environmental pollution resulting from manure by adding tafla and yeast to animal ration. Accordingly, from the studies it could be concluded that using feeding supplemented and additives (such as Tafla and Yeast) lead to reduction in physical, chemical and biological pollution from manure which may be refer to it's roles in improvement digestibility of some nutrients in digestive system of ruminants as expected in previous studies.

REFERENCES

Abd El-Baki, S. M., S. M. Bassuny, A. M. Aiad and E. M. Hassona (2001). Clays in animal nutrition, 9. In vitro adsorption of ammonia by some local clays and using tafla clays in pelleted complete feed containing urea for sheep. Egyptian J. Nutrition and Feeds, 4(special issue):77-87.

Abd El-Baki, S. M., S. M. Bassuny, H. M. Ghanem, R. I. Moawd and A. H. Ghoneim (2003). Clays in animal nutrition, 2. Study on using tafla in buffalo bull calves feeding. Egyptian J. Nutrition and Feeds, 6(special issue):703-708.

Anonymous. (1972). Sagebrush for odor control: in the feed or the manure? feedlot Manage. 14:74.

Cole, N. A., R. N. Clark, R. W. Todd, C. R. Richardson, A. Gueye, L. W. Greene and K. McBride (2005). Influence of dietary crude protein concentration and source on potential ammonia emissions from beef cattle manure. J. Anim. Sci. 83:722-731.

Copeland, C. and J. Zinn (1998). Animal Waste Management and the Environment: Background for Current Issues, CRS Report 98-451, for congress p. 40, May 12, 1998.

El-Tahan, A. A. H., R. I. Moawd, A. A. Zaki and M. Marghany (2005). Effect of adding tafla clay on performance of growing calves fed rations containing maize silage. Egyptian J. Nutrition and Feeds, 8(special issue):167-178.

Fleming, R. and M. Ford (2001). Humans versus Animals - Comparison of Waste Properties. Available online at: http://www.ridgetownc.com/research/documents/ fleming_huvsanim0107.PDF. Date accessed: 7/1/ 2011.

Ingrain, S. H., R. C. Albin, C. D. Jones, A. M. Lennon, L. F. Tribble, L. B. Porter and C. T. Gaskins (1973). Swine fecal odor as affected by feed additives. J. Anita. Sci. 36:207 (Abstr.).

James, T., D. Meyer, E. Esparza (1999). Effects of dietary nitrogen manipulation on ammonia volatilization from manure from holstein heifers. J. Dairy Sci. 82:2430–2439.

Kattab, H. M., H. M. El-Ssyed, A. M. Mansour, S. A. Emara and G. A. Gouda (2009). Effect using clay minerals (bentonite & tafla) and baker's yeast on the digestibility and metabolism in high roughage rations of lactating buffaloes. Egyptian J. Nutrition and Feeds, 12(3) special issue:59-70.

Kellems, R. O., J. R. Miner and D. C. Church (1979). Effect of Ration, Waste Composition and Length of Storage on the Volatilization of Ammonia, Hydrogen Sulfide and Odors from Cattle Waste. J. Anim. Sci. 48:436-445.

Korevaar, H. (1992). The nitrogen balance on intensive Dutch dairy farms: a review. Livest. Prod. Sci. 31:17–27.

Mahender, M., V. L. K. Prasad and G. V. N. Reddy (2006). Effect of yeast culture on growth and nutrient utilization in Nellore lambs. Indian Journal of Animal Nutrition 23(1): 10-13.

Panivivat, R., E. B. Kegley, J. A. Pennington, D. W. Kellogg, S. L. Krumpelman (2004). Growth performance and health of dairy calves bedded with different types of materials. J. Dairy Sci. 87: 3736-3745.

Paul, J. W., N. E. Dinn, T. Kannangara and L. J. Fisher (1998). Protein Content in Dairy Cattle Diets Affects Ammonia Losses and Fertilizer Nitrogen Value. Journal of Environmental Quality 27(3): 528-534.

Peters, J., S. Combs, B. Hoskins, J. Jarman, J. Kovar, M. Watson, A. Wolf and N. Wolf (2003). Recommended methods of manure analysis. University of Wisconsin, Madison, WI. http://learningstore.uwex.edu/pdf/A3769.pdf.

Powers, W. J., H. H. Van Horn, A. C. Wilkie, C. J. Wilcox and R. A. Nordstedt (1999). Effects of anaerobic digestion and additives to effluent or cattle feed on odor and odorant concentrations. J. Anim. Sci. 77:1412-1421.

Ribaudo, M., N. Gollehon, M. Aillery, J. Kaplan, R. Johansson, J. Agapoff, L. Christensen, V. Breneman and M. Peters (2004). Manure management for water quality: costs to animal feeding operations of applying manure nutrients to land. U.S. Department of Agriculture, Economic Research Service, Resource Economics Division. Agricultural Economic Report 824.June 2004.

Satter, L. D., T. J. Klopfenstein and G. E. Erickson (2002). The role of nutrition in reducing nutrient output from ruminants. J. Anim. Sci. 80:143-156.

Smits, M. C. J., H. Valk, G. J. Monteny and van A. M. Vuuren (1997). Effect of protein nutrition on ammonia emission from cow houses. Pages 101–107 in Gaseous Nitrogen Emissions from Grasslands. S. C. Jarvis and B. F. Pain, ed. CAB International, Wallingford, Oxon 0X10 8DE U.K.

Spiehs, M. J. and V. H. Varel (2009). Nutrient excretion and odorant production in manure from cattle fed corn wet distillers grains with solubles. J Anim Sci.87:2977-2984.

SPSS (Statistical Package for Social Science) program version 11.0, (2001)

Srinivas Kumar D,, J. Rama Prasad, E. Raghava Rao and K. Sarjan Rao (2010). Effect of yeast culture supplementation on nutrient utilization in Graded Murrah buffalo bull calves. Livestock Research for Rural Development. Volume 22, from http://www.lrrd.org/lrrd22/7/kuma22125.htm.

Tilley, J. M. A. and R. A. Terry (1963). A two-stage technique for in vitro digestion of forage crops. J. Br. Grassl. Soc. 18:104.

US Environmental Protection Agency (USEPA). 2004. Risk Assessment Evaluation for Concentrated Animal Feeding Operations. U.S. Environmental Protection Agency, Cincinnati, Ohio, EPA/600/R-04/042, May 2004.

Van Vliet, P. C. J., J. W. Reijs, J. Bloem, J. Dijkstra and R. G. M. de Goede (2007). Effects of Cow Diet on the Microbial Community and Organic Matter and Nitrogen Content of Feces. J. Dairy Sci. 90:5146–5158.

تقليل التلوث البيئى للسباخ بإضافة الطفلة والخميرة لعلائق الجاموس الحلاب

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الملخص العربي

أجريت هذه الدراسة فى وحدة الجاموس البحثية التابعة لقسم الإنتاج الحيوانى بكلية الزراعة- جامعة المنوفية بشبين الكوم من عام ٢٠٠٩ م إلى عام ٢٠١٠م. استخدم عدد ٩ جاموسة فى موسم حليب الثانى والرابع بمتوسط وزن ٦١٤± ٢٤,٠٨ كجم. وتم تقسيمها عشوائياً بين ثلاث علائق تجريبية (٣حيوانات/ مجموعة)، وهى عليقة المقارنة (٤٢% مخلوط علف مركز + ٣٣% دريس برسيم + ٢٥% قش أرز، العليقة المقارنة + ٣% طفلة/حيوان/يوم، العليقة المقارنة + ٢٠جم خميرة الخباز/حيوان/يوم (على أساس المادة الجافة). وتم تجميع عينات السباخ الطازج من كل حيوان يومياً وأجري عليها التحليل الطبيعى والكيماوى والبيولوجى. وكان الهدف من الدراسة هو محاولة تقليل التأثيرات الضارة لمخلفات الحيوانات المزرعية على البيئة عن طريق استخدام بعض الإضافات الغذائية المتاحة.

ويمكن تلخيص النتائج فى أن إضافة الطفلة أوالخميرة أدى إلى تقليل كثافة رائحة السباخ الناتج عنها فى العليقة المقارنة، كذلك إنخفضت نسبة الرطوبة فى السباخ الناتج من الحيوانات التى غذيت على إضافات الطفلة أو الخميرة عنها فى السباخ الناتج من التغذية على العليقة المقارنة. كما تأثرت درجة الحموضة بالمعاملات عنها فى العليقة المقارنة. كما أن % النيتروجين كانت أقل بدرجة معنوية فى حالة إضافة الطفلة (٠,٤٣٣%) عنها فى حالة إضافة الخميرة أو العليقة المقارنة (٠,٤٦٧، ٠,٤٩٨% على التوالى). كذلك % الفوسفور كانت أقل بدرجة معنوية فى حالة إضافة الطفلة (٠,١٠٥%) عنها فى حالة العليقة المقارنة (٠,١٢١%) وكانت متوسطة فى حالة إضافة الخميرة (٠,١٠٨%). وكانت % البوتاسيوم كانت أقل بدرجة معنوية فى حالة إضافة الطفلة أو إضافة الخميرة (٠,٣٧٧، ٠,٣٧٤% على التوالى) عنها فى

حالة العليقة المقارنة (٠,٣٩٥%). أما بالنسبة لكمية الغاز المنتجة من السباخ بعد مدة تحضين ٦،١٢،٢٤ ساعة فكانت أقل بدرجة معنوية فـي حالـة إضـافة الطفلـة (٠,٦٣٣، ١,٤٨٥، ٢,٧٦٧مل/جم سباخ على التوالى) تلاها إضافة الخميرة (٠,٦٧٤، ١,٥٧٠، ٣,٠٩٣ مل/جـم سباخ على التوالى) وكانت أعلاها فى حالـة العليقـة المقارنـة (٠,٨٩٣، ١,٩٠٣، ٤,٣٤١ مل/جم سباخ على التوالى). وكان عدد خلايا بكتيريا الكوليفورم أقل بدرجة معنوية فـي حالـة إضافة الطفلة تلتها إضافة الخميرة وكانت أعلاها فى حالة العليقة المقارنـة (٥,٣١ ، ٥,٤٤، ٦,٤٦ لو١٠ خلية بكتيرية/ جم سباخ على التوالى).