Research Article

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Comparative Study of Local and Imported Enzymes in Improving the Nutritional Values of Agricultural Waste on Performance and Economic Efficiency of Iraqi Lambs

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Abstract

In the current study, we use 25 local Iraqi lambs. With initial body weight (24) kg. The lambs were randomly divided into five treated groups, the first group without treatment as control, the second and third treated with 20%and 40% Agricultural Waste treated with trade enzymes, fourth and fifth treatment 20%and 40% Agricultural Waste treated with local enzymes. The result demonstrated a significant ($P<0.01$) increase in the quantity of roughages, total feed intake, Neutral Detergent Fiber (NDF) and Acid Detergent Fiber(ADF) and Lignin (ADL) in T5 followed by T4 compared with others treated groups and showed a significant ($P<0.01$) increase in the digestibility of NDF ,ADF in T4, T5 compare with other treated groups. While T5and T4 recorded Superiority increase in weight gain, and significant improvement in economic cost efficiency with ratio improvement of 5.90, 5.97 % respectively.

Keywards: Local and Trade enzyme, lambs, feed intake , weight , economic cost

مقارنة بين الانزيم المحلي والتجاري لتحسين القيمة الغذائية للمخلفات الزراعية واستخدامها في التغذية على صفات النمو والانتاجية والكفاءة الاقتصادية للحملان العراقية

الخلاصة

استخدم في هذه الدراسة 25 حملاً ذكرياً من الأغنام العراقية , بمتوسط وزن ابتدائي (24) كغم , ووزعت الحملان عشوائياً الى خمس معاملات , المعاملة الاولى عليقة سيطرة , الثانية والثالثة معاملات 20و40% مخلفات زراعية ملوثة للبيئة بالأنزيم التجاري و الرابعة والخامسة معاملات 20و40% مخلفات زراعية ملوثة للبيئة بالأنزيم المحلي واشارت النتائج زيادة معنوية بكمية العلف الخشن والكلي المستهلك والالياف المتعادلة والحامضية واللكنين للمعاملة الخامسة تلتها الرابعة و بالمقارنة مع باقي المعاملات . وزيادة معنوية في معامل هضم الالياف المتعادلة والحامضية للمعاملة الرابعة والخامسة مقارنة مع باقي المعاملات . سجلت المعاملتين الرابعة والخامسة زيادة عالية المعنوية في معدل الزيادة الوزنية اليومية وتحسن معنوي في الكفاءة الاقتصادية بمعدل تحسن بنسبة 5.597 و 5.90 على التوالي .

Introduction:

Highly increased in human population growth led to find alternatives to reduce hole of food available to human, by suitable strategies of production field crops. This cause to accelerate accumulation large amount of food production and by product .with bad management of by-product, by burn, wasted in public places or channeled into water source or thereby resulting air pollution, soil contamination, a harmful gas, smoke, dust and water (1) This really harmful to environment .The negative influence of agriculture by product could reduce by using biological technique like enzymatic bioremediation (2),It is possible to reduce pollution by uses in ruminants feed ,the ruminant contribute to decrease 10% of the world's total greenhouse gas emissions and increase soil carbon and decrease Environmental damage. Reduce air overall carbon dioxide (3).Ruminant feed represent 60-70% from production cost. due to high price of good quality of feed like alfalfa hay ,berseem ,Panicum , Green grass push the scientist to search for alternatives from pollute agro- industrial poor quality waste that harmful to environment or cause damage like corncob date palm leave and Rice husk (3,4,5).Those contain high level of lignocellulose rich by complex carbohydrate like cellulose and hemicellulose contacted with lignin (6). Components of the plant cell wall for roughages like ADF, NDF and Lignin. the treatment by crude extract the extract from medium of growth white root fungi lead to decrease in ADF 6-8% and NDF 4-8 % ,Lignin 17% to straw (7) when treated roughages with exogenous enzymes 4g\kg corn silage led to increase in ADF ,DMD the improvement increase linear with increase enzymes level (8). Biological treatment of low quality roughages led to degrade digestibility inhabitation factor reflex to improve nutritive value and highest increase in digestibility of ADL, ADF and NDF (9). Significance improve in vitro dry matter digestibility and *invivo* feed conversation (10). Biological treatment by enzymes led to significance improved in feed intake by lambs feed on corncobs with level 1% due to improve eco-system of rumen fermentation by free nutrient from treated (11). Treated olive cake with fibro lytic enzymes with level 4%,16% (12). The improvement increases with increase enzymes concentration (12), and increase in weight gain (13,14). This study was conducted to evaluate the role of local crude extract enzymes MUAD or trade enzymes on feed intake, digestibility of fiber, weight gain and economic efficiency when replaced partly of good quality alfalfa hay with agriculture pollute residue .

Material and method

The study was conducted to survey effective role of enzymes on quantity of nutrient intake, live weight gain gram\day per day for lambs and cost feed efficiency. In current study were using 25 Iraqi male lambs 3-4 month of age with average weight 24 kg, individual feeding regimen, the lambs housed 25 pens randomly grouped to 5 treatments, the regime feeding animal on concentrate 3% of Body weight table(1),feeding meal twice a day, the roughages (Alfalfa Hay) supplement add libitum. Alfalfa Hay partly replaced 20 % Agricultural Waste mixed 10% Iraqi date palm leave,5% corncob,5%rice huskand40% mixed 20% Iraqi date palm leave,10% corncob,10 %rice husk treated with local enzymes *MUAD*(Mix local Iraqi lignin lytic crude extract enzymes extract from growth medium of two types of white rot fungi) obtained from Dept. of animal production\University of Anbar and Ministry of science & technology or trade *LABAZYME*. T1: control. T2: 20%

Agricultural Waste Treated with trade enzymes, T3: 40% Agricultural Waste Treated with trade enzymes T4: 20% Agricultural Waste Treated with *MUAD*, T5: 40% Agricultural Waste Treated with *MUAD* enzymes. Every day before morning feed, weight the Residual Previous day minus from provided feed in the same day. The lambs weight every weak. All chemical analysis as described method (15,16). Feed efficiency calculated as equation cost feed efficiency = Daily profit treatment \ Daily profit of control

Statistical analysis

The Statistical computations were done using SAS software program (17) to explore the influence of treatment (Control and treatment). (18) Multiple range test (1955) to compassion between means. The statistical model was as follows:Yij = μ + Ti + eij Where: Yij = dependent variable. μ = overall mean. Ti= Effect of treatment (Control and treatment). eij = Error term.

Result sand discussion

Roughages daily intake:

Substitution of a percentage of alfalfa Hay with treated Agricultural Waste by local enzymes *MUAD* or trade enzymes *LABAZYME* recorded significance increase (P<0.01) total feed intake and roughages intake Figure (1). The highest amount T5 40% local enzymes (1260) g\lambs \day and 540 g\lambs \day respectively may be led to improve daily gain weight (170.67) g\lambs \day table 1. The lowest feed consumed T2 20% Trade enzymes (1137) g\lambs\ day and (417) g\lambs \ day led to negative effects on average daily gain (160)g\lambs \day. This increases due to act of Exogenous fibro lytic enzymes (*Versatile peroxidase*) with have ability to destroy complex bonds between Agricultural Waste compound and made the nutrient free and improve microorganism activity in rumen ecosystem of lambs reflected to quantity Increase of feed intake (4). White root fungi have high ability to decay Cell Wall and improve nutritive value of Agricultural Waste by the enter of fungal hyphae end to cell wall and improve activity of rumen microorganism and reduce complex bonds of cell wall of low quality roughages or wood average of lignin degrade faster compare with average of degrade cellulose and hemicellulos with biological treatment with white rot fungi the treatment alteration the structure of cell wall led to increase surface area of cell wall of Agricultural Waste (12,19, 20,21,22).

The improvement of feed intake due to decrease quantity of aromatic compound in cell wall compound by treated with enzymes (12) and improve feed intake, gain weight of lambs, feed conversation (4 ; 21).The negative effects by treatment Two trade enzymes may be by high ability to lytic phenolic compound toxicity microorganism by fast reduce in PH and increase concentration of phenol the trade enzymes compound enzymes and probiotics. Live weight Gain and feed conversation efficiency.

Statically analyses in table (1) showed significances differences (P<0.01) in average daily gain weight and feed conversation efficiency the better T5 170 g\ lambs\day in daily gain weight than other treatment flowed T4 165 g\ lambs\day . this may be due to positive effect of local exogenous enzymes on increase growth and activity of rumen microbiome make better in digestibility and increase feed intake also showed in table 1 and elevation in daily gain weight ,flowed with T1(160) g\lambs\day ,T3 (157) g\lambs\day the lowest recorded with T2 trade enzymes 20% (153) g\lambs\day .T2 recorded highest decrease in feed conversation efficiency (7.43) comparable with others treatment . The

reason of this may be due to increase average lytic compound of phenolic in high level cause high decrease in PH led to negative effect on inhibition growth, activity microbiome in rumen and acidosis. Increase in daily feed intake may be caused by enzymatic treatment have high ability to destroy bond and Digestive inhibitors of cell wall and free carbohydrate and fiber led to improve digestibility , daily gain weight and finishing weight of lambs without any side effect to animal (11 , 12). Biological treatments with enzymes laccase extract from medium of white root fungi have high ability to improve low quality of roughages recorded improve daily gain weight (21) Improve gain weight caused by dietry supplemented of animal feed (22,23,25).

The apparent result in figure (2) show significance difference ($P<0.01$) in the amount of neutral detergent fiber (NDF) the highest amount consumed (943.74) g\lambs \day for T5 40% enzymes MUAD and T4 20% MUAD (916.49) g\lamb \day the lowest T3 (849.42) g\lambs\day 40% trade enzymes. As the result demonstrate significance variation between the treatments in NDF digestibility (DNDF) The highest record T4 20% MUAD (566.39) g\lambs\day and the lowest (506.40)g\lambs\day for T3 40% *LABAZYME* the figure. (3) Showed significance differences ($P<0.01$) for intake and digest, acid detergent fiber (ADF) (814.72) g\l\day T4 20% for local enzymes, whereas decreased to (677.41) g\l\d T3 40% with trade enzymes, the highest ADF digestibility (732.11) T5 40% g\l\day local enzymes and decreased to (456.41) g\l\ d T2 20% with trade enzymes

Figure (4) showed highest Acid Detergent Lignin ADL intake (62.12) g\lambs\day T5 40% local enzymes the lowest T1, T2 (50.52,51.16) g\lambs\ day respectively .The highest digest ADL (42.17) g\lambs\ dayT4 20% local enzymes the lowest 30.27 g\lambs\ day T1 control. The apparent experiment result showed highest increase ($P<0.01$) in quantity of NDF, ADF, ADL with range local enzymes MUAD 20%, 40%. Compared with trade enzymes and control, this due to performances of exogenous enzymes that add to local Agriculture pollute Residue decay or bioremediation of complex bond that connected like a cement wall between cellulose and hemicellulose and another nutrient ,Increase surface area Permit rumen microorganism more attached to particles of feed, improve digestibility of feed compared with trade enzymes(21,24), The researchers prefer decay the lignin by fungi special white root fungi because have high ability to secretion wide range of lignocellosic enzymes these Tanique improve feed digestibility, increase feed intake and ruminant growth (22 ; 23). Biolysis of lignocellosic material that treated with crude extract from medium of growth white root fungi led to decrease in ADF , NDF and ADL (19) The improvement is due to active role play by enzymes that produced by white root fungi to reduce lignin content (22). Because alfalfa hay have a good quality comparable with Agricultural Waste. Us Local fibro lytic enzymes *HAMU* to improve nutritive value us treatment before 24 hour led to highest improvement in NDF, ADF and decrease ADL Compared with enzymes *LABAZYME* (24),The data showed Good improvement in nutritive value, increase in NDF, ADF, decrease in lignin content when use local enzymes MUAD compared with trade enzymes ,No significance difference between T3,T4,T5 in lignin content 4.77,4.61 and 4.93 respectively. Mode of action of exogenous enzymes by attack the hard cell wall bond between cell wall compound specially lignin, silica...etc, led to increase neutral detergent fiber and partly lytic for fiber, reducing sugars, free carbohydrate that play active role in increase activity, speed of growth of microorganism colony led to improve rumen environment increase feed attached reduce

period of stay digest feed in rumen flow to another part of digestive canal (12, 19). No significance variation digestibility of dry matter and organic matter.

Economic Efficiency

The economic efficiency. Mean the profit or daily gain comparable price of meat year2020 (10.000) ID for one kilogram. The data in table (3) demonstrate the lowest cost of roughages daily intake was T2 (130.95) ID \Lambs\ day. significance difference (P<0.01) with others treatment .the highest cost T5 168.75 g\lambs\ day significance difference with others flowed by T1 control 145.625 T4 141.300 T3 138.120 g\ lambs\ day. The reason of decrease cost of daily roughages intake T2 (1137) g\lambs\ day may be due to Reduce feed intake, figure (1) T5 record highest feed intake (1137) g\lambs \ day with Significance differences (P < 0.01) between treatment in daily profit gain, he Highest profit gain recorded T4 and T5 (1.3353, 13350) ID \lambs \ day respectively recorded significance difference (P<0.01) with others treatment ,net profit improvement due to ability of local enzymes *MUAD* to decay or digest cell wall complex links in feed led to increase accessible area attached of rumen microbiome and convert unsuitable feed to high quality ruminant feed caused improve feed conversation efficiency, health of the animal, daily gain weight and net profit(4,5,11,13,19,23,24),in cost efficiency T4,T5 record best with ratio of improve 5.90 and 5.97 respectively .

Conclusions

The best treatment of productivity or economic efficiency T4 20 % Agricultural Waste with local enzymes *MUAD*. local crude extract enzymes *MUAD* proved high ability to improve Digestibility of Dry matter, Organic matter , ADF,NDF ,increase feed intake , daily weight gain , feed conversation efficiency and Economic cost efficiency .without any side effect on animal health . Reduce environmental pollution.

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Table (1) concentrates composition

Feed	%
Barley	45
Wheat Brain	32
Corn	10
Soya bean meal	10
Salt	2
Calcium	1
Multivitamin	1

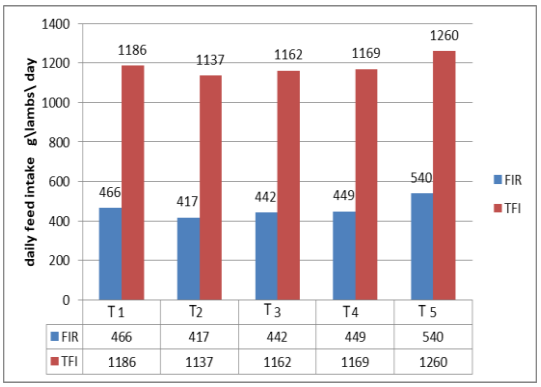

Figure (1): Effect of replace ratio of Agricultural Waste Treated with enzymes *LABAZYME* or *MUAD* with Alfalfa Hay in Total Feed Intake (TFI) and Roughages Feed Intake (FIR)g\lambs\day . T1: control 100%AH. T2: 20% Agricultural Waste Treated with trade enzymes+80% AH, T3: 40% Agricultural Waste Treated with trade enzymes +60% AH T4: 20% Agricultural Waste Treated with MUAD +80% AH, T5: 40% Agricultural Waste Treated with

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Table (2) role of replaced different ratio of Agricultural Waste that treated with trade or local enzymes in gain weight, efficiency of feed conversation

Treatment	IW	FW	TWG	ADGW	FCR
T1	24±2.62	33.60±1.80	9.60±1.24	160.±0.57C	7.4±0.0BC
T2	24±2.26	33.2±2.09	9.200±0.66	153±0.57E	7.43±0.0B
T3	24±1.87	33.40±1.69	9.200±1.88	157.16±0.57D	7.40±0.0A
T4	24±2.40	34.00±2.12	10.0±1.09	167.0±1.00B	7.0±0.0 D
T5	24±1.80	34.20±1.01	10.20±1.01	170.67±0.9 A	7.41±0.0A
Significant	NS	NS	NS	**	**

** [a, b, c] Means within Colom with different letter superscripts differ (P < 0.01). NS: NO Significance FCR: Feed conversion efficiency of ruminants. AGW: average gain weight g\lambs\day TWG: Total gain weight \kg. FW: Finishing weight. IW: Initial weight. T1: control 100%AH. T2: 20% Agricultural Waste Treated with trade enzymes+80% AH , T3: 40% Agricultural Waste Treated with trade enzymes +60% AH T4: 20% Agricultural Waste Treated with *MUAD* +80% AH, T5: 40% Agricultural Waste Treated with *MUAD* enzymes+60% AH

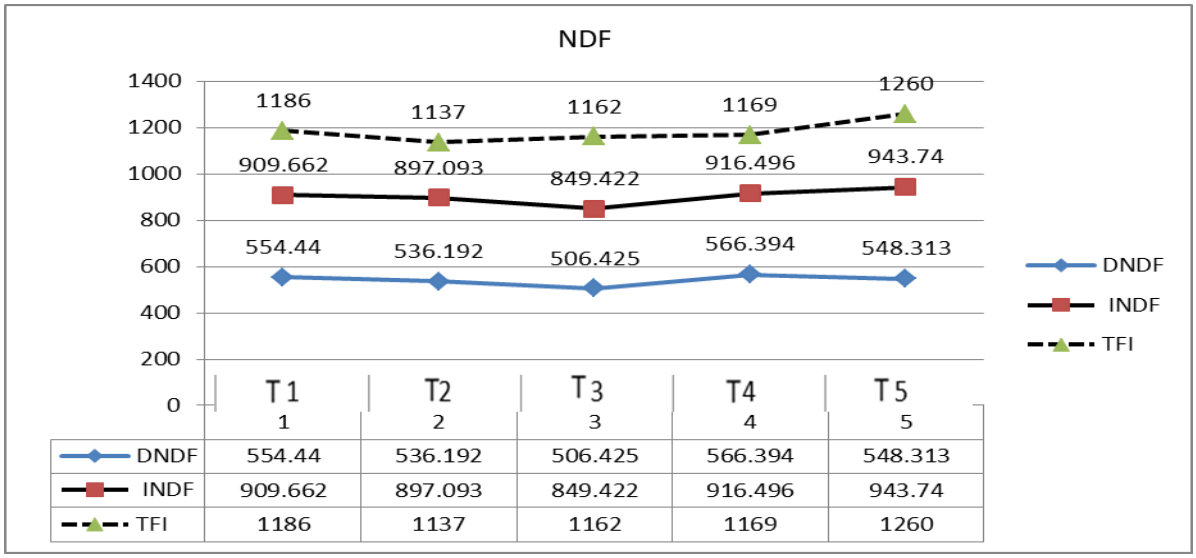

Figure 2. Role of replaced different ratio of Agricultural Waste that treated with trade or local enzymes in feed intake and digestibility NDF, with Alfalfa Hay. T1: control 100% Alfalfa Hay T2:20% Agricultural Waste treated with enzymes *LABAZYME* .T3: 40% Agricultural Waste treated with enzymes *LABAZYME,* T4:20% Agricultural Waste treated with enzymes *MUAD* .T5:40% Agricultural Waste treated with enzymes *MUAD*. INDF: Intake of Neutral Detergent Fiber. DNDF: digestibility of NDF.

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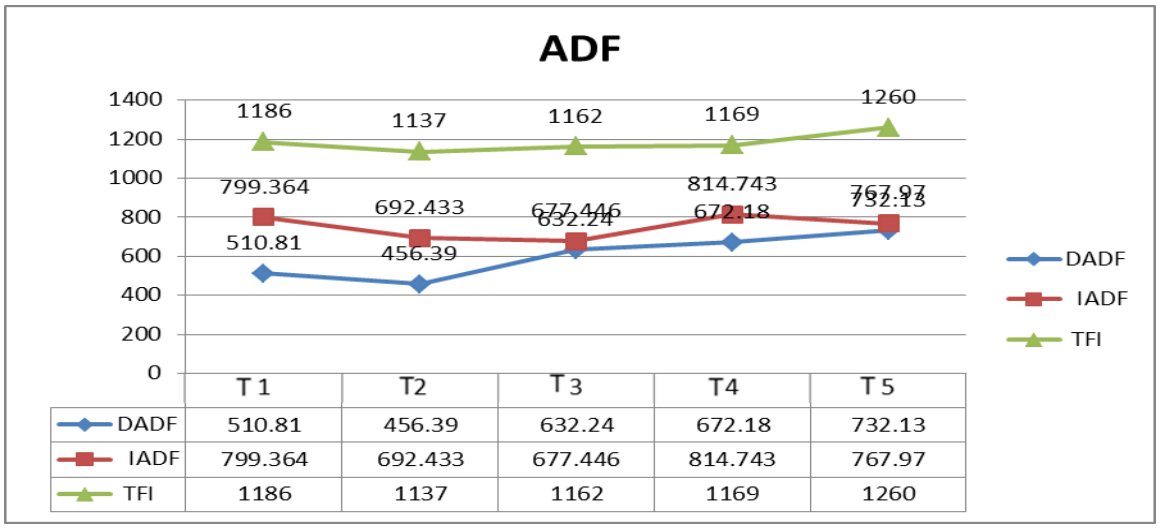
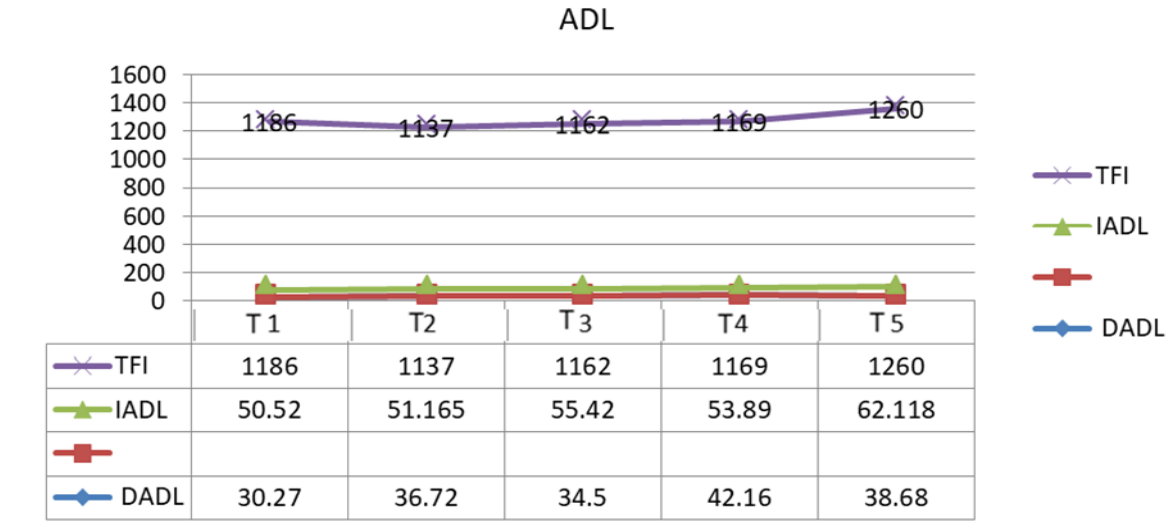


	T 1	T2	T 3	T4	T 5
DADF	510.81	456.39	632.24	672.18	732.13
IADF	799.364	692.433	677.446	814.743	767.97
TFI	1186	1137	1162	1169	1260

Figure.(3)Role of replaced different ratio of Agricultural Waste that treated with trade or local enzymes in feed intake and digestibility ADF, with Alfalfa Hay. T1: control 100% Alfalfa Hay T2:20% Agricultural Waste treated with enzymes *LABAZYME* . T3: 40% Agricultural Waste treated with enzymes *LABAZYME*, T4:20 Agricultural Waste treated with enzymes *MUAD* .T5:40% Agricultural Waste treated with enzymes MUAD. IADF: Intake of Acid Detergent Fiber DADF digestibility of ADF



	T 1	T2	T 3	T4	T 5
TFI	1186	1137	1162	1169	1260
IADL	50.52	51.165	55.42	53.89	62.118
DADL	30.27	36.72	34.5	42.16	38.68

Figure.(4)Role of replaced different ratio of Agricultural Waste that treated with trade or local enzymes in feed intake and digestibility NDF, with Alfalfa Hay. T1: control 100% Alfalfa Hay T2:20% Agricultural Waste treated with enzymes *LABAZYME* . T3: 40% Agricultural Waste treated with enzymes *LABAZYME*, T4:20% Agricultural Waste treated with enzymes *MUAD* .T5:40% Agricultural Waste treated with enzymes *MUAD*., IADL: Intake of Acid Detergent lignin. DADL: Digestibility ADL.

Table (3) role of replaced different ratio of Agricultural Waste that treated with trade or local enzymes

Treatment	TFC	FRC	ADGW	Net profit	EE
T1	340±0.57B	145.6±0.57 B	160.±0.57C	1.259±0.00B	100
T2	324.7±1.1D	130.9±1.2 E	153 ±0.57E	1.2053±0.0D	95.66
T3	333.50±0.57C	138.120±0.57D	157.2±0.57 D	1.2371±0.8C	98.18
T4	333.70±0.57C	141.30±0.57 C	167.0±1.0 B	1.330±0.06A	105.9
T5	362.8±1.45A	168.75±0.57 A	170.67± .9 A	1.330±0.05A	105.97
Significance	**	**	**	**	

** a, b, c Means within rows with different letter superscripts differ (P<0.01).TFC: Total feed cost \ ID\ day\ per lambs; FRC: Feed Roughage cost ID\ day\ per lambs ADG: Average Daily Gain g \ lamb \ day EE: Economic Efficiency T1: control 100%AH. T2: 20% Agricultural Waste Treated with trade enzymes+80% AH , T3:40% Agricultural Waste Treated with trade enzymes +60% AH T4: 20% Agricultural Waste Treated with *MUAD* +80% AH, T5: 40% Agricultural Waste Treated with *MUAD* enzymes+60% AH.

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