Analytical analysis of the productive characteristics of Awassi lambs Influence of the enzyme β-glucanases fiber analyzer

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Abstract— This study was conducted in the department of animal wealth at Tikrit University, Iraq, during November 2013 to February 2014. In the nutritional evaluation experiments, 20 lambs were used with a weight of 23.82+1.28kg, aged 4 to 5 months, and bought from the local markets. Based on the weight, lambs were randomly divided into five groups, each comprising 4 lambs. The lambs were fed five experimental foods containing concentrated and coarse diet (wheat straw). Each of these groups was further treated with enzyme fiber analyzer type (SFIZYM GP 2500) commercially prepared food at levels of 1-2g/kg mixed in fodder, while control group remained no enzyme. The necessary measurements were taken to determine the effect of enzyme fiber analyzer in the studied traits. The concentrated diet was set as 2.5% of the body weight while the coarse diet was provided for free consumption. According to the results, T3 exceeded the rate of daily increase, final weight gain rate and rate of total weight compared to all groups in the Euclidean distance.

Index Terms— β-glucanases, Analytical analysis, Awassi, Lamb, Enzyme, fiber.

1 Introduction

WE followed the fattening ruminant feeding systems based on the contents and composition of the food energy. As the basis of feedlot systems, the level of efficiency of the diets that are high level of grain (Mendoza and others 2007). Due to prolonged drought, the current costs of production, and large number of differential uses of grains may reduce opportunities for use as feed for animals. This condition may lead to the search of alternative sources of grain feeds without change or damage responses to the healthy growth and production of lambs. These alternative feeding sources primarily focused on coarse fodder diets, which are the main source of feed for ruminants. Increase of coarse feedings may reduce the growth of ruminant's due to incomplete decomposition of cell membranes by internal enzymes inside the gut of grazzers. This is due to the acidic conditions inside the rumen resulting due to the use of cereals (Zinn and Ware, 2002).

In order to overcome this problem, it was said that most of the nutrients should obtained from coarse diet. It is preferable to use lipid enzymes as external additives to ruminant diets may pose positive effects on the breakdown of carbs that make up the walls of plant fiber cells found in the feed (Krueger et al. 2008). External fibers and microorganisms within the rumen enhance the animal's ability to digest fiber and food components. Recently, use of fiber-extracting enzymes for decades have been reported (Bauchemin, and others 2004), but utilization of such foods was done in much focused way. Enzymes generally act as catalysts in chemical reactions, and make the surface structure of the material useful and highly efficient for the contents of the rumen by improving gut microbiota and ultimately the digestion (Bilungi et al., 2011).

The use of proteolytic enzymes is one of the biological methods of improving diet and digestion of synthetic carbohydrates (Dean and others, 2008). The microbial digestion patterns in ruminants allowed improved digestion of the plant cell walls compared with other animal species. These enzymes are commercial products, of which majority are common bacterial and fungal strains (Nadeau et al. 2001)

A well-described example of such enzymes is the enzyme β-glucanases which originally marketed on the basis of their ability to decompose plant cell walls and low costs (Gashe, 1992). The use of the enzyme-rich fiber increases the growth of lambs, Giraldo observed that animals which fed the enzyme based feed containing high level of coarse feed increases the effectiveness of the enzyme in the rumen to boost digestion and increases gut micrbiota. To reduce the use of grain in the feeds that cause fattening of ruminants, the large number of secondary outputs for the operations of harvesting and processing of grain. Especially wheat and barley straws, which constituted the animal feed, make rough and poor quality by declining the nutritional value and abundance of fiber. The current research focused on how to improve coarse diets through the use of the enzyme fiber analyzer as an external source.

The enzyme β-glucanase was used as an external supplement in the feed of the Iraqi Awassi goats. Whether the concentrated or the coarse (wheat straw) contained 1-2g of the enzymes to the lamb feed to determine the effect of digestion of fibers and other food compounds in the rumen.

2 Materials and Methods

2.1 Experiment animals

The experimental animal field of the department of livestock at the faculty of agriculture at the university of Tikrit, Iraq. The experiment spanned for the period of 77 days with the exception of pre-trial periods (14 days). About a total of 20 lambs were used in the experiment, purchased from local markets aged 5-6 months. The lambs were divided according to their weights into five groups comprised of randomly arranged 4 lambs in each group, and the lambs were housed in cages of 2x1 square meters each, and cages were equipped

with feeders and stripes. Lambs were vaccinated with the following treatments:
1. Vaccine Co-Baghdad against intestinal poisoning disease.
2 - Levozan 5 ml for each lamb against hepatic and pulmonary worms.
3 - Pantoprazole 10 ml for each lamb against intestinal worms.
4 - Ivermectine 1 ml per 50 kg live weight subcutaneous against external parasites.

2.2 Lambs feeding

The lambs were fed with five experimental diets with a feed rate of 2.5% of the animal weight for upto 77 days. Earlier preceded by a preliminary period lasts for two weeks followed by weighing the lambs were weighed to be the primary weight.

The weight of the lambs was measured on weekly basis by digital balance machine. In order to adjust the amount of feed available to the lambs according to their weights and to calculate daily and weekly weights were increased. Concentrated fodder was provided twice a day with 2.5% of the body weight, the first feed at 8.00 am while second at 5.00 pm. Total amount of the concentrated fodder that given to each lamb daily, while the coarse fodder (wheat straw) was freely provided to the lambs to eat from it upto saturation, and the wheat straw was calculated daily by subtracting the remaining amount in the feed from the amount provided to the lambs.

2.3 Experiment Groups

The lambs were distributed on five feeding parameters and used the fiber enzyme (Safizyme GP 2500) β-glucanasez powder, is intended for animal feed and is prepared from local markets. The enzyme protease to digest fibers was added with two levels i.e., 1g enzyme/kg fodder and 2g enzyme/kg fodder to both concentrated and coarse diets (wheat straw). The first group (1g enzyme/kg) was considered as control without addition of any enzyme fiber analyzer to the diet.

Experiment Diet 1. Preparation and treatment of concentrated feed:

The fiber enzyme was added at 1g and 2g levels to the concentrated diet by adding the prescribed amount of the enzyme with an adequate and sufficient volume of distilled water. Spray the solution with a spray pump by pressing the wheat bran portion of the concentrated diet, then sprinkle with 5 cm and leave to dry the air and mix with other ingredients. The concentrated diet is a good mixture on a solid and cleaned the concrete floor with flipping several times until it completely dried. Now the treated quantities were filled in the plastic bags until used to feed the lambs.

Preparation and treatment of coarse feed

Weighing the amount of straw and sprayed on an up raised floor about 5 cm, and then sprinkled with the enzyme of the fiber at the levels of 1 g and 2 g. Now used the same way in the preparation of concentrated diet then the amount was flipped several times and left for air dry.

2.4 Data Analysis

The data obtained was analyzed using the averages of the studied traits, and groups were highlighted by using cluster analysis.

3 Results and Discussion

The effect of the enzyme on the rate of daily weight increases. The main objective of the cluster analysis was to determine the approximation or similarity of the characters under study between the groups based on the amount of Euclidian distances between them.

The results showed a difference in the daily rate of increase between the groups and the highest daily increment rate (168.99g) for the Group T3, and the weight increase rate (160.60g) was minimum in group T5 (Table 1).

TABLE 1
SHOWING THE CLUSTERING AND EUCLIDIAN DISTANCES BETWEEN THE GROUPS

Euclidian distances	Stages	Clustering Groups	Daily increase rate	Groups
4.276	1	T4- T2	gm 143.50	T1
6.762	2	T5- T2	gm 154.54	T2
11.085	3	T2- T1	gm 168.99	T3
25.568	4	T3- T1	gm 150.76	T4
-	-		gm 160.60	T5

It is clear from the data (Table 1) that, there are different Euclidian distances between the groups and based on the rate of daily weights increases according to the cluster analysis stages. Clustering the first phase of the analysis involves group T2 with a concentration diet of 1g/kg with group T4 with a coarse diet at the level of enzyme 1g/kg, and they get a lower coefficient of clustering (4.276). This indicated the convergence and similarity between the two groups in the rate of daily increase in weight, while the last phase was T3 group from the rest of the groups with the largest Euclidian distance of 25.568 (Table 2, Figure 1).

TABLE 2
The matrix of Euclidian distances between groups

Proximity Matrix

Case	Euclidean Distance				
	1	2	3	4	5
1	.000	11.085	25.568	7.855	17.562
2	11.085	.000	14.485	4.276	6.762
3	25.568	14.485	.000	18.257	8.625
4	7.855	4.276	18.257	.000	9.891
5	17.562	6.762	8.625	9.891	.000

This is a dissimilarity matrix

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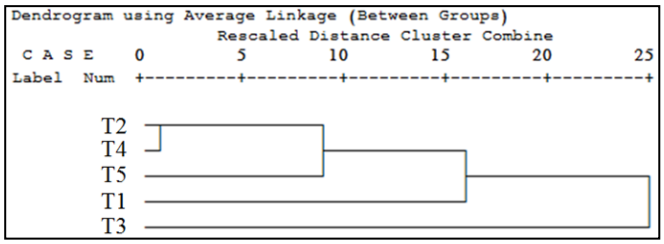

Figure 1: The stages of clustering according to the Euclidean distances between the groups

It is clear from the results (Figure 1) that the total lambs were distributed according to the rate of the daily increase in weight to two main groups of enzymes. The first main group further divided into two subgroups, the first subgroup comprised of two small groups. The subset under the first secondary included the groups T2 and T4. Below the second secondary, while the second subgroup included the T1 group on its own, while the T3 group in the second main group emerged as a result of the difference in the average daily weight increase from the control group and the rest of the groups. The daily increase in the T3 group (168.99) may be due to the superiority of the third group to the concentration of the enzyme used and its effectiveness (Bowman et al., 2002).

Second: The effect of the enzyme on the final weight of lambs.

The results showed that there was a difference in rate of the final weight gain between the various groups. The highest final weight rate was 36.54 kg for T3 followed by T5 with a final weight rate of 36.27 kg (Table 3).

TABLE 3
The clustering and Euclidian distances between the groups

Euclidian distances	Stages	Clustering Groups	Daily increase rate	Groups
1.256	1	T3- T2	34.85 kg	T1
1.479	2	T5- T4	35.78 kg	T2
1.366	3	T2- T1	36.54 kg	T3
3.018	4	T4- T1	35.18 kg	T4
-	-	-	36.27 kg	T5

The results further told that (Table 3) there were different Euclidian distances between the groups and depending on the final weight increments. According to the cluster analysis stages, the first phase of group T2 analysis was concentrated diet with enzyme level 1g/kg with T3 group was coarse diet with an enzyme level of 1g/kg and both get less clustering coefficient of 1.256. This indicated the convergence and similarity among the two groups in the rate of final weight gain, while in the final phase, the group T4 alone from the rest of the groups the largest Euclidian distance of (3.018) (Table 4, Figure 2).

TABLE 4
The array of Euclidean distance between groups

Proximity Matrix

Case	Euclidean Distance				
	1	2	3	4	5
1	.000	1.366	2.618	3.018	4.245
2	1.366	.000	1.256	2.088	3.040
3	2.618	1.256	.000	1.688	2.018
4	3.018	2.088	1.688	.000	1.479
5	4.245	3.040	2.018	1.479	.000

This is a dissimilarity matrix

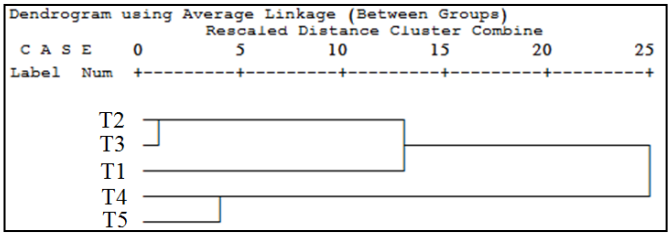

Figure 2: The stages of clustering between the groups.

It is evident from the results (Figure 2) that the groups were divided according to the rate of final weight gain into two main groups. The first main group consisted of two subgroups, the first subgroup included T2 and T3, T1 was unique in the second subgroup, the second group included T4 and T5, and the Euclidean distances were convergent except for the fourth group, which reached the Euclidean distance (2.683). This may be due to the conditions surrounding the experiment and the level of the enzyme (Beauchimin et al. 2003).

Third: the overall rate of increase.

The results showed a difference in the rate of total increase in weight between the groups and the highest rate of increase in total weight (13.01kg) for the group T3 followed by the group T5 rate of total weight increase (12.37kg) (Table 5).

TABLE 5
The clustering phases and the Euclidean distances between groups

Euclidian distances	Stages	Clustered groups	Total rate of increase	Groups
1.262	1	T5- T4	11.05 kg	T1
1.312	2	T2- T1	11.90 kg	T2
1.729	3	T4- T3	13.01 kg	T3
3.800	4	T3- T1	11.60 kg	T4
-	-	-	12.37 a kg	T5

There is a presence of Euclidean distances between different groups and depending on the rate of total increases in weights according to the cluster analysis stages (Table 5). In the first phase of the cluster analysis, T4 group was coarse diet and enzyme level of 1g/kg with T5 with a coarse diet and enzyme level of 2g/kg and both groups get a lower coefficient of clustering (1.262). This indicated the convergence and similarity between the two groups in the overall rate of increase in

weight. While the last stage group T3 has been singled out for the rest of the groups has the largest Euclidean distance of (2.800) (Table 6, Figure 3).

TABLE 6
The array of Euclidean distance between groups

Proximity Matrix

Case	Euclidean Distance				
	1	2	3	4	5
1	.000	1.312	2.800	3.050	4.212
2	1.312	.000	1.494	2.022	3.037
3	2.800	1.494	.000	1.729	2.100
4	3.050	2.022	1.729	.000	1.262
5	4.212	3.037	2.100	1.262	.000

This is a dissimilarity matrix

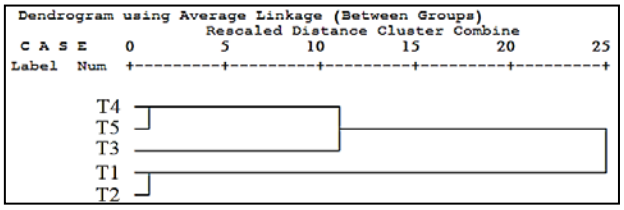

Figure 3: The stages of clustering between the groups.

The groups were distributed based on level of the overall rate of increase in total weight to two main groups the first group consisted of two subgroups, the first subgroup of groups T4 and T5 (Figure 3). The T3 group was separated by the second subgroup, while the second group included the T1 and T2 groups. The Euclidean distances were close except for the T3 group, which had a Euclidean distance of 2.800. This may be due to the conditions surrounding the experiment and the level of the enzyme (Beauchimin et al. 2003).

Fourth: The difference between groups according to all studied traits.

The groups showed differed rates in the daily, final and total weight increments according to the levels of addition of the fiber enzyme (Figure 4).

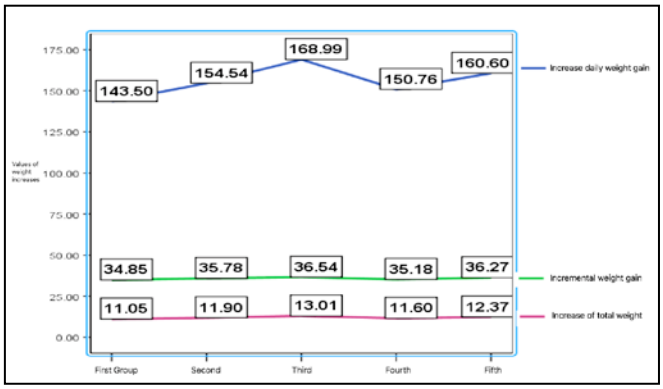

Figure 4: Increment in rates of the daily, final and total weights

There was a difference in the rates of the daily, final and total weights between the groups (Figure 4). The Euclidean distances differed according to the difference in the increment rates (Table 7).

TABLE 7
The stages of clustering between groups

Clustering factor	Stages	Clustered groups	Groups
4.329	1	T4- T2	T1
6.796	2	T5- T2	T2
11.157	3	T2- T1	T3
25.699	4	T3- T1	T4
-	-	-	T5

There were different Euclidean distances between groups and depending on the rate of total increases in weight (Table 7). According to the cluster analysis stages, the first phase of the analysis (T2 group) was fed with concentrated diet having enzyme level of 1g/kg with the T4 group. With coarse diet and enzyme level of 1g/kg both groups get a lower coefficient of clustering (4.329), indicating the convergence between the two groups in the rates of weight increases. While the last stage group T3 has been singled out for the rest of the groups, and has got highest Euclidean distance (25,699) (Table 8, Figure 5).

TABLE 8
The Euclidean distance matrix

Proximity Matrix

Case	Euclidean Distance				
	1	2	3	4	5
1	.000	11.157	25.699	7.882	17.668
2	11.157	.000	14.547	4.329	6.796
3	25.699	14.547	.000	18.362	8.653
4	7.882	4.329	18.362	.000	9.980
5	17.668	6.796	8.653	9.980	.000

This is a dissimilarity matrix

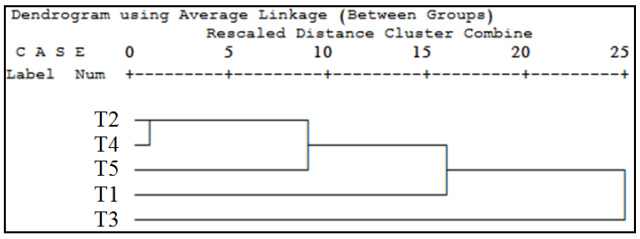

Figure (5) shows the clustering stages between groups

The groups were divided according to the rates of weight increases to two main groups the first major group had two sub-groups (Figure 5). The first subgroup consisted of two subgroups, including the first group T2 and T4, while the second group included the T5 group. The T1 group was unique in the second subgroup, the second group included the group T3, which had Euclidean distance 25,699.

4 Conclusions

Group T3 out performed in the daily increase on all groups and differed from the other groups with the largest Euclidean distance.
T3 out performed in the final weight gain on all groups and approached with group T2 with the lowest Euclidean distance. –The group T3 out performed among all groups at the rate of total increase weight and differed from the group T1 in having highest Euclidean distance.

5 Recommendations

To demonstrate the full effect of fiber-extracting enzymes, it is recommended to evaluate their carcasses in terms of the amount of fat and their distribution in the pieces of this evaluation. Study of the enzyme addition analysis of fibers in the experiments of fattening of lambs using higher levels of adding the enzyme. Studies of the addition of the enzymes analysis of fiber on the quality of other lambs and cheese.

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