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PERFORMANCE OF GROWING OSSIMI LAMBS FED ON RATIONS CONTAINING FUNGAL TREATED BANANA LEAVES WITH OR WITHOUT YEAST ADDITION.

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SUMMARY

Twenty four growing Ossimi lambs were used to investigate the effect of replacing clover hay (CH) in ration by fungal treated banana leaves (TBL) on nutrients digestibility and growth performance. Chopped banana leaves (2-3 cm) were treated by P*leurotus Ostreatus* fungi and incubated at room temperature for four weeks. Then, the treated banana leaves were replaced clover hay without or with yeast culture in growing Ossimi male lambs rations for 104 days in growing and metabolism trials. The experimental rations were concentrate feed mixture (CFM) plus CH (control, R1), CFM plus CH plus 3 gm yeast culture, *Saccharomyces cerevisia*, /h/d. (R2), CFM plus TBL (R3) and CFM plus TBL plus 3 gm yeast culture/h/d. Concentrate feed mixture was offered for all animals by 2% of live body weight while roughages were offered *ad lib*. Results indicated that fungal treatment for banana leaves decreased CF and fiber fractions content and increased CP content. Feeding lambs on R3 significantly ($P<0.05$) improved all of nutrients digestibility compared with those fed on R2. The nutritive values as total digestible nutrients (TDN) and digestible crude protein (DCP) for lambs fed on R3 had the same trend of nutrients digestibility. Adding yeast culture in R2 and R4 improved digestion coefficients of nutrients, TDN, DCP and NB compared with R1 and R3. The highest average daily gain. ADG, (209 g) and best feed conversion, 4.74 g DMI/ g gain, were recorded with lambs fed R4, while, the lowest ADG (165 g) and worst feed conversion (5.39 g) were recorded with lambs fed R1. The lowest feed cost (6.60 L.E. / 1 kg gain) was recorded with lambs fed on R4 followed by those fed on R3 (6.79 L.E.). Meanwhile, it can be concluded that fungal treated banana leaves can be replace clover hay in growing lambs rations to decrease the feeding cost without negative effect on digestion or growth performance.

Keywords: *banana leaves; fungal treatment; clover hay; growing lambs.*

INTRODUCTION

In Egypt, there is a limitation in the cultivated area and at the same time there is a high increasing in the population rate. Thus, there is a serious shortage in animal feeds, causing high negative effects on livestock production. Meanwhile, it is very important to use the unconventional sources as animal feeds. Agricultural wastes and by-products seem to overcome partially this problem. Millions of tons of these materials are produced annually and most of them are burned leading to environmental pollution and subsequent health hazards.

Banana leaves is one of the agricultural wastes which are available almost at all the year. The cultivated area from banana plant represents about 45.000 feddans (Ministry of Agriculture and Reclaiming lands, 2005) which given about 40 tons per feddan of banana wastes. Chemical composition of banana leaves is much closer to clover but there are some factors limiting the utilization of these wastes for example their low nitrogen content, high fiber and lignocelluloses content and hence low palatability and digestibility. To maximize the utilization from these wastes as ruminant feeds different treatments (physical, chemical and biological) were carried out to destroy the linkages between cellulose, hemicelluloses and lignin (El-Ashry *et al.*, 2003 and Galila and Ali, 2005). Fungal treatment can be an approach to convert the low quality agricultural wastes into higher quality feeds for ruminants (Isroi *et al.*, 2011and Lixia *et al.*, 2011).

Yeast, *Saccharomyces cerevisia*, as a probiotic was incorporated in ruminant rations to improve the utilization from these rations (Ali, 2005, Moallem *et al.*, 2009 and Khotsakdee *et al.*, 2010).

The objective of the present study was to investigate the impact of replacing clover hay by fungal treated banana leaves with or without yeast addition in rations on growth performance of growing lambs.

MATERIALS AND METHODS

Preparation of banana leaves and fungal treatment:

Banana leaves was obtained from experimental farm of Faculty of Agriculture Cairo University and rinsed in water and chopped into 2-3 cm. Chopped banana leaves were sterilized in boiled water for 2 hrs then it were mixed with sterilized ground potato jacket by 10% (w/w), to increase the efficiency of fungal treatment as mentioned by Galila and Ali (2005) and packed in bags (1 kg/bag). Bags were inoculated with 10% (w/w) of *Pleurotus Ostreatus* spawn and incubated at room temperature (28-35 °C) for 4 weeks.

Growth trial:

Twenty four growing Ossimi male lambs (27.5 kg average live body weight and 6-7 months old) were randomly divided according to their live body weight into four feeding groups (6 each) in a growth trial for 90 days. Concentrate feed mixture, CFM, (13.85% CP and 60% S.V.) was offered for all animals by 2% of live body weight while, roughages (clover hay, CH, or fungal treated banana leaves, TBL) were offered *ad lib.* The experimental rations were: R1) CFM+ CH (control), R2) CFM+CH+3 gm yeast/h. /d., R3) CFM+ TBL and R4) CFM+ TBL+3 gm yeast/h./d. Amounts of CFM were adjusted biweekly according to live body change. Drinking water was available at all time. Feed intake was daily recorded; meanwhile, daily body weight gain and feed conversion (g feed/g gain) were calculated biweekly.

Metabolism trial:

At the end of the growth trial, four animal of each group were used in metabolism trials. Animals were dwelled in metabolic cages for seven days as a preliminary period, and then feces and urine were collected during the next seven days. Samples represented tenth of the voided feces and excreted urine were taken daily just after collection. Urine samples were stored in tight bottles containing sulfuric acid (1:1) and refrigerated at 4°C for nitrogen determination. Feces samples were weighted and dried at 60°C /12 hrs. in a hot oven. Dried samples of feces and feeds were ground to pass through 1-mm sieve, and it was stored in emeried bottles for chemical analysis. Meanwhile, digestion coefficient and nutritive value of the experimental rations were calculated.

Chemical analysis:

The proximate analysis of feeds, feces and urine were carried out according to the conventional method of A.O.A.C. (1995). Cell wall constituent were determined according to Goering and Van Soest (1970).

Statistical analysis:

Data were statistically analyzed using general liner of SAS (1986). Significant differences between means were tested by multiple rang test (Duncan, 1955).

RESULTS AND DISCUSSION

Data in Table (1) represents the chemical composition of feedstuffs and showed that fungal treatment of banana leaves decreased the contents of OM, EE, CF, NDF, ADF, ADL, hemicellulose and cellulose by 2.5, 21.6, 31.2, 42.2, 53.6, 16.3 and 60.5%, respectively compared with untreated banana leaves. These results are in agreement with the findings of Yang *et al.* (2010) and Zeng *et al.*, (2011). This reduction in CF and fiber fractions contents may be due the influence of cellulase enzymes secreted by fungi that brake down the linkage between structure carbohydrate and lignin (Fazaeli *et al.*, 2004). While, the fungal treatment increased CP and ash contents of treated banana leaves by 38.8 and 17.8%, respectively compared with raw banana leaves. This increase in CP content may be due to the relatively high of

protein content in fungal mycelium (Mariel *et al.*, 2011) while, the increase in ash content may be reflect the decrease in OM content (Yang *et al.*, 2010).

Table (1): Chemical composition of feedstuff (as DM basis).

Item	Feedstuff			
	Concentrate feed mixture (CFM)*	Clover hay (CH)	Banana leaves (BL)	Biologically treated banana leaves (TBL)
Chemical composition, %				
OM	90.81	88.01	87.85	85.69
CP	13.85	12.25	13.25	18.39
EE	2.24	1.85	1.39	1.09
CF	9.50	32.42	23.25	15.99
NFE	65.22	41.49	49.96	50.22
Ash	9.19	11.99	12.15	14.31
Fiber fractions, %				
NDF	40.32	68.66	45.95	26.54
ADF	18.99	45.25	31.99	14.85
ADL	5.22	10.99	12.65	7.21
Hemicellulose	21.33	23.41	13.96	11.69
Cellulose	13.77	34.26	19.34	7.64

**CFM consists of 40% yellow corn, 30%cottonseed meal, 25% wheat bran, 3% lime stone, 1% salt and 1% minerals and vitamins.*

Data in Table (2) showed that replacing clover hay (CH) in R1 by fungal treated banana leaves (TBL) in R3 significantly ($P<0.05$) improved the digestibility of DM, OM, CP, EE, CF, NFE, cellulose, hemicelluloses by 6.7, 3.6, 5.6, 2.4, 4.2, 1.9, 8.9 and 7.4%, respectively. This improvement may be due to that TBL contains higher CP content (18.39%) and lower CF content (15.99%) than CH (12.25 and 32.42%, in the same order). The nutritive values as TDN and DCP have the same trend, being 76.33 and 11.13% and 79.16 and 12.09%, respectively for R1 and R3 rations. This result may be due to the higher nutrients digestibility in R3 ration than in R1 ration. Feeding lambs on R3 improved nitrogen balance compared with those fed on R1, being 4.98 vs. 2.56 g, respectively. This improvement in nitrogen balance may be due to the high digestion coefficient of CP in R3.

Table (2): Digestion coefficients, nutritive value and nitrogen balance of growing lambs fed the experimental rations.

Item	Experimental rations				±SE
	R1	R2	R3	R4	
Digestion coefficients, %					
DM	78.95^{c}	82.33^{b}	84.25^{a}	85.32^{a}	0.53
OM	84.26^{c}	86.31^{b}	87.31^{ab}	88.98^{a}	0.83
CP	76.21^{c}	79.98^{b}	80.45^{b}	83.21^{a}	0.46
EE	85.16^{c}	86.22^{bc}	87.21^{ab}	88.40^{a}	0.59
CF	73.66^{c}	77.02^{b}	76.77^{b}	79.65^{a}	0.24
NFE	87.21^{b}	88.02^{ab}	88.89^{a}	90.06^{a}	0.82
Fiber fractions digestibility, %					
Cellulose	54.75^{c}	61.57^{b}	59.60^{b}	66.32^{a}	0.92
Hemicellulose	59.87^{c}	65.33^{b}	64.32^{b}	69.75^{a}	0.53
Nutritive value, %					
Total digestible nutrients, TDN	76.33^{c}	78.87^{b}	79.16^{b}	80.56^{a}	0.21
Digestible crude protein, DCP	11.13^{c}	11.97^{b}	12.09^{b}	12.48^{a}	0.05
Nitrogen balance					
Nitrogen intake, g/h/d.	9.72	10.43	11.54	13.24	
Fecal intake, g/h/d.	2.31	2.08	2.45	2.39	
Urine intake, g/h/d.	4.85	4.57	4.99	5.87	
Nitrogen balance, g.	2.56^{c}	3.78^{b}	4.1^{b}	4.98^{a}	0.15

^{a,b,c} Means in the same row with different superscripts are significantly differ ($P<0.05$).

R1: CFM+CH R2: CFM+CH+3 g yeast/h/d R3: CFM + TBL R4: CFM+ TBL+ 3 g yeast/h/d

The best feed conversion (g DMI/g gain) was recorded with feeding lambs on R4 (4.74 g) followed by those fed on R3 then those fed on R2, being 4.97 and 5.14 g, respectively while the worst one recorded with lambs fed on R1 (5.39 g).

Incorporating yeast culture in growing lambs rations (R2 and R4) significantly ($P<0.05$) improved nutrients digestibility compared with R1 and R3. This improvement may be resulting from the increase in the numbers of bacteria, especially cellulatic bacteria, and fungi in rumen (Wiedmeier *et al.*, 1987). The improvement in nutrients digestibility with adding yeast culture was reflected on a significant ($P<0.05$) improvement in the nutritive values as TDN and DCP and nitrogen balance in R2 by (3.3, 7.5 and 47.7%) and R4 by (1.8, 3.2 and 21.5%) compared withR1 and R3, respectively. Data indicated that there was no significant ($P<0.05$) difference in the nutritive value either TDN or DCP and nitrogen balance between R2 and R3.

Data of feed intake and growth performance of growing lambs fed the experimental rations in Table (3) showed lambs fed on R3 had high significant ($P<0.05$) average daily gain, ADG, compared with those fed on R1, being 190 vs. 165 g/h/d., respectively. Such difference is fairly regarded to the type of roughage as mentioned by Taie (1997). Addition of yeast in R2 and R4 significantly ($P<0.05$) improved ADG to 185 and 209 g/h/d. compared with those fed R1 and R3, being 165 and 190 g/h/d. in the same order. This improvement may be due to the increase in CP digestibility in these rations (Haddad and Goussous, 2005).

Total dry matter intake (DMI) was higher in R3 than R1 (945 vs. 890 g/h/d.). This result may be due to the high digestible crude protein in R3 than R1 (Ruiz *et al.*, 1995). Yeast addition in R2 and R4 increased DMI by 6.7 and 4.7% compared with R1 and R3, respectively. This increase in DMI may be due to the increase in fermentation capacity of rumen (Hughes, 1987) or to the initiate a dynamic action, that outcome faster passage rate of feed particles in the gastro-intestinal tract (Abd El-Ghani, 2004).

Table (3): Impact of feeding experimental rations on nutrients intake, live body weight gain and feed conversion of growing lambs.

Item	Experimental rations				±SE
	R1	R2	R3	R4	
Live body weight, kg					
Initial live body weight	27.6	27.4	27.6	27.5	
Final live body weigh	42.45^{c}	44.05^{b}	44.70^{b}	46.31^{a}	0.34
Total body weight gain	14.85^{c}	16.65^{b}	17.10^{b}	18.81^{a}	0.23
Daily body weight gain	0.165^{c}	0.185^{b}	0.190^{b}	0.209^{a}	0.004
Feed intake, kg, /h/d.					
Concentrate	0.700	0.720	0.720	0.740	
Roughage	0.190	0.230	0.225	0.250	
Total DMI	0.890	0.950	0.945	0.990	
TDN intake	0.679	0.749	0.748	0.798	
Feed conversion, g feed/g gain					
DMI	5.39	5.14	4.97	4.74	
TDN	4.12	4.10	4.00	3.91	

$^{a, b, c}$ *Means in the same row with different superscripts are significantly differ ($P<0.05$).*

R1: CFM+CH R2: CFM+CH+3 g yeast/h/d R3: CFM + TBL R4: CFM+ TBL+ 3 g yeast/h/d

***Economic evaluation*:**

Data in table (4) indicated that the lowest feed cost per 1 kg gain was recorded with feeding lambs rations containing fungal treated banana leaves either without yeast addition (R2) or with yeast addition (R4) compared with those feeding R1 or R2, being 6.6, 6.79, 8.24 and 8.05 L.E./kg gain, respectively.

In view of the obtained results, it can be concluded that clover hay can be replaced by fungal treated banana leaves with/without yeast addition in growing lambs rations to improve the growth performance and to decrease the cost of feeding.

Table (4): Economical evaluation of feeding growing lambs experimental rations.

Item	Experimental rations			
	R1	R2	R3	R4
Price of feed intake, h/d., L.E.*				
CFM	1.12	1.15	1.15	1.18
CH	0.24	0.29	---	---
TPL	---	---	0.14	0.15
Yeast	---	0.05	---	0.05
Feed cost/ daily gain, L.E.	1.36	1.49	1.29	1.38
Feed cost/ kg gain, L.E.	8.24	8.05	6.79	6.60

**Based on market price at the beginning the experiment, the prices were as follow: CFM, 1600; CH, 1250; TPL, 600 (L.E. / ton) and yeast 15 L.E. / kg.*

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كفاءة حملان الاوسيمى النامية المغذاة على علائق محتوية على أوراق الموز المعاملة بالفطر مع إضافة أو عدم إضافة الخميرة.

على محمد على

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تم استخدام 24 حمل اوسيمى نامي لدراسة تأثير استبدال دريس البرسيم بأوراق الموز المعاملة بالفطر على كفاءة هضم العناصر الغذائية وكفاءة النمو والكفاءة الإقتصادية. تم تقطيع أوراق الموز (2-3 سم) ومعاملتها بفطر *Pleurotus ostreatus* والتحضين على درجة حرارة الغرفة لمدة 4 أسابيع . ثم بعد ذلك تم إحلال أوراق الموز المعاملة بالفطر محل دريس البرسيم فى علائق حملان الاوسيمى النامية مع إضافة أو عدم إضافة الخميرة وذلك فى تجربتي نمو وهضم لمدة 104 يوم.

والعلائق المختبرة كانت عبارة عن :

المجموعة الأولى : مخلوط العلف المركز + دريس البرسيم (عليقه المقارنة).

المجموعة الثانية : مخلوط العلف المركز + دريس البرسيم + 3 جم خميرة *Saccharomyces cervisisa* /راس/يوم .

المجموعة الثالثة : مخلوط العلف المركز + أوراق الموز المعاملة بالفطر .

المجموعة الرابعة :مخلوط العلف المركز + أوراق الموز المعاملة بالفطر + 3 جم خميرة *Saccharomyces cervisisa* /راس/يوم .

تم تقديم العلف المركز بما يعادل 2% من الوزن الحي للحملان فى حين تم ترك العلف الخشن ليؤكل حتى الشبع.

أوضحت نتائج التجربة أن المعاملة البيولوجية لأوراق الموز أدت الى تقليل المحتوى من الألياف الخام ومكونات هذه الألياف كما أدت الى زيادة المحتوى من البروتين الخام. أدى تغذية الحملان على العليقه الثالثة إلى تحسن معنويا فى قيم هضم العناصر الغذائية مقارنة بالحملان المغذاة على عليقه المقارنة. وحققت الحملان المغذاة على نفس العليقه (الثالثة) تحسنا فى القيمة الغذائية فى صورتي مركبات غذائية مهضومة كلية أو بروتين خام مهضوم. أدى إضافة الخميرة الى العلائق الثانية و الرابعة الى وجود تحسن فى معاملات هضم العناصر الغذائية، المركبات الغذائية المهضومة الكلية، البرونين الخام المهضوم و ميزان النيتروجين.

كما اشارت نتائج التجربة إلى أن الحملان المغذاة على العليقه الرابعة حققت أعلى زيادة يومية فى الوزن (209 جم/راس/يوم) ,أفضل كفاءة تحويل غذائي (4.74 جم مادة جافة مأكولة/ جم زيادة فى الوزن)، فى حين حققت الحملان المغذاة على العليقه الأولى (المقارنة) أقل زيادة يومية فى الوزن (165 جم/راس/يوم) وأسوء كفاءة تحويل غذائى (5.39 جم مادة جافة مأكولة/ جم زيادة فى الوزن). أقل تكلفة لكل 1 كجم زيادة فى الوزن تم تحقيقها عند تغذية الحملان على العليقه الرابعة حيث سجلت 6.60 جنية يليها الحملان المغذاة على العليقه الثالثة والتى سجلت 6.79 جنية .

من خلال نتائج هذه التجربة يمكن أحلال أوراق الموز المعاملة بفطر *Pleurotus ostreatus* محل دريس البرسيم فى علائق الحملان النامية لتقليل تكاليف التغذية دون تأثيرات سلبية على كفاءة الهضم أو كفاءة النمو. إضافة الخميرة عظم الاستفادة من علائق الحملان النامية سواء المحتوية على دريس البرسيم أو أوراق الموز المعاملة بالفطر.