

EFFECT OF YEAST CULTURE (*Saccharomyces*) SUPPLEMENTATION ON INTAKE, DIGESTIBILITY AND LAMBS PERFORMANCE

I.A.Gomaa, A.H. Mohamed, T.A. Drazz, A. Abd El-Basit and A.M. Abdou

Department of By-Products Research, Animal Production Research Institute, Agricultural Research Center, Giza, Egypt

SUMMARY

The effects of yeast culture supplements (YC) on lambs performance fed on rice straw based rations were investigated. On DM basis, the cultures were supplemented in four levels 0.0, 0.5, 1.0 and 1.5% of the concentrate mixture (CM) for groups Y0, Y1, Y2 and Y3, respectively. To determine the effect the YC on digestibility a metabolism trial was conducted using 12 mature rams.

Twenty four lambs having an initial average weight of 26.5 kg aged 6-8 month were divided randomly into four groups in a feeding trial to study the effect of the YC supplement on the lambs performance. The four groups were fed a restricted amount of CM while *ad-lib*, rice straw (RS) was offered. Non significant effect resulted from (YC) supplement on DMI compared to the control group. Apparent DM digestibilities were lower ($P<0.05$) for rams fed control group (51.46%) than those fed Y1, Y2 and Y3 (55.17, 54.72 and 54.38%, respectively). Apparent OM, CP and CF digestibility followed trends similar to DM.

However, apparent nutrient digestibility decreased with increasing levels of the YC in the tested rations. Supplemented rations with YC improved significantly ($P<0.05$) the nutritive value in terms of SE, TDN and DCP compared to the control ration (Y0). Compared with lambs fed the control group (Y0) average daily gain was improved ($P<0.05$) being 142, 126, 114, g for Y1, Y2 and Y3, respectively. Due to YC supplementation better feed conversion was estimated and the cost for producing one Kg gain by tested growing lambs was reduced compared to the control one.

Keywords: Lambs, yeast culture, intake, digestibility, lambs performance

INTRODUCTION

Feed additives have been used successfully to manipulate rumen microbial activity. Previous studies have suggested that yeast culture supplement can

have a significant impact on the performance of ruminants which will reflect on the production level and cost production (Dawson et al., 1990). The main aim of this experiment is to study the effect of yeast culture supplementation with different levels on intake, digestibility and animal performance.

MATERIALS AND METHODS

This study was carried out at Sids experimental station, Animal Production Research Institute, Ministry of Agriculture in 1994. Four metabolism trials were carried out to determine the digestion coefficient of the tested rations using twelve mature rams divided into four similar groups. Preliminary period lasted for 14 days followed by 10 days collection period. The nutrients intake and excretion were determined to calculate their digestibility and utilization by conventional balance trial methods. The tested animals were fed concentrate mixture to cover maintenance requirement according to the NRC 1988 allowances and rice straw was given *ad-lib*. The rations were supplemented with yeast culture at 0.0, 0.5, 1.0 and 1.5% of the concentrate on (DM basis) for groups Y0, Y1, Y2 and Y3, respectively.

Samples were saved for later analysis. Analytical methods to estimate the nutrients were followed according to A.O.A.C. (1980).

Feeding trials were conducted using twenty four male lambs with an live weight average of 26.5 kg and aged 6-8 months. Animals were divided into four similar groups according to their weight and age. Concentrate mixture was offered twice daily. Rice straw was fed *ad-lib*. The yeast culture was supplemented at 0, 0.5, 1.0 and 1.5 percent of the concentrate for groups Y0, Y1, Y2 and Y3, respectively. Fasted animals were weighed twice in the morning. Fresh water was available at all times. Veterinary care was available for the animals. The data were statistically analyzed according to Steel and Torrie (1960). Significance among groups was tested by Duncan's (1955) Multiple Range Test.

RESULTS AND DISCUSSION

Digestion trials

Chemical composition of ingredients and of whole tested rations fed to lambs are presented in Table (1). Dry matter intake, digestion coefficients and nutritive value of the ingredients and experimental diets are shown in Table(2).

During the metabolic trial the total dry matter intake ranged from 1224 to 1324g being higher for the control group and decreased by increasing the YC percentage in the ration. However, statistical analysis revealed non significant differences. The apparent DM digestibility differed significantly ($P < 0.05$) between the control ration and the three supplemented groups being 51.46, 55.17, 54.72 and 54.38% for Y0, Y1, Y2 and Y3, respectively.

There were no significant differences among the DM digestibility values between the different levels of yeast culture supplementation. Organic matter digestibility followed similar trend showing no significant differences between the different levels of yeast culture supplementation.

Table 1. Chemical composition of ingredients and of whole tested rations

Item	DM%	OM%	CP%	CF%	NFE%	EE%	ASH%
Ingredients							
Rice straw	91.18	84.29	4.32	36.14	42.21	1.62	15.71
Concentrate	90.67	93.49	16.88	12.15	61.05	3.41	6.51
Mix.							
Yeast Culture	96.25	94.39	37.69	1.70	49.50	5.50	5.61
Tested Rations							
Y0	100	88.47	8.65	25.24	52.04	2.54	11.53
Y1	100	88.59	8.86	24.93	52.23	2.57	11.41
Y2	100	88.64	9.00	24.76	52.30	2.58	11.36
Y3	100	88.69	9.13	24.63	52.33	2.60	11.31

Y0 = Control ration

Y1 = Tested ration with 0.5% (YCS)

Y2 = " " " 1.0% (YCS)

Y3 = " " " 1.5% (YCS)

Table 2. Influence of yeast culture supplementation on intake, digestibility and nutritive value

Item	Tested rations				SE
	Y0	Y1	Y2	Y3	
DM intake g:					
Rice straw	871 ^a	813 ^{ab}	787 ^{ab}	764 ^{ab}	1.22
concentrat	453	453	453	453	0.86
yeast culture	-	2.18	3.85	5.78	
Total DM intake	1324 ^a	1267.18 ^{ab}	1243.85 ^{ab}	1223.78 ^{ab}	1.52
Digestion oefficients					
DM	51.46 ^a	55.17 ^b	54.72 ^{bc}	54.38 ^{bc}	0.32
OM	4.83 ^a	58.72 ^b	58.53 ^{bc}	58.17 ^{bc}	0.34
CP	61.46 ^a	68.84 ^b	64.92 ^c	63.64 ^{cd}	0.52
CF	49.55 ^a	54.46 ^b	51.46 ^c	50.68 ^{ad}	0.26
NFE	68.38 ^a	70.54 ^{ab}	69.38 ^{ab}	68.52 ^{ab}	0.44
EE	73.26 ^a	75.08 ^{ab}	74.72 ^{ab}	73.62 ^{ab}	0.58
Nutritive value					
TDN	56.84 ^a	60.88 ^b	59.94 ^{bc}	58.39 ^{bc}	0.36
SE	41.41 ^a	44.95 ^b	43.74 ^{bc}	43.06 ^{bc}	0.19
DCP	6.16 ^a	7.10 ^b	6.75 ^{bc}	6.7 ^{bc}	0.08

a,b,c Means on the same line having unlike superscripts differ significantly (p<0.05).

All the rams were fed on isoprotein ration according to their requirements. The apparent digestibility of crude protein during the digestibility trial was recorded as 61.46, 68.84, 64.92 and 63.64% for Y0, Y1, Y2 and Y3, respectively. The apparent crude protein digestibility was significantly higher for YC groups compared to the control group. These results indicate that digestibility of protein decreased by increasing the level of YC in the ration. Apparent CF digestibility was generally significantly enhanced by YC supplementation. However, The digestibility of CF decreased with increasing YC level in the tested ration from, 54.46% for Y1 to 50.68% for Y3. However, non significant differences were revealed among the supplemented groups. On the other hand, YC has no significant effect on the apparent digestibility of NFE and EE. The supplementation of YC improved ($P < 0.05$) the nutritive value as compared to the control ration being 56.84, 60.88, 59.94 and 58.39% for the TDN, 41.41, 44.95, 43.74, 43.06% for the SE and 6.16, 7.10, 6.75, 6.70 for DCP for Y0, Y1, Y2 and Y3, respectively. There were no significant differences among the nutritive value between the different levels of yeast culture supplementation.

These results were in line with findings of Adams *et al.* (1981); Fallon *et al.* (1987); Wiedneier *et al.* (1987); Olson *et al.* (1994) and Putnam and Schwab (1994) who reported that the (YC) improved digestion coefficient and nutritive value.

Feeding trials

The data of feeding trial are summarized in Table(3). Supplement of YC resulted in decrease of the DMI of rice straw from 672 (control group) to 543 g/h/d for Y3. However, non significant differences were observed among the four tested groups. Concerning the effect of YC supplement on body weight, the results showed that ADG of lambs responded positively to the YC supplement being 142, 126,114 g for Y1, Y2 and Y3, respectively compared to 104 /g/h/d for the control group.

Meanwhile, effect on the ADG was significant ($P < 0.05$) for Y1 and Y2 as compared to Y0 groups.

These results reflect the improvement of the digestion and nutritive value of the tested rations. These results are in agreement with those found by Adams *et al.* (1981); Mould *et al.* (1983-84); Chadmana and Offer (1990); Nisbet and Martin (1991) and Mutsvangwa *et al.* (1992) who stated that the (YC) had a positive effect on the performance. Present results indicated the positive influence of yeast culture supplementation on digestion. This improvement generally was accompanied by increased concentration of cellulolytic bacteria in the rumen (Martin *et al.*, 1989). Although, yeast culture supplementation may not consistently improve the digestibility of fibrous substrate in the rumen, yeast culture supplementation can stimulate the

growth of cellulolytic microorganisms in the rumen (Dawson *et al.*, 1990 and Martin and Nisbet, 1992).

The results of the feeding trials showed that YC supplement resulted in better feed conversion in terms of DMI , TDNI , DCPI / kg gain compare . 12.05 , 8.59 , 9.37 and 10.22 and TDN, 6.85 , 5.23 , 5.54 and 5.97 and SE 5, 3.86 , 4.1 and 4.4 and DCP 0.74, 6.1 ,0.63 and 0.69.

Table 3. Effect of yeast culture supplementation on daily feed intake and the performance lambs

Item	Tested rations			
	Y0	Y1	Y2	Y3
No. of lambs	6	6	6	6
Initial LBW Kg	25.8	25.4	27.8	27.2
Final LBW Kg	35.2	38.20	39.10	37.5
Total gain in LBW	9.4	12.80	11.30	10.3
Av. daily gain g	104 ^a	142 ^b	126 ^c	114 ^{ad}
Dry matter intake g				
Concentrate	589	589	589	589
Rice straw	672 ^a	628 ^{ab}	568 ^{ab}	543 ^{ab}
Yeast culture	-	2.83	5.77	8.78
Total DM intake	1261 ^{ab}	1220 ^{ab}	1163 ^{ab}	1141 ^{ab}
Energy and Protein intake g				
TDN	712.20 ^a	742.7 ^b	698.47 ^{ac}	680.12 ^{ac}
SE	518.87 ^a	548.08 ^b	516.5 ^{ac}	561.55 ^{ac}
DCP	77.18 ^a	86.56 ^b	79.71 ^{ac}	78.04 ^{ac}

a,b, c Means on the same line having unlike superscripts differ significantly (p<0.05).

The data of feed cost and feed cost per unit of gain are presented in Table (4). The cost of feed was the sum of straw plus concentrate and (YC). The cost of other production items were similar for the four experimental groups, therefore the feed costs were only studied. The cost of daily feeds consumed were higher with the three tested groups than the control group. on the other hand, the cost of producing one kg of gain by lambs fed (YC) groups(Y1, and Y2) was lower than the control, but the cost of the production one kg gain for group (Y3) was higher than the control. group .

The lowest cost of feed consumed to produce one kg gain was observed with lambs fed (Y1) ration than the other groups(Y0, Y2 and Y3). The corresponding decrease percentage in cost of producing one kg gain were 20.81 and 4.03% for Y1 and Y2, respectively. The overall results might indicate that the (YC) improved the nutritive value of ration. and the best level of supplementation was between Y1 and Y2 groups. Yeast culture supplementation still need further investigations which will help to improve their influence and hence or reduce their negative effects.

Table 4. Effect of (YCS) ON feed conversation and cost of feed to produce 1 kg gain in weight

Item	Tested rations			
	Y0	Y1	Y2	Y3
Feed conversion				
Av. DM intake kg/ kg gain	12.05	8.59	9.37	10.22
Av. TDN intake kg/ kg gain	6.85	5.23	5.54	5.97
Av. SE intake kg/ kg gain	5.00	3.86	4.1	4.40
Av. DCP intake kg/kg gain	0.74	0.61	0.63	0.69
Total cost LE				
Per av. daily gain	0.49	0.53	0.56	0.60
Per kg gain	4.71	3.73	4.52	5.26

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تأثير إضافة بيئة الخميرة على كل من المأكول ومعاملات الهضم والقيمة الغذائية وكفاءة الحملان

إسماعيل أحمد جمعه، علاء الدين حسن محمد، طارق عبد الوهاب دراز، أحمد عبد الباسط، عزيزه محمود عبده

قسم بحوث استخدام المخلفات، معهد بحوث الإنتاج الحيوانى، مركز البحوث الزراعية، جيزة، مصر

تم إجراء تجارب هضم لدراسة تأثير إضافة بيئة الخميرة بأربع مستويات مختلفة (١، ٥، ١٠، ١٥٪) من كمية المركزات المستخدمة بمعدل ٥٠٠ جم/الرأس/اليوم تم تغذيتها للمجموعات (١، ٢، ٣، ٤) على التوالي.

مع إعطاء قش الأرز للشبع. لوحظ أن إضافة بيئة الخميرة بمستويات مختلفة لم يكن لها تأثير معنوى على المأكول من قش الأرز بينما أدت الإضافة إلى تحسين القيمة الهضمية للمادة الجافة والمادة العضوية والبروتين الخام والألياف الخام زيادة معنوية عن مجموعة المقارنة. بينما كان تأثير بيئة الخميرة على القيمة الهضمية لكل من مستخلص خالى الأروت ومستخلص الأثير تأثيرا غير معنوي. كذلك أدت إضافة بيئة الخميرة إلى تحسين القيمة الغذائية محسوبة كعادل نشا والمركبات المهضومة الكلية والبروتين الخام المهضوم زيادة معنوية. وقد أوضحت نتائج تجربة التغذية أن إضافة بيئة الخميرة أدت إلى زيادة متوسط معدل نمو الحملان للمجموعات (١، ٢) زيادة معنوية مقارنة بالمجموعة (٠) بينما كانت الزيادة غير معنوية بالنسبة لمجموعة (٣). ونتيجة لهذه النتائج فإن الكفاءة التحويلية محسوبة ككمية مادة جافة لازمة لإنتاج كجم نمو قد ارتفعت مما أدى إلى إنخفاض تكاليف إنتاج كجم نمو ٤,٧١، ٣,٣٧، ٤,٥٢، ٥,٢٦ جنيها/كجم نمو للمجموعات (١، ٢، ٣).