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EFFECT OF TREATING RICE STRAW WITH ZAD ENZYMES® OR EFFECTIVE MICROORGANISMS ON PRODUCTIVE PERFORMANCE OF OSSIMI EWES AND THEIR LAMBS

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ABSTRACT

The present study aimed to evaluate the effect of treating rice straw bales by enzymes (ZAD) or effective microorganisms (EM) on milk production, milk composition, some blood parameters and live body weight of ewes and growth performance of their lambs and economic efficiency.

Forty-five Ossimi ewes (41.05±2 kg live body weight and 3.5±0.3 years old) at last month of pregnancy were divided into three similar groups (15 each) according to their parity, body weight and age. The first group served as control (G1) and fed 60 % concentrate feed mixture (CFM) plus 40% untreated rice straw (RS). The second group (G2) fed 40% CFM plus 60% RS treated with ZAD and the third group (G3) fed 40% CFM plus 60% treated RS with EM for 105 days (feeding periods). Results showed that total milk yield was significantly ($p<0.05$) lower with both treated rice straw rations (G2 and G3) than control one (G1), being 32.78 and 32.22 vs 33.95 kg, respectively. However, milk protein was significantly ($p<0.05$) higher with G3 than G2 group and insignificantly higher than that of control group. While there were non-significant differences among the dietary treatments in respect of the other milk constituents. Lambs performance (birth weight, total gain, daily gain and weaning weight) did not significantly affected by dietary treatments, but estimates were slightly lower for the two tested rations than control one. Blood parameters not affected by ZAD or EM treatments. Economic efficiency of treated rice straw roups had better values than G1 (55.63 and 56.40 *vs.* 41.09%), respectively. The improved economic efficiency by treating rice straw with ZAD or EM due to decreasing feed cost for both tested rations compared to the control one.

***Key words**: ZAD, EM, biological treatments, straws, lambs growth. milk, Ossimi ewes.*

INTRODUCTION

One of the main shortcomings of rice straw as an animal feed is the low digestibility of its major organic constituents and the high contents of cell wall components. Recently, several treatments including the bio-processing techniques are implemented around the globe to improve the nutritive value of the lingo-cellulosic residues. Many chemical treatments, aimed to delignify or disrupt the lignin carbohydrate complex have attempted to improve the accessibility and exposure of structural carbohydrates to ruminal cellulolytic microorganisms. Chemical and biological treatments achieved more improvement particularly the digestibility of the hemicelluloses fraction **(Gado, 1997).**

The key problem of feeding lingo-cellulosic materials to farm animals is the low protein content, high crude fiber, low digestibility and to some extent the high content of some anti-nutritional factors such as tannins and alkaloids **(Kholif, 2005).** The same author reported that to increase the digestibility of these lingo-cellulosic materials, it was important to breakdown the linkage between cellulose, hemicellulose and lignin or breakdown the compact nature of the lingo-cellulosic plants tissue. Besides, **Mahrous, and Abou Ammou, 2005** found no significant effects on blood urea, total protein, albumin, globulin, GOT and GPT when

treated rice straw by ZAD, fungus and ZAD with fungus compared with untreated rice straw.

A positive impact of probiotics supplementation on feed intake, weight gain and feed conversion ratio in ruminants has well reported by various previous researchers **(Chiofalo *et al.*, 2004; Antunovic *et al*., 2006 and Whitley *et al*., 2009). Gomaa *et al.* (2012)** concluded that treating rice straw with bacterial enzymes (ZAD compound) improved significantly digestibility coefficients, chemical composition and fiber fraction of ration fed to the Ossimi rams. Also, treated rations with ZAD compound increased TDN and digestibility of crude protein without any abnormal signs on blood or rumen parameters. Effective micro-organism (EM) is a product characterized by a mix of three major groups: i.e. photosynthetic bacteria, lactobacillus bacteria and yeasts and/or fungi **(Higa and Wididana, 2007).** The EM compound could better used as a biological inoculants to improve the nutritive value of non-conventional feedstuffs (poor quality roughage) like rice straw, coffee pulp, husk, and others **(Yonatan *et al*., 2014).** Moreover, improved animals performance was detected by yeast culture supplementation to ruminant diets and also found to increase glucose concentration (Sharma et al., 1998), blood total protein **(El-Shaer, 2003)** and decrease cholesterol **(Fayed *et al*., 2005).** The purpose of this study was to investigate the effect of treated rice straw by ZAD or EM on productive performance of Ossimi ewes and their lambs.

MATERIALS AND METHODS

This study carried out to investigate the effect of biological treatments (enzymes; ZAD® or effective microorganisms; EM) of poor quality roughage (rice straw RS) on productive performance of Ossimi ewes and their lambs. The trial was carried out at Sids Research Station belonging to Animal Production Research Institute (APRI), Agriculture Research Center, Ministry of Agriculture, Egypt.

Ensiling procedures:

Rice straw bales ensiled in two heaps where the first one mixed with bacterial enzymes (0.3% ZAD) that commercially produced through the bio-processes of enzymes separated from the anaerobic bacteria of the rumen. It contains a mixture of cellulase, hemicellulase, protease and alpha amylase enzymes **(Gomaa *et al.*, 2012)**. The second heap of straw mixed with effective microorganisms (0.3% EM), which consisted of a mix of aerobic and anaerobic microorganisms with three major groups: i.e. photosynthetic bacteria, lactobacillus bacteria and yeasts and/or fungi ***(Higa and Wididana, 2007)***. The microbial inoculation was prepared as follows; mixing package of 1 liter to 100 liter of water and left for 2 h then sprayed on 50 tons of rice straw which squeezed well. Heaps covered by double-layer of linoleum plastic and straw bales had closely tighten coverage. Samples from the two heaps taken after 60 days ensiling period for analysis to examine of roughage quality.

***Animals and feeding*:**

Feeding trial carried out using forty-five Ossimi ewes averaged 41.05±2 kg live body weight and 3.5±0.3 years old. The trial started at last month of pregnancy until lambing and continued up to weaning lambs to study the effect of biological treatment of rice straw (RS) by ZAD or EM on productive performance. Ewes divided into three similar groups (15 ewes each) according to their parity, body weight and age. The first group (G1) served as control and fed 60 % concentrate feed mixture (CFM) plus 40% untreated RS, the second group (G2) fed 40% CFM plus 60% RS treated with ZAD and third group (G3) fed 40% CFM plus 60% RS treated with EM. The feeding trial lasted 105 days. Ingredients of daily rations, which fed to cover the nutritional requirements for pregnancy and lactation according to **NRC (1985)** are presented in Table 1. Animals housed in a semi open shaded yard and mineral-vitamin blocks were freely available for liking along the experimental period. Body weight changes of ewes recorded at begging of the trail, lambing, weaning and estrus, for consecutive two days before morning feeding and drinking. Daily gain, feed intake, and feed conversion ratio were

determined and lambs weight was recorded biweekly from lambing until weaning.

Chemical compositions of ingredients as well as the experimental rations are present in Table (2). Nutrients digestibility and feeding values of experimental rations determined using nine rams in indirect method as mentioned by **Abou-Raya, (1967)**. The digestibility trial continued along 22 days (15 days preliminary period followed by 7 days as collection period). Animals divided into three groups (3 each) and fed the experimental rations as presented in Table (1). Due to capturing rams in digestion boxes, it noticed that they were not able to consume all allowances, thus ninety percent of requirements found to consumed in the preliminary period, which offered to rams at 9:00 am and 4:00 pm and continued during the days of collection period to guarantee stable feed consumption. Water was available all times. Daily fresh feces collected from each ram was weighed during the collection period and representative samples of each collection was taken and dried in forced air oven at 65 ºC for 48 h. Dried feces samples collected from each ram at the end of collection period and thoroughly mixed, ground and kept for chemical analysis. Chemical analysis of the sampled rations and feces carried out to determine DM, CP, CF, EE and ash according to **A.O.A.C. (1995).** While, NFE values calculated by difference. Total digestible nutrients (TDN) and digestible crude protein (DCP) calculated according to the classic formula of **McDonald *et al.* (1995)**. While, digestible energy (DE Mcal/kg DM) calculated according to **NRC (1985).**

Milk yield and sampling:

Milk yield estimated for suckling lambs by weight differential technique **(Economides, 1986)** where ewes milked twice daily. Ewes considered dried off when the amount of milk reached less than 100 ml/d. Milk samples were taken biweekly during lactation period. Representative milk samples (about 1% of the total milk produced) were taken from each ewe and a composite sample from the morning and evening milking of the same day was used for chemical analysis by using Milko-Scan (133B N. Foss Electric, Denmark).

Table (1): Formulation of the experimental rations

Ingredients	%, on DM basis		
	G_1	G_2	G_3
CFM *	60	40	40
RS	40	--	--
ZAD-RS **	--	60	--
EM-RS ***	--	--	60

:* CFM *contained 24 % Cotton seed meal; 40% Wheat bran; 30% Yellow Corn 1.5% Lime stone; 1 % Sodium chloride, 0.5% vitamins and mineral mixture and 3% Molasses; **: rice straw treated* w*ith ZAD; *: rice straw treated* w*ith EM.*

Blood samples analysis:

Blood samples of ewes collected from the jugular vein in the morning before drinking and feeding at the beginning of the experiment then monthly along the experimental period. The collected blood samples centrifuged at 3000 rpm for 15 minutes and the obtained clear serum were stored at -20 ºC until analysis. Concentrations of total protein and albumin estimated in serum using kits of Diamond Diagnostic, EC Hannover, Germany. Globulin level calculated by the difference between total protein and albumin. Glucose and cholesterol quantified in serum by using kits of Spinreact, S.A.U. Ctra. Santa Coloma, 7 E-17176 Sant Estevez de Bas (GI), Spain by spectrophotometer. Aspartate aminotransferase (AST) and alanine aminotransferase (ALT) were determined as described by **Reitman and Frankel (1957).**

Economic efficiency:

Economic efficiency calculated according to basic prices of daily body weight gain and feed cost. Prices of feedstuffs and feed additives were 4.00 and 1.00, 70.00 and 3.00 LE/kg for CFM, RS, ZAD and EM, respectively. While, price of daily body weight gain was 100 LE/kg.

Statistical analyses:

Data statistically analyzed using the general linear model procedure **(SAS, 2002).** The

differences among means tested using Duncan's Multiple-rang test **(Duncan, 1955).** The model used in statistical analysis was:

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

Where:

Y_{ij} = an observation
μ = overall means
R_i = effect of treatment (i = control, ZAD, EM)
e_{ij} = random error.

RESULTS AND DISCSSION

Chemical composition:

Chemical composition of ingredients and the calculated composition of experimental rations presented in Table (2). Results showed that treated rice straw by ZAD or EM had increased CP, EE and Ash contents and decreased CF content compared to un-treated rice straw. These results are in agreement with the findings recorded by **Gomaa *et al*. (2012)** who reported that there was a significant decrease in CF for rations treated with ZAD compared to non-treated one, while, CP content was increased. Also, **ELmoghazy *et al*. (2015)** indicated that treatment with five microorganisms showed that CF content significantly decreased, from 33.15 to 27.14, while, CP content significantly increased, from 5.61 to 11.40. Meanwhile, **Abdel-Khalek *et al*. (2012)** revealed that biological treatments (1 or 1.5% EM) slightly increased contents of OM and NFE, while, decreased EE and ash contents in the diet of rabbits. However, considerable increase in CP and reduction in CF contents was observed, particularly in the diet treated with 1.5% EM.

Table (2): Chemical composition of ingredients and calculated composition of experimental rations (% on DM basis).

Items	DM	OM	CP	EE	CF	NFE	Ash
CFM	90.64	91.72	16.20	4.53	15.82	55.17	8.28
RS	91.13	85.55	3.41	1.20	38.33	42.61	14.45
RS ZAD	90.51	82.01	6.08	1.78	31.08	43.07	17.99
RS EM	88.15	83.65	7.78	1.57	33.35	40.95	16.35
Rations:							
G1	90.84	89.25	11.08	3.20	24.82	50.15	10.75
G2	90.57	85.94	10.13	2.93	24.78	47.89	14.06
G3	89.25	86.88	10.55	2.75	26.45	46.64	13.12

G1: 60% CFM+40% RS. G2: 40% CFM+60% RS ZAD. G3: 40% CFM+60% RS EM.

Digestion coefficients and feeding values of the experimental rations:

Digestion coefficients of the experimental rations fed to Ossimi ewes are shown in Table (3). Data indicate that there were insignificant differences among G1, G2 and G3 in respect to digestibility of DM, OM, EE and NFE. While, digestibility of CP was significantly ($P<0.05$) higher with G3 while insignificantly higher with G2, than control ration (G1). Otherwise digestibility of CF was significantly higher with (G2) while insignificantly higher with G3, than control ration (G1). In other words, the biological treatment with ZAD (R2) caused improvement in most nutrients digestibility in comparison with untreated one (control). The significant higher digestibility of CF in the two tested rations (G2 & G3) might be due to the lower portion of CFM (40%) which excessively in sympathetic with the activity of cellulolytic and hemi-cellulolytic microorganisms, leading to an increase in CF digestibility in the rumen. These results are in agreement with those obtained by **Gomaa *et al*. (2012)** who observed that treated rice straw- ration with ZAD had the best digestibility of fiber fractions compared to non-treated rations. Also, **Yonatan *et al*. (2014)** reported significant ($P<0.001$) improvement in *in-vitro* dry matter digestibility of coffee husk ensiled with EM in comparison with untreated one. Feeding values of the experimental rations as TDN, DCP and DE, shown in Table (3), had no significant differences among the experimental dietary treatments.

Milk production and composition:

Results in Table (4) showed that both daily milk yield and total milk yield of the two tested rations (G2 & G3) were significantly lower than control one (G1), being 538.9 vs. 520.3 and 511.5g; 33.95 vs. 32.78 and 32.22 kg for G1, G2 and G3, respectively. Thus, improve gained on RS by biological treatments was not compensating the nutritive value of CFM. Consequently, reducing CFM from 60% to 40% expressed on the low milk production of treated groups compared to control.

Table (3): Digestion coefficients (%) *and feeding values* (%) *of the experimental rations*

Rations	DM	OM	CP	EE	CF	NFE	TDN	DCP	DE
	NS	NS	*	NS	*	NS	NS	NS	NS
G1	75.31	57.52	59.56b	65.91	18.07b	72.92	53.13	6.52	2.26
	±1.55	±2.19	±0.52	±2.73	±4.68	±1.92	±2.04	±0.06	±.09
G2	77.18	59.53	62.21ab	66.15	31.74a	73.54	53.5	6.82	2.28
	±1.03	±1.14	±0.51	±4.91	±4.33	±1.69	±2.25	±0.05	±.008
G3	72.86	56.66	63.26a	63.98	28.37ab	72.32	51.09	6.68	2.16
	±1.44	±1.98	±0.69	±4.53	±4.34	±1.20	±1.82	±0.07	±.08

[a and b]: Means within each column with different superscripts are significantly differ (P<0.05).
G1: 60% CFM+40% RS. G2: 40% CFM+60% RS ZAD. G3: 40% CFM+60% RS EM.

Concerning milk composition, the contents of all milk constituents were not significantly affected by dietary treatments. Only milk protein concentration was significantly higher with EM-rice straw ration (G3) than that of ZAD-rice straw ration (G2). The present results disagree with **Gado *et al.* (2009)** who reported that milk production was higher in enzyme-supplemented cows. Also, **Soliman (2006)** reported that milk production was increased by 23% for dairy cows fed peanut hay ensiled with enzymes for 45 d, and referred the improvement to increased nutrients digestibility and microbial protein synthesis. Earlier study conducted by **Khalili *et al*. (1992) reported** that respond of milk production of cows to feeding, greatly depend on the protein quality of the roughage and the correcting proportion of concentrate feed mixture accompanied the offered ration to cows. In general, fluctuation in response of cows than sheep to treatments applied might refer to species difference in genetic potential to producing milk between sheep and cows.

Blood parameters:

Results of some blood components of ewes fed the experimental rations are presented in Table 5.Most measured blood metabolites (TP, ALB, GLOB, CHOLES, ALT and AST) did not significantly affected by the dietary treatments. Only blood glucose concentration reduced with treated groups, but difference was significant only with RS ZAD- ration (G2) while not significant with RS EM- ration (G3), than control ration (G1).

Table (4): Effect of experimental rations on milk production and composition

Items	Total milk (kg)	Daily milk(g)	FAT %	PROTEIN %	LACTOSE %	ASH %	SNF %	T-SOLID %
Rations:	*	*	NS	*	NS	NS	NS	NS
G1	33.95a	538.87a	6.04	5.93ab	4.58	0.68	11.19	17.23
	±0.41	±6.53	±0.28	±0.13	±0.27	±0.36	±0.40	±0.66
G2	32.78b	520.34b	5.95	5.72b	4.41	0.72	10.85	16.80
	±0.22	±3.56	±0.16	±0.10	±0.12	±0.01	±0.12	±0.20
G3	32.22b	511.47b	5.72	6.22a	4.30	0.69	11.21	16.93
	±0.49	±7.71	±0.13	±0.11	±0.15	±0.29	±0.21	±0.30

[a and b]: Means within each column with different superscripts are significantly differ (P<0.05).
G1: 60% CFM+40% RS. G2: 40% CFM+60% RS ZAD. G3: 40% CFM+60% RS EM.

This again confirm that enhance of RS nutritive value by treatments failed to supplement animals with adequate energy, which reflected on reducing glucose level, as happened with milk production. These results are in agreement with those obtained by **Khattab *et al*. (2009)** who found insignificant differences (P> 0.05) in blood serum globulin, urea, creatinine concentrations as well as ALT and AST activities due to either effects of biological treatment or concentrate roughage ratio in rations of Barki lambs. Similarly, earlier results obtained by **Gado *et al***. (2006) found no significant differences in most blood metabolites when fed Ossimi lambs four rations consisted of CFM in addition to different biologically treatement of rice straw. In contrast, results here are in disagreement with **Abdel-Khalek *et al*. (2012)**, who indicated that serum TP, Alb and Glob were significantly (P<0.05) higher with EM treatment than the control one with rabbits. Also, **Gomaa *et al*. (2012) and Gomaa *et al*. (2016),** reported that treating RS by ZAD for sheep ration had a significantly (P<0.05) higher level of blood TP than those fed untreated RS-ration.

Table (5): Effect of experimental rations on some blood parameters

Rations	TP	ALB	GLOB	A/G	GLUC	CHOLES	ALT	AST
	NS	NS	NS	NS	*	NS	NS	NS
G1	5.01	3.54	1.47	2.62	91.42a	98.96	14.9	32.88
	±0.13	±0.08	±0.12	±0.30	±2.30	±1.35	±0.57	±2.75
G2	4.75	3.46	1.28	3.13	81.45b	96.88	14.2	34
	±0.11	±0.12	±0.16	±0.41	±3.45	±1.80	±0.45	±1.33
G3	4.94	3.51	1.43	2.86	83.09ab	96.61	13.8	31.75
	±0.12	±0.10	±0.14	±0.50	±3.30	±2,25	±0.11	±0.81

[a and b]: Means within each column with different superscripts are significantly differ (P<0.05). G1: 60% CFM+40% RS. G2: 40% CFM+60% RS ZAD. G3: 40% CFM+60% RS EM.

Change of Ossimi ewes body weights:

The data in Table (6) are illustrated the live body weight changes of Ossimi ewes during experimental periods. Ewes weight at lambing up to weaning, had gained less weight, in treated groups with ZAD or EM than control group (G1) but differences among all groups were not significant. Similar results are observed by **Salama *et al.* (1993), Youssef *et al.* (2001),** and **Sabri *et al.* (2010).** However, it observed that ewes in treated groups maintained their weights post-lambing without any adverse effect. **Khattab *et al*. (2009)** reported that it was possible to use treated wheat straw at level up to 40% of rations without any adverse effect on rumen parameters, daily gain and feed conversion.

Growth performance of suckling lambs:

Data in Table (7) showed no significant differences in birth weight, weaning weight, total gain among dietary treatment groups. Similar results observed by **Titi *et al*. (2008),** who reported that yeast supplementation did not have any significant effect on growth rate of lambs and kids. Meanwhile, the present result is in harmony with those reported by **Khattab *et al*. (2009)** who found insignificant differences in final body weight, daily gain and total gain either between lamb groups fed rations contained biologically treated or un treated wheat straw, or among groups fed rations contained 75 : 25 or 60 : 40 ratios of concentrate : roughage. On the other hand, **Gado *et al*. (2007)** found that feeding lambs on rations treated with ZAD compound were significantly heavier, grew faster and had higher weight gain than lambs fed control ration. Similarly, growth performance parameters of growing lambs significantly improved when fed rations contained RS treated by ZAD or EM compounds (Gomaa et al, 2016).

Table (6): Effect of experimental rations on changes of Ossimi ewes body weights during 105 days

Rations	Pre Lambing	At Lambing	At Weaning	Change in body weight (kg)
	NS	NS	NS	
G1	41.27	37.53	40.8	3.27
	±1.22	±1.13	±0.82	
G2	40.67	37.33	40.07	2.74
	±1.36	±1.22	±1.09	
G3	41.2	37.53	40.13	2.6
	±1.06	±1.02	±0.94	

G1: 60% CFM+40% GS. R2: 40% CFM+60% RS ZAD. G3: 40% CFM+60% RS EM.

Table (7): Effect of experimental rations on growth performance of Ossimi suckling lambs

Rations	Birth Weight (kg)	Weaning weight (kg)	Total Gain (kg)	**Daily gain (g)**
	NS	NS	NS	NS
G1	3.41	15.27	11.86	158.11
	±0.08	±0.23	±0.35	±3.37
G2	3.24	15.05	11.81b	157.49
	±0.07	±0.20	±0.25	±2.83
G3	3.22	14.9	11.66c	155.51
	±0.07	±0.27	±0.31	±4.12

G1: 60% CFM+40% RS. G2: 40% CFM+60% RS ZAD. G3: 40% CFM+60% RS EM.

Feed conversion and Economic efficiency:

Data in Table (8) revealed that economic efficiency of G2 and G3 groups were significantly (P≤0.05) better than control group (55.63 and 57.30 *vs.* 41.09%), respectively though no significant differences among groups in feed intake or feed conversion efficiency. Impact of biological treatment with ZAD or EM on economic efficiency of sheep was mainly due to decreasing feed cost for both treated groups compared to the control group. These result is in agreement with **Gomaa *et al*. (2016),** who reported marked improvement in feed cost per Kg gained for both rations having RS treated by ZAD or EM. These results are in harmony also with those obtained by **Gado *et al.* 2007**, that no significant changed in feed efficiency found when wheat straw treated with 1 litter ZAD/ ton and incorporated in ration of lambs. However, **Stocks (1992)** noted that roughage treated with cellulose enzymes increased dry matter intake, milk production, nutritional values and degradation rates of carbohydrates in the rumen of cows. **Gado (1997)** revealed also that enzymatic treatments improved the NDF and ameliorated growth performance of kids. Moreover, **Colombatto et al., (2003)** reported that enzymes were more efficient in degrading fibers without increasing methane production in the rumen. Lastly, **Abdel-Aziz** (????) recorded that replacing 40% of CFM by biologically treated rice straw reduced the cost of feeding by 29%.

Conclusion:

It could conclude that it safe and economic beneficial to incorporate treated straw by 60 % of the total ration,, but in case milk production is essential target it might possible to reduce incorporation rate than that level, which needs more future study.

Table (8): Effect of treatment on feed intake, feed conversion and economic efficiency

Rations	Intake (kg)Feed	Gain (kg) Total	Feed conversion	Feed cost (LE)	Gain price (LE)	Economic efficiency (%)
	NS	NS	NS	**	NS	**
G1	84	11.86	7.06	234.72a	1186	41.09b
G2	79.2	11.81	6.69	182.35b	1181	55.63a
G3	80.4	11.66	6.9	175.72b	1166	56.40a
± SE	2.34	0.3	0.23	6.05	10.7	1.92

[a and b]: Means within each coalmen under summer or winter with different superscripts are significantly differ (P<0.01).

G1: 60% CFM+40% RS. G2: 40% CFM+60% RS ZAD. G3: 40% CFM+60% RS EM.

Economic efficiency (%) = gain price – feed cost/ feed cost * 100

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تأثير قش الأرز المعامل انزيميا بالزاد أو بالميكروبات الفعالة على الأداء الإنتاجي للنعاج الأوسيمي وحملانها

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تهدف الدراسة إلى معرفة تأثير معاملة قش الأرز بـــ ZAD او EM على القيمة الغذائية للقش وخصائص الدم وإنتاج اللبن وتركيبه ومعدل النمو للحملان الرضيعة ومعاملات الهضم فى الأغنام الآوسيمى وتأثير ذلك على التكلفة الاقتصادية للعلائق المقدمة للحملان.

تمت هذه الدراسة فى محطة بحوث التربية بسدس- معهد بحوث الإنتاج الحيواني.، حيث استخدم فى هذه الدراسة عدد 45 نعجة في الشهر الأخير من الحمل بمتوسط وزن 05و41 كجم ومتوسط عمر 5و3 سنة وقسمت عشوائيا حسب موسم الولادة ووزن الجسم والعمر إلى 3 مجموعات متساوية 15 نعجة بكل مجموعة وكانت المجاميع كما يلي:

1. المجموعة الأولي: كنترول قش أرز غير معامل + مخلوط العلف المركز (40: 60%)
2. المجموعة الثانية: قش أرز معامل ب ZAD + مخلوط العلف المركز (40:60%)
3. المجموعة الثالثة: قش الأرز المعامل ب EM + مخلوط العلف المركز (40:60%)

وكانت العلائق المقدمة تغطى احتياجات النعاج الغذائية تبعا لـ NRC 1985 واستمرت التجربة 105 يوم (فترات التغذية) وقد اوضحت النتائج: أن هناك انخفاض معنوي عند مستوي (5%) في كمية اللبن الكلية لكل من المجموعتين الثانية والثالثة التي تم التغذية فيهما على قش أرز معامل مقارنتا بالمعاملة الأولى (الكنترول) وكانت القيم (78و32 و 22و32 مقابل 95و33 ، كجم على التوالي)، لكن نسبة بروتين اللبن كانت اعلى معنويا عند مستوى (5%) مع المجموعة الثالثة عن المجموعة الثانية وكانت الزيادة غير معنوية عن المجموعة الأولى (كنترول) بينما لم تكن هناك أي فروق معنوية لمكونات اللبن الأخرى بين المعاملات الغذائية.

أيضا لا توجد أي فروق معنوية لكل من (وزن الميلاد ، النمو الكلي ، معدل النمو اليومى ووزن الفطام) بين كل من المجموعات الأولى ، الثانية والثالثة. حيث كان هناك انخفاض خفيف للمجموعتين المختبرتين عن الكنترول لهذه المقاييس المذكورة. كذلك لم يكن هناك تأثير معنوي للمعاملات على مكونات الدم.

الكفاءة الأقتصادية للمجموعتين الثانية والثالثة التي تم تغذيتهما على قش أرز معامل بال ZAD أو EM كانت ذات قيم أعلى عن المجموعة الأولى (63و55 و 40و56 مقابل 09و41 %) على التوالي. تحسن الكفاءة الأقتصادية مع قش الأز المعمل بال ZAD أو EM يرجع إلى خفض تكلفة التغذية لكلا العليقتين المعاملتين مقارنة بعليقة الكنترول.

EFFECT OF TREATING RICE STRAW WITH ZAD ENZYMES® OR EFFECTIVE MICROORGANISMS ON PRODUCTIVE PERFORMANCE OF OSSIMI EWES AND THEIR LAMBS