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The Effect of Treating Barley Straw with Fungus (*Trichoderma Harzianum)* (1): on Growth and Some Carcasses Characteristics of Awassi Lambs

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ABSTRACT

This study was conducted at the farm of Ruminants Research Station / Office of Agricultural Research / Ministry of Agriculture / in Abu Ghraib – Baghdad. The experiment was continued for 60 days in addition to the adaptation period for 14 days to study the effect of treating barley straw with fungus (*Trichoderma harzianum)* (1): on growth and some carcasses characteristics of Awassi lambs. Ten Awassi lambs were used in this experiment average age is 8-9 months and her average weight is 38 ± 0.50 were divided randomly into two equal groups, and then put with individual pens. Lambs were fed individually on a unified concentrate diet (2.5% of body weight). While the roughages offered on *ad libitum* basis. Each group were fed on roughages (barley straw), as follows: 1. The First group was a control group fed on untreated barley straw. 2. The second group was fed on barley straw treated with *Trichoderma harzianum* at rate 0.1% (1 kg /tones). At the end of the experiment the lambs were prepared for slaughter and were fasted for a while 14 an hour before the slaughter, with the continued provision of water for it ,and immediately before the slaughter, the lambs were weighed to stabilize the live weight before the slaughter, then they were slaughtered, and all weights of the carcass have been taken, and weights of major and minor parts. An analysis of the statistical data using the program of statistical analysis (SAS) and the experience was the use of (CRD). The results showed that different effects among treatments as follow: the fungi treatment (T2) significantly outperformed (P <0.05) in both the efficiency of food conversion, daily gain weight (g / day), total gain weight (g / day) and the total weight increase (kg / day) which amounted to (13.75, 131.55 and 7.37 respectively) compared to the control treatment (T1) Which amounted to (17.29, 94.64 and 5.30 respectively), and indicate a significant increase (P <0.05) in the dressing percentage based on live weight of (T2) Compared to the control treatment (T2) that amounted (50,47 and 45.59 respectively), shows a significant increase (P <0.05) in proportion of shoulder piece in (T2) compared to (T1) That amounted (20.40 and 15.26 respectively), while a significant decrease (P <0.05) in the proportion of a loin piece in (T1) compared to (T2), as for the effect of the treatment on the proportion of the minor pieces, shows a significant decrease (P <0.05) in the proportions of fore shank, flank, and the total proportion of the minor pieces in the (T2), recorded (4. 29 ، 2. 61 and 26. 44 respectively) compared to (T1) (8. 46, 4. 81 and 30. 42 respectively), That amounted (9. 48 and 7. 70 respectively), while there are no significant differences in the rest of the traits.

Keywords: Treating Barley Straw, Fungus, *Trichoderma Harzianum*, Awassi Lambs

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INTRODUCTION

The researchers aimed to improve the value of poor quality feed to be used in animal nutrition, Therefore, chemical treatments were used, and it was later found that the resulting improvement was associated with an increase in phenolic compounds, a decrease in the number of anaerobic bacteria, and an increase in the pH of rumen, and the increase of free lignin (Al-Samarrai, 2001), and thus this affects the activity of micro-organisms inside the rumen, so it is imperative to find alternatives to take advantage of these feeds. Therefore, researchers directed to use biological treatments for the purpose of improving the feed, as some researchers used the probiotic as additives Forage (Al-Saady, 2009) or the use of the probiotic as a direct treatment for the feed (Alwaeli et al., 2017), and yeast has also been used as a biological treatment (Al-Samaraee et al., 2019), as well as the use of fungi to improve feed value (Al-Samaraae and Alwaeli, 2016), while others resorted to using enzymes (Almaamory, 2016) and (Rida, 2017), biological treatments help to break the link between lignin and cellulose, and increase free cellulose to make it easier to use by ruminants (Mahesh and Mohini, 2013).

The *Trichoderma harzianum* of the fungi under investigation that were used in biological treatments to broke down the link between lignin and cellulose (Alwaeli, 2016), Consequently, the improvement in the value of feed and the increase in the benefit of the animals from it leads to an improvement in the quality of the carcasses (Morteza et al., 2010), so this experiment was designed to study The effect of treating barley straw with fungus (*Trichoderma harzianum)* on growth and some carcasses characteristics of Awassi lambs.

MATERIALS AND METHODS

This study was conducted in the field of the Ruminant Research Station / Office of Agricultural Research/ Ministry of Agriculture in Abu Ghraib - Baghdad and continued the experiment for 60 days and add the pre - trial period for14 a day to study the effect of treatment on the specific characteristics of Awassi lambs. Used were 10 lambs average age is 8-9 months and her average

weight is 38 ± 0.50 randomly divided into two groups, and each lamb was placed in a single cage with dimensions1.25 X 1.25m., the lambs underwent a two-week introductory phase during which all the lambs were fed with the standard feed (tables1 and 2), Provided concentrated diet by 2.5% of body weight. The lambs were weighed every two weeks and the concentrated feed was adjusted on the basis of weight. The roughages offered *ad libitum*, and the net provision of water continuously and underwent all the lambs of Vaccines approved in the vaccination schedule followed in the field, and divided groups as next one:

1- First group (T1): Control group was fed lambs on barley straw untreated.
2- The second group (T2): The lambs were fed on barley straw treated with fungi *Trichoderma harzianum* (T. *h*.)

The barley straw was divided into two parts and its moisture increased to 70% by spraying water on it, and each part was treated as follows: -

1- The first part not treated is presented to the control group that is used to offer a comparison.
2- The second part was treated with the fungus *Trichoderma harzianum* at a rate of 0.1% (1 kg per ton of barley straw) the ingredients were dissolved in water (100 g / 10 liters). The liquid containing the fungi was sprayed on the barley straw and turned to ensure that the fungi were distributed over it.

After spraying the treatment materials, the barley straw was covered with a black nylon bag to prevent sunlight and air and left for two weeks, after which the nylon bag was removed from the barley straw and left to dry, and then the barley straw was crushed for the purpose of its use and presented to the experimental Lambs.

Table 1: The concentrated diet ingredients used in feeding lambs and the chemical analysis of each feed material

Feed material	Percentage %	DM	Ash	CP	CF	EE	NFE	TDN	ME MJ / kg DM
Barley	48	92.3	4.33	11.16	7.26	1.52	75.73	66.50	10.507
yellow corn	20	90.1	2.66	9.99	2.66	4.77	79.92	74.53	12.003
Wheat bran	20	90.1	5.66	17.09	11.99	4.55	60.71	70.73	11.295
soybean meal	10	90.1	4.99	49.39	6.55	2.22	36.85	81.77	13.352
stone limestone	1								
Nacl	1								

The energy metabolized was calculated according to the following equation:
ME (MJ/kg DM) = [- 0.45 + (0.04453×% TDN)] × 4.184
TDN (DM%) = **-17.2649+1.2120(%CP) +0.8352%NFE+2.4637% EE+0.4475 % CF**, (Kearl, 1982)

Table 2: Chemical composition of barley straw (treated and non-treated) and concentrated diet (% of dry matter)

Transaction	% DM	% Ash	% CP	% CF	% EE	% NFE	% NDF	% ADF	% ADL	% Hemi	Cell%	TDN	ME MJ / kg DM
T1	90.83	14.46	4.17	64.47	1.38	15.52	63.68	42.02	24.08	21.66	17.94	33.00	2.82
T2	90.80	14.99	4.92	66.00	1.29	12.80	65.05	49.08	25.92	15.97	23.16	32.10	2.69
Concentrated diet	89.91	7.72	12.33	13.31	5.23	61.40	41.1	18.5	5.02	22.56	13.52	67.81	10.48

The energy metabolized was calculated according to the following equation:
ME (MJ/kg DM) = [- 0.45 + (0.04453×% TDN)] × 4.184
TDN (DM%) = **-17.2649+1.2120(%CP) +0.8352%NFE+2.4637% EE+0.4475 % CF**, (Kearl, 1982)
T1, Control treatment. T2, Treatment of fungus

At the end of the experiment the lambs were prepared for slaughter and were fasted for a while 14 an hour before the slaughter, with the continued provision of water for it and immediately before the slaughter, the lambs were weighed to stabilize the live weight before the slaughter, then they were slaughtered, and the weights of the slaughtering residues (skin, head, and legs) were recorded, as well as the carcass cavity and the weight of all internal organs were calculated. and the weight of the digestive system is full and empty (to calculate the weight of the contents of the digestive system), and the hot carcasses were weighed within less than an hour after slaughter, then they were placed in the cold room under a temperature 4 °C for 24 hour later, the cold carcasses were weighed, then the kidneys, kidney fat, Pelvis, and Fat Tail were separated and weighed separately, after which each carcass was divided into two halves, where the left half was cut to 4 major parts (Leg, Loin, Ribs, and Shoulder) and 4 minor parts (Neck, Fore shank, Breast, and Flank) (Forrest et al., 1975).

The experimental data analyzed statistically by complete random design (CRD) and compared the significant differences between averages by Duncan test (Duncan,

1955), using statistical program SAS (SAS, 2012). According to the following mathematical model:

Yij = μ + ti + eij

As:

Yij = View value j Per transaction i

μ = The overall mean of the trait

ti = Treatment effect

eij = Random error that is normally distributed with mean equal to zero and variance of its magnitude $\sigma^2 e$

RESULTS AND DISCUSSION

The results are shown in Table 3 that the fungi treatment (T2) significantly difference (P <0.05) in both the efficiency of food conversion, daily gain weight (g / day) and total gain weight (kg / day) which amounted to (13.75, 131.55 and 7.37 respectively) compared to the control treatment (T1) Which amounted to (17.29, 94.64 and 5.30 respectively), while the transaction outperformed (T2) arithmetical in the final weight compared to the control treatment (46.33 and 43.83 respectively), which may be due to the improvement in the efficiency of the feed conversion in (T2) in which fungi were used and thus increased the benefit of ruminants from the provided feed, despite the low intake of concentrated and roughages feed arithmetical.

Table 3: The effect of treating barley straw with *Trichoderma harzianum* fungi in the weights of the Awassi lambs, the total and daily weight gain, the amount of feed intake, and the efficiency of the feed conversion for different treatments.

Transaction / Adjective	T1	T2	sign
Initial weight (kg)	38.53 ±4.34	38.97 ± 3.36	N.S.
Final weight (kg)	43.83 ±2.40	46.33 ± 4.04	N.S.
Total gain weight (kg)	5.30 ±1.16 b	7.37 ± 0.69 a	*
Daily gain weight (g / day)	94.64 ± 1.16 b	131.55 ± 0.69 a	*
Roughages intake total (kg/DM)	34.02 ± 2.86	31.86 ± 2.02	N.S.
concentrated diet intake (kg/DM)	57.63 ± 1.32	46.77 ± 0.65	N.S.
Food conversion efficiency	1 7. 29 ± 2.3 0 a	13. 75 ± 1. 30 b	*

*The different letters within the same row indicate the presence of significant differences (P <0.05) Between transactions
N.S. non-significant

Various studies have shown that biological treatments led to an improvement in daily gain weights increases this may be due to the effect of the treatment on the efficiency of microorganisms in the digestion of organic matter (Abdel-Azim et al., 2011), and thus increase food conversion efficiency (Alwaeli, 2016), and stated Gado et al. (2007) that the significant increase in the concentration of cellulase enzyme may be the reason for the high average body gain weight when feeding animals on the biological treated feed.

The results in Table 4 indicate a significant increase (*P* <0.05) in the dressing percentage based on live weight of (T2) Compared to the control group (T2) that amounted (50,47 and 45.59 respectively), while other characteristics did not show any significant difference between the treatments, but there is an arithmetical difference in the dressing percentage based on the empty weight of the (T2) Compared to (T1) recorded (71.76 and 69.06 respectively), and the increase in the dressing percentage may be due to its association with the weight at slaughter, which has a significant effect on this proportion (Benchaar et al., 2009).

Table 4: The effect of treating barley straw with *Trichoderma harzianum* fungi in the live weight of lambs at slaughter, empty weight, carcasses weights, the proportion of Fat Tail and dressing percentage.

Transaction / Adjective	T1	T2	sign
Live weight (kg)	1.01 ±47. 25	1.95 ± 43	N.S.
Empty Weight (kg)	0.67 ± 31.19	0. 30 ±30.24	N.S.
Hot carcass weight (kg)	0. 84 ± 21.81	0. 29 ± 21.90	N.S.
Cold carcass weight (kg)	0. 73 ± 21.55	0. 29 ± 21.70	N.S.
Proportion of Fat Tail to weight of cold carcass (%)	0. 61 ± 8.63	0. 42 ± 7.66	N.S.
Dressing percentage based on live weight (%)	0. 98 ± 45.59 b	0. 67 ± 50.47 a	*
Dressing percentage based on empty weight (%)	1. 54 ± 69.06	0. 25 ± 71.76	N.S.

*The different letters within the same row indicate the presence of significant differences (P <0.05) Between transactions

N.S. non-significant

Table 5 shows a significant increase (P <0.05) in proportion of shoulder piece in (T2) compared to (T1) that amounted (20.40 and 15.26 respectively), while a significant decrease (P <0.05) in the proportion of a loin piece in T1 compared to T2 That amounted (9. 48 and 7. 70 respectively), and there is no significant difference in the proportion of both the leg and rack, with a superior arithmetical in total of proportions major pieces. As for the effect of the treatment on the proportion of the minor pieces. A significant decrease (P <0.05) in the proportions of fore shank, flank, and the total proportion of the minor pieces in the (T2), recorded (4. 29، 2. 61 and 26. 44 respectively) compared to (T1) (8. 46, 4. 81 and 30. 42 respectively), While there was no significant difference in the proportion of the neck and breast pieces.

The treatment may not have a direct effect on the proportion of the carcass pieces, and this effect may be through improving the digestion of the lambs fed on barley straw treated with fungi, and that there is an inverse relationship between the major and minor pieces, as the height of one leads to a decrease in the other (Al-Tamemmy et al., 2017)

Table 5: The effect of treating barley straw with *Trichoderma harzianum* fungi in the proportion of carcass pieces proportion to half of the cold carcass removed Fat Tail.

Transaction / Adjective	T1	T2	sign
Major Pieces%			
Leg	0. 87 ± 33.40	0. 27 ± 33.42	N.S.
Loin	0. 57 ± 9. 48 a	0. 33 ± 7. 90 b	*
Rack	0. 84 ± 10. 56	0. 95 ± 10. 82	N.S.
Shoulder	0. 57 ±15. 16 b	0. 23 ± 20. 60 a	*
Total	0. 91 ± 68. 6	0. 66 ± 72. 74	N.S.
Minor Pieces%			
Neck	0. 65 ± 8. 34	0. 77 ± 7. 97	N.S.
Fore shank	0. 95 ± 8. 36 a	0. 12 ± 4. 49 b	*
Breast	0. 55 ± 10. 39	0. 56 ± 11. 96	N.S.
Flank	0. 38 ± 4. 31 a	0. 35 ± 2. 84 b	*
Total	0. 91 ± 31.4 a	0. 85 ± 27. 26 b	*

* The different letters within the same row indicate the presence of significant differences (P <0.05) Between transactions

N.S. non-significant

From the above, we conclude that the treatment with *Trichoderma harzianum* fungi It improved some characteristics of the carcass, and we recommend that more studies be carried out using different proportions of fungi and on other types of forages.

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