

## UTILIZATION OF TWO PLANT PROTEIN SOURCES BY OSSIMI LAMBS

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(Received 14/10/2003, accepted 8/7/2004)

### SUMMARY

Three experimental rations in this study were formulated to determine the impact of protein source i.e, soybean meal (SBM), linseed meal (LSM) and (SBM + LSM) on growth performance of Ossimi lambs.

Seventy-five Ossimi male lambs of average 27.8 Kg body weight were divided into three similar groups and assigned at random to three experimental rations for 105 days. The first group was fed ration containing SBM, the second and third groups were fed ration containing LSM and SBM + LSM respectively. All lambs groups were fed 3% of body weight on concentrate feed mixture plus rice straw *ad Lib*. At the middle of the feeding trials (eight weeks of the start), three-digestibility trials were conducted using three representative lambs from each of the experimental groups to evaluate the nutritional value of the experimental ration. At the end of the digestibility trial, blood samples were taken before feeding and rumen liquor samples were collected at 0, 3 and 6 hrs after morning feeding. Results indicated that there was non-significant effect in feeding values, daily body weight gain of growing lambs, or some blood and rumen parameters.

It can be concluded that substitution of LSM instead of SBM decreases cost of Kg gain and improves economical efficiency.

*Keywords: soybean meal, linseed meal, Ossimi lambs, performance.*

### INTRODUCTION

In Egypt, cotton seed meal (CSM) is the traditional plant protein source used in formulating ruminant concentrate feed mixture (CFM). But yearly quantity of CSM is considered the backbone of CFM produced with contrary, However the CFM production is not sufficient to give CFM to cover livestock requirements (A.E.S.I. 2000). So it is recommended to increase the protein sources to introduce more quantity of CFM. Soybean meal (SBM) is generally regarded as one of the best sources of protein available to animals. It has lower value of fiber than linseed meal (Bechai, 2001). El -

Reweny (1999) reported that SBM has the highest protein quality and has slightly more TDN than CSM or LSM. On the other hand, the classification of ARC (1984) ranks SBM in class (A) including materials with CP degradability from 70 to 90 %

Linseed meal (LSM) is one of most popular protein sources in most countries. Hussin (1998) reported that, in Egypt, LSM is considered as the third important plant protein source in animal feeding. Its popularity is due not to its richness in protein, but even more to its palatability and its slightly laxative effect (Ahmed, 1996). On the other hand, LSM has fair level of calcium, rich in phosphorus and a fair content of the B-

complex vitamins (Goll, 1975). Church (1979) reported that, with poor roughages LSM would be worth more per ton than that CSM. The protein content in LSM is lower than SBM. However, on a comparable protein basis. LSM is equal in feed value to either SBM or CSM (Matsushima, 1979).

The objective of this study was to investigate the effect of protein source (SBM & LSM) on growth performance, economical efficiency, some rumen & blood parameters of growing Ossimi lambs.

## MATERIALS AND METHODS

Seventy five Ossimi lambs of 27.8 Kg. live body weight were divided into three similar groups of 25 heads each and assigned at random to three experimental rations for 15<sup>th</sup> weeks. Lamb groups fed different CFM were offered to animals at 3% of live body weight twice daily at 8 am and 3 pm, while rice straw was offered ad. lib. Water was available for animals at all times. After 7<sup>th</sup> weeks of experiment, three metabolic trials were conducted to determine the digestion coefficients and feeding values of the three experimental rations. Three representative lambs from each experimental group were used. The preliminary period lasted for 10 days followed by 5 days collection period. Three isonitrogenous and isoenergetic experimental rations were prepared using two plant protein sources, R1 (SBM), R2 (LSM) and R3 (SBM + LSM). Rations formulations are shown in Table (1), also the chemical analysis of feed ingredient and the calculated feeding values of the experimental rations and rice straw are presented in Table (2).

Samples of rice straw, experimental rations and faeces were analyzed according to the methods of the A.O.A.C (1990). At the end of the digestibility

trials and before morning meal, blood samples were collected in vacuotainer tubes and centrifuged at 4000 rpm for 20 minutes to obtain and frozen at -20 °C till time of analysis according to A.O.A.C (1990). Also samples of rumen fluid were collected using stomach tube. The samples were withdrawn just before morning feeding, 3 and 6 hrs post feeding. Samples were filtered through double layer of cheesecloth and pH values were immediately recorded using digital pH meter. Few drops of saturated solution of mercuric chloride were added to stop microbial activity. The samples were frozen for TVFA's determination (Kromann *et. al.*, 1967).

Data were statically analyzed using (SAS program, 1992). Differences among groups were tested by Duncan's multiple range test (1955).

## RESULTS AND DISCUSSION

### *Chemical analysis and digestibility trails:*

Chemical analysis of the experimental rations are presented in table (2). The results indicated that R1 which contained soybean slightly showed higher value of OM % followed by R2 which contained (SBM+LSM) 50:50 Cp basis. However the calculated three experimental rations were nearly similar. They had the values 93.53, 92.89 & 92.85 % OM for R1, R2, & R3 respectively. Mean values of crude protein were nearly similar for all groups of the experiment (12.42). R2 showed slightly higher values of CF & EE (10.08 & 2.85) while R3 had the highest value of NFE (69.65). However the three experimental groups were nearly similar. They were 69.65, 67.64 & 68.11 % for R1, R2 & R3; respectively.

Nutrient digestibility coefficients and nutritive value as affected by sources of protein are presented in Table (3).

**Table (1): The formulation of different experimental rations (%)**

Ingredient	CFM 1	CFM 2	CFM 3
Corn grains	80.0	70.0	74.0
Soybean meal	15.0	00.0	8.0
Linseed meal	00.0	25.0	13.0
Molasses	3.0	3.0	3.0
Lime stone	1.5	1.5	1.5
Salt	0.5	0.5	0.5
Total	100	100	100

**Table (2) : Chemical analysis of the experimental ration**

Items	DM	OM	CP	CF	EE	Ash	NFE	TDN *
CFM 1	87.3	95.3	14.1	4.1	2.9	4.4	74.2	76.9
CFM 2	87.4	94.9	14.1	4.9	3.2	5.2	72.7	76.4
CFM 3	87.4	95.0	14.3	4.0	3.1	5.1	73.7	76.6
Rice straw	88.4	83.8	4.1	34.4	1.2	16.3	44.0	
Rations (calculated)								
Ration 1	88.4	93.5	12.6	8.7	2.6	6.5	69.7	
Ration 2	87.6	92.9	12.3	10.1	2.6	7.1	67.6	
Ration 3	87.6	92.9	12.4	9.7	2.1	7.2	68.1	

\* Calculated

**Table (3) : Digestibility coefficient and nutritive value of the experimental rations**

Items	Digestibilities %						Feeding value%	
	DM	OM	CP	CF	EE	NFE	TDN	DCP
G1	69.5 a	72.4 a	70.3 a	53.6	73.6	75.1	70.1 a	8.8 a
G2	68.3 c	71.3c	68.5 b	53.5	74.9	74.3	68.9 b	8.4 b
G3	68.6 b	71.5 b	69.3 b	54.1	74.0	74.6	69.0 ab	8.6 ab

a, b, and c means in the same column with different letters are significant (  $p < 0.05$  )

**Table (4) : Effect of source of protein on some rumen liquor and blood plasma parameters for experimental rations.**

Items	Rumen liquor								Blood plasma			
	pH				TVFA's meq / 100 ml				g / 100 ml			
	0	3	6	mean	0	3	6	mean	T.P	AL	GL	AL/GL
G1	6.6	6.1	5.8	6.2	6.3	8.1	9.0	7.8 a	6.9	4.4	2.5	1.7
G2	6.6	6.4	6.3	6.4	6.1	6.9	7.5	6.8 b	6.8	4.5	2.3	1.9
G3	6.7	6.1	6.0	6.3	5.9	7.9	8.4	7.4 a	6.9	4.5	2.4	1.9

a and b means in the same column with different letters are significant (  $p < 0.05$  )

Coefficients of digestibility for DM was significantly ( $p < 0.05$ ) the highest in R1 followed by R3. The same trend was recorded for OM digestibility. CPD was higher ( $p < 0.05$ ) in R1 than R2 and R3 while there is no significant differences among R2 and R3. Ether extract digestibility was in significantly lowest in R1 followed by R3 and R2. NFE was insignificantly higher in R1 followed by R3 and R2. The total digestible nutrient (TDN) value was highest in R1 followed by R3 and R2. The same trend was shown in digestible crude protein.

Diet (1) including SMB showed highest values for DM, OM and NFE digestibility coefficients (69.53, 72.40 and 75.09% respectively). It may be associated with high level of OM and NFE intake (Table 2) and with high proportion of corn grains in CFM 1 (Table 1). Hanafy (1998), found significant increase in DM and OM digestibilities with the increase of proportion of corn in the diet. El-Sayes and Gaafer (1998) found that with increase of corn grains in rations increased DM, OM and NFE digestion coefficients.

There are significant differences between ration (1) including SBM and the other two experimental rations in CP digestibility. This may be due to the high content of CP in ration (1) (Table 2). These results are in agreement with those noticed by El-Bedawy et. al. (1993) and Taie (1998), who observed that the digestibility of CP increased with increasing CP in the diet. Paguay et. al. (1972) reported that the most important factor affecting N digestibility was N content in the diet.

On the other hand, ration (2) containing LSM had insignificantly higher EE digestibility. It may be due to the high content of EE in CFM 2 and ration (2) (Table 2). This result is in harmony with those reported by Yacout

(1993), who found that EE digestibility in the diet containing LSM was higher than that diet contained SBM.

Group (1) containing SBM showed significant highest TDN and DCP values. These results are in agreement with those reported by Gabr et. al. (1998) and Abdel-Salam (2003)

#### *Rumen liquor parameters and blood plasma components:*

Table (4) shows the average values of some rumen liquor parameters (pH values and TVFA's concentrations) at different time (0, 3 and 6hrs post feeding). The rumen pH values of the three rations exhibited similar trend. They showed higher values before feeding (at 0 time) then tended to be decreased up to 6 hrs post feeding. After 3 and 6 hrs post feeding G2 had the higher pH value than the other groups due to the decrease of TVFA's in rumen liquor at that time. Generally, the overall mean of ruminal pH value was not affected by protein source. Concentrations of TVFA,s in rumen liquor samples of the three groups were significantly affected by treatment. The maximum concentration of TVFA's was observed at 6 hrs post feeding. The of TVFA's concentration at 3 and 6 hrs post feeding was higher than those recorded before feeding for all groups.

Deraz (1996), Mehrez et. al. (2001) and Fouad (2001 and 2002) reported that minimum pH values were observed at 3 hrs post feeding and tended to increase again after 6 hrs. On the other hand, EL-Ashry et. al. (2000), Fouad and Attia – Ismail (2002), Fouad and Deraz (2002) and Fouad et. al. (2002 b) found that TVFA's concentration in the rumen fluid was low before feeding and increased at three hrs after feeding with lambs fed rations containing CFM and rice straw.

Lower ruminal pH value and higher TVFA's concentration were recorded for the diet (1) contained soybean meal (6.2 and 8.95, respectively). These may be

due to increase corn grains proportion in CFM 1 (Table 1), increased NFE content in ration (1) (Table 1) and improved NFE digestibility (Table 3). Fouad et. al. (1997 and 2002 a) found that, the higher ruminal TVFA's concentrations associated with increased NFE intake. Fadel et. al. (1987), reported that increase in ruminal TVFA's concentration is an indicator for better utilization of dietary carbohydrates.

Generally, the obtained ruminal pH values recorded in the present study are within the normal ranges (5.5 to 7.3) recorded by Hungate (1966). On the other hand, the values of ruminal pH and TVFA's concentration lie in the range observed by Ahmed (1996), Bechai (2001) and Soliman (2001) with lambs fed rations containing soybean meal or linseed meal.

Plasma total proteins, albumin, globulin and albumin / globulin ratio were similar within different treatments.

Similar observations were reported by Ahmed (1996), Bechai (2001), Soliman (2001) and Abdel - Salam (2003), with lambs fed rations containing linseed meal or soybean meal.

Blood plasma constituents recorded on the present study are within the normal ranges recorded by Underwood (1966) and Varley (1969). William (1997), reported that the normal blood of sheep has a range of 6 to 8 gm / 100 ml for total protein. Consequently values in Table (4) indicate that no harmful effects of soybean meal or linseed meal rations were detected on the liver tissue (Salem et. al. 2001).

On the other hand, data given in Table (4) revealed that levels of plasma total protein and globulin were slightly increased (non - significant) for soybean meal ration (G1) than other rations. These results may be due to stimulation of protein synthesis and as a response to the increase in regulators of growth

hormone synthesis (Wood et. al. 1927). Growth hormone has a major role in the movement of amino acids and peptide transport and subsequently blood protein anabolic (Hussein, 1986).

### ***Growth performance***

Table (5), present the average daily gains for different groups. It is clear that the values were practically similar (186.48, 184.67 and 185.09 gm / h for G1, G2 and G3 respectively), without significant difference among them (Table 5). Daily total dry matter intake (DTDMI), TDN intake and DCP intake were slightly higher in G1 than the other groups (G2 and G3) and differences were not significant ( $p < 0.05$ ).

Data in (Table 5) indicated that, slightly improvement in gain on lambs fed ration (1) including SBM. This may be attributed to the higher TDN and DCP intake Table (5). And may also be due to good fermentation on rumen (Table 4), higher nutrient digestibility (Table 3) and the normal blood components (Table 4). Ames et. al. (1980) and Fouad (2001), reported that improved lambs daily gain attributed to availability of fermentable nitrogen and ready available carbohydrate. These results are in agreement with those observed by Shehata (1997), Shalaby (2000) and Abdel -Salam (2003) with lambs fed high energy concentrate feed mixture containing 80% yellow corn and 15% soybean meal.

Values in Table (5) illustrate a slight improvement in utilization efficiency of DM and TDN / Kg gain was observed for lamb group fed ration (3).

### ***Economic evaluation***

The cost / Kg gain in L.E. was 6.25, 5.93 and 6.07 for G1, G2 and G3 respectively. Data presented in Table 5 showed that G2 which was fed CFM containing LSM had the best economic efficiency followed by G3 which was fed

**Table (S): Effect of experimental rations on lambs performance**

Items	G1	G2	G3	Significant
No. of animal	25	25	25	
Ave. Initial weight (Kg.)	27.88	27.92	27.84	
Ave. Final weight (Kg)	47.46	47.32	47.36	
Total gain (Kg.)	19.58	19.40	19.52	
Daily gain (g / h / d)	186.48	184.76	185.90	NS
<b>Daily feed intake (g/h/d)</b>				
CFM	967.55	945.69	946.41	
Rice straw	224.33	232.51	229.75	
Total DM intake	1191.88	1178.20	1176.16	NS
Total TDN intake	835.98	811.90	811.79	NS
Total DCP intake	105.24	99.32	100.80	NS
<b>Feed conversion (Kg / Kg gain)</b>				
DM	6.39	6.38	6.33	NS
TDN	4.48	4.39	4.37	NS
DCP	0.56	0.54	0.54	NS
Cost / Kg gain (L.E) +	6.25	5.93	6.07	
Economical efficiency ++	2.29	2.41	2.35	

NS. Not significant.

+ Based on the assumption that the price of one ton of CFM 1, CFM 2, CFM 3 and Rice straw were (722, 694, 714 and 63 L.E.); respectively, the price of 1 Kg body weight gain was 10.00 L.E.

++ Economical efficiency (as a ratio between price of the weight gain and cost of feed consumed).

CFM containing the two sources of protein (LSM + SBM).

## CONCLUSION

In conclusion, both lambs groups fed diets (R2 or R3) were equivalent to that group fed (R1) in their performance and use of LSM to substitute SBM protein in fattening lambs ration is very effective in reducing the body weight gain costs.

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## استفادة الحملان الاوسيمي من مصدرين من البروتين النباتي

طارق عبد الوهاب دراز

معهد بحوث الإنتاج الحيواني - مركز البحوث الزراعية - الدقى

في هذه الدراسة تم إجراء ثلاثة تجارب تغذية لتحديد اثر مصدر البروتين النباتي من كسب الصويا أو الكتان أو الخليط بينهما الداخلى في التركيب العلائق المركزة على القيم الغذائية واستجابة الحملان للنمو . استخدم في هذه التجربة ٧٥ حمل اوسيمي قسمت عشوائيا إلى ثلاثة مجاميع كل منها ٢٥ حمل وغذيت لمدة ١٠٥ يوم كما بلى :-

المجموعة الأولى غذيت على علف مركز يحتوى على كسب الصويا

المجموعة الثانية غذيت على علف مركز يحتوى على كسب الكتان

المجموعة الثالثة غذيت على علف مركز يحتوى على خليط من كسب الصويا وكسب الكتان

وقد غذيت كل المجاميع على العلف المركز بنسبة ٣% من وزن الجسم علف مركز مع التغذية على قش الأرز لحد الشبع . كما تم أجريت ثلاثة تجارب هضم في منتصف التجربة (في الأسبوع الثامن) واخذ ثلاثة حملان من كل مجموعة وضعت بصناديق الهضم واخذ منها عينات دم وسوائل كرش بعد اليوم الأخير من تجربة الهضم .

أظهرت النتائج انه لا يوجد فروق معنوية في القيم الغذائية أو في المكتسب من وزن الجسم للحملان النامية مع عدم وجود اضطرابات صحية وكذلك مقاييس سوائل الكرش والدم . ومن هذه الدراسة يمكن استنتاج انه يمكن إدخال كل من كسب الصويا وكسب الكتان في علائق الحيوانات المزرعية بنجاح وانه كلما اتجهنا إلى كسب الكتان كان هناك خفض في ثمن العلائق وزيادة الكفاءة الاقتصادية .