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PERFORMANCE OF GROWING CROSSBRED FRIESIAN CALVES FED BIOLOGICAL TREATED ROUGHAGES AND CONCENTRATE: 1- FEEDING VALUES AND ANIMAL PERFORMANCE.

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SUMMARY

The aim of this study was to investigate the effect of feeding biological treated roughages and concentrate feed mixture of growing crossbred Friesian calves on the nutritive values and animal performance. A feeding trial for 183 days was carried out using forty eight crossbred Friesian calves of 6 -7 months old and 189.17 $\pm$ 3.58 Kg live body weight (LBW). Animals were divided into 3 similar groups in LBW of 16 calves; each group was divided into two bgroups (8 calves each). The experimental groups allotted randomly into six rations: control (R1, R3 and R5): 2% of LBW. Concentrate feed mixture (CFM) and *ad-libitum* straws of wheat, bean and clover, respectively, while R2, R4 and R6 included 2% CFM of LBW plus biological treated (*Trichoderma harzinaum F-418* fungi) previous straws *ad-libitum*, respectively. Feeding period extending to 183 days. Feed intake, digestibility coefficients, nutritive values, daily gain, feed conversion and economical efficiency was determined. Results indicated that the apparent digestibility coefficients of all nutrients were higher ($P<0.05$) with rations containing biological treated straws than those in other rations. Nutritive values as TDN and DCP were significantly higher ($P<0.05$) with biological treatment than the control groups. Also, CF and fiber fractions digestibility of biological treated straws were significantly higher ($P<0.05$) than the control treatments. Daily DMI expressed as Kg/h/d or DM/kg $W^{0.75}$ was significantly ($P<0.05$) higher in calves fed rations containing biological treated straws compared to those given the control rations. Calves received rations containing biological treated straws recorded higher ($P<0.05$) average daily gain (ADG) than those received the control rations, the realized ADG was 1.328, 1.524 and 1.721 kg/day for R2, R4 and R6, respectively, while calves of the control groups R1, R3 and R5 recorded 1.253, 1.357 and 1.456 kg/day, respectively. Feed conversion of calves fed R2, R4 and R6 was markedly better than of the control groups. Economical efficiency was better with calves fed rations containing biological treated bean and clover straws, while wheat straw was not economic (R2). It could be concluded that, feeding biological treated (*Trichoderma harzinaum F-418* fungi), wheat, bean and clover straws *ad-libitum* with 2% of LBW concentrate feed mixture (2% of LBW of growing crossbred Friesian calves), resulted in superior nutrition status and better daily gain, feed conversion and economical efficiency, as compared with control groups could be recommended.

Keywords: straws, fungus, biological treatments, feeding value, frisian calves

INTRODUCTION

In Egypt, the shortage of animal feedstuffs, in general and protein in particular, attracted the attention of many research workers towards the unconventional feed resources. It was stated that the annual nutritional requirements of animal population is estimated to be 12.86 million tons of TDN and 1.367 million tons of DCP per year, according to (Census 1982). However, only 4.0 to 4.3 million tons of crop residues out of 13.7-15.2 million tons produced are used for feeding ruminants (EL-Shinnawy, 1990, Hathout and EL-Nouby, 1990). Approximately two thirds of the crop residues are burned or wasted, and hence lead to environmental pollution and consequently health hazards. Accordingly, the biological treated roughages can provide farm animals with high source of energy as a result of improving residue crops. Many in vivo studies were done in different parts of the world on biological treatments of straws for improving their nutritional quality have remained for a long time at the laboratory scale only (Flegel and Meevootison 1986). Due to the urgent needs to search for more available and cheaper roughage, resources particularly agricultural by-products for animal feeding, improving the nutritive values of such residues would provide a major contribution in the field of feed resources. In summer season, the available feeds {mainly concentrate feed mixture (CFM) and straws} only cover 39% and 22% of the animal energy and protein requirements (El-Serafy, 1991). However, its use for small and large ruminants has not been fully explored.

However, no studies have reported or assessed its replacement rates or comparative feeding value primarily with high energy growing and finishing rations for growing calves. Fouad *et al.*, (1998) showed that feeding biological treated six different kinds of low quality roughages (cotton stalks, corn cubs, corn stalks, rice straw, wheat straw and bean straw) and concentrate feed mixture (1% of LBW of growing lambs) resulted in improvement of feed consumption and better daily gain, feed and economical efficiencies, rumen fermentation and blood parameters without negative effects on animal metabolism.

The present study aimed to investigate: (1) the ability of biological treatment with (*Trichoderma harzinaum F-418* fungi) to improve, its chemical composition, cell wall constituents, and nutritive value in terms TDN and DCP. (2) Effect of feeding CFM with rate of 2% of LBW plus biological treated wheat, bean or clover straws *ad-libitum* for growing calves on their performance.

MATERIALS AND METHODS

This study was carried out at Arabic Agriculture Company at El-Behera governorate and Animal Production Research Institute. A feeding trial lasted 183 days was carried out on forty eight crossbred Friesian calves of 6 -7 months old and 189.17 ± 3.58 Kg LBW. Animals were divided into similar 6 subgroups (8 calves each). Eight tons of wheat straw, bean straw and clover straw were obtained from the same company fields, while the fungal strain of (*Trichoderma harzinaum F-418* fungi) was obtained from the Microbial Chemistry Laboratory, National Research Center.

Preparation of fungal inoculums:

Three days old slants cultures of *Trichoderma harzinaum F-418* was crushed into flask containing 250 ml of sterilized water. The inoculum was used to inoculate 500 ml capacity flaks containing 20g of cooled sterilized sugar beet pulp moistened by basal medium containing 2% molasses, 0.2% urea, 0.2% KH_2PO_4 and 0.05 $MgSO_4.7H_2O$ in solid liquid ratio 1:2 by 10% (v/w). The inculated flasks were incubated in adjusted temperature incubator at 30 $\pm$ 1 °C for 5 days. These inoculums were used to inoculate 10 liters containers each contained 1 kg sugar beet pulp moisted with medium containing the composition of the same above mentioned medium by 10% (w/w) then incubated for 3 days to produce the fungal cultures that used for enrichment of the experimental straws at 10% (w/w). Then fermented for a week in room temperature.

Preparation of fungal treatments:

The treated chopped straws (1-1.5 inch) were moisture at 65 – 70% and well mixed with specific fungal prepared culture at 10% (w/w) and left for three weeks open air. The treated straw was mixed well at intervals 48 hours, the moisture decreased to about 12%.

The experimental groups allotted randomly into six rations as shown in (Table 1): control (R1, R3 and R5): 2% of LBW. CFM plus *ad-libitum* straws of wheat, bean and clover, respectively, while R2, R4 and R6 included 2% CFM of LBW. plus biological treated (*Trichoderma harzinaum F-418* fungi) previous straws *ad-libitum*, respectively.

Concentrate feed mixture (CFM) consisted of; 35% yellow corn grain, 25% wheat bran, 20% undecortecated cottonseed meal, 10% line meal, 5 soybean meal, 2% limestone, 1.5% common salt, 0.5% ammonium chloride, 0.3% premix, 0.3% dicalssium phosphate, 0.3% sodium bicarbonate, and 0.1% yeast.

Feeds were offered in group feeding in two equal portions at 8.00 am and 4.00 pm. Refused feeds (if any) were daily collected and recorded. The offered amounts of feed mixtures were biweekly adjusted according to body weight changes. Drinking water was freely available all times. During the mid of the feeding trial, three animals were chosen randomly from each group to be subjected to digestibility trials. Grab sample method was used and acid insoluble ash method (AIA) internal marker was applied for determining the digestibility (Van Keulent and Young, 1977). Faeces grab samples were collected handily at 12.00 a.m. for three successive days from each animal for chemical analysis.

Chemical analysis:

Feeds:

Proximate chemical analysis of feeds, ingredients, feces and urine were done according to A.O.A.C. (1990). Fiber fractions were done according to Goering and Van Soest (1970), while digestible energy (DE) and metabolizable energy (ME) MJ/kg DM of the tested rations were calculated according to (MAAF, 1975) equations.

Aflatoxin:

The parent compound of extracted AFB_1 from the biological treated roughages was spotted in duplicate on thin layer plates having silica gel of 0.25 mm thick [March, DC-Kieselgel 60 (Dramstadlt, GFR)] were used and quantitatively determined using TLC scanner 3–CAMAG. Assay of aflatoxin B_1 was done according to Shanon *et al.*, 1983 method.

Statistical Analysis:

The data for all traits were statistically analyzed according to Snedecor and Cochran, 1980 using program of SAS (1995). The difference between means was tested by Duncen multiple range test, (1955).

RESULTS AND DISCUSSION

Chemical composition:

Chemical composition of the experimental straws were presented in Table (1).The biological treated wheat, bean and clover straws with *(Trichoderma harzinaum) TH* resulted in slight decreasing dry matter (DM) being 0.93 0.97 and 0.96%, respectively. Also, all treated straws were decreased OM, CF and fiber fractions contents, while CP and ash content were increased compared with control. The substantial increase in crude protein (CP) of the biological treated straws against control groups being 5.08 *vs.*1.81%, 10.71 *vs.* 5.96% and 11.20% vs. 6.45%, respectively. Similar results were reported by Langer et al. (1980) who reported that the fungal treated straw led to decrease of OM and CF contents, while CP and ash contents increased as compared to the untreated wheat straw. Ward and Perry (1982) reported that the treated corn cubs with fungus increased the CP content up to 14%, while Dahanda *et al.*, (1994) mentioned that the CP content of spent straw increased from 3.42% to 6.1%. Biological treatment of straws resulted in reducing NDF, ADF, ADL, cellulose, hemicelluloses and energy content. These observations were agreement with Kholif (2005) and Mahrous (2005).The degradation of various fiber fractions increased with increasing level of hemicelluloses. These observations indicating their influence on hemicelluloses breakdown as the effect of the biological treatment. Dahanda *et al.*, (1994) found that the increase of crude protein in white rot fungi treated straw was due to the capture of excess nitrogen by aerobic microbes and conversion of the same into microbial protein during solid-state fermentation. Generally, the biological treatment with *TH* was led to crude protein augmentation and reduces the fiber fractions.

Table (1): Chemical composition, fiber fractions and calculated the experimental rations and gross energy (GE).**

Item	DM%	Nutrients% (DM basis)											GE, MJ /kg DM	AFB_1 µg/kg DM
		OM	CP	CF	EE	NFE	Ash	NDF	ADF	ADL	Cell.	Hem.		--
CFM*	100	91.18	16.84	9.42	4.11	60.81	8.82	33.52	17.88	7.82	10.06	15.64	17.37	
Untreated WS	91.36	89.15	1.81	40.11	0.42	46.81	10.85	77.09	45.28	9.89	35.39	31.81	16.57	
Treated WS	90.51	83.41	5.08	38.01	0.68	39.64	16.59	69.18	40.13	6.29	30.8	23.05	15.74	4.50
Untreated BS	92.68	84.29	5.96	37.79	0.72	44.82	10.71	68.17	49.32	9.60	39.72	18.85	16.83	--
Treated BS	91.78	84.58	10.71	35.53	1.05	37.29	15.42	63.15	45.12	7.50	37.62	18.03	16.27	4.00
Untreated CS	91.60	88.75	6.45	38.15	0.86	43.29	11.25	65.10	51.23	13.35	37.88	13.87	16.79	--
Treated CS	90.72	85.80	11.20	34.18	1.75	38.67	14.20	60.08	48.11	9.17	38.94	11.97	16.65	4.25

*CFM = Concentrate feed mixture, WS=wheat straw, BS=bean straw and CS=clover straw.

**GE, MJ/kg DM = 0.0226 CP + 0.0407 EE + 0.0192 CF + 0.0177 NFE (MAFF, 1975).

Digestibility coefficients and nutritive values:

Results obtained in (Table 2) indicated that all digestibility coefficients, % of nutrients showed higher ($P<0.05$) values with rations contained biological treated roughages as compared with untreated groups (control). The improvement in DM digestibility coefficients% being 5.37, 7.65 and 5.52%, for wheat, clover and bean straws, respectively, while the corresponding values of CP% were 4.97, 8.16 and 10.27%, respectively. The results were in agreement with the results obtained by Wiedmieier *et al.* (1987) who indicated that DM and CP digestibilities of cattle fed diet treated white fungi were higher than the untreated diet. Digestibility coefficients of CF and fiber fractions (NDF, ADF, cellulose and hemicellulose) were increased ($P<0.05$) higher for biological treated straws compared with control groups. The improvement in CP, CF and fiber fractions digestibility coefficients of over a wide range of law quality roughages due to fungus treatments were observed by El-Ashry *et al.* (1997), Fouad *et al.* (1998) and Kholif *et al.* (2005). Gorden (1985) found that roughages subjected to biological treatments increased digestibility of nutrients especially CF because biological treatments degraded crude fiber by cellulose enzymes produced by microorganisms during incubation of roughages. The results agree with Fouad *et al.* (1998) and Mahrous *et al.* (2005) who reported that the NDF, ADF, cellulose and hemicellulose digestibilities of fungal treated roughages were ($P<0.05$) higher than untreated roughages. Deraz and Ismail (2001) and Kholif *et al.* (2005) who mentioned that fungus treatments had the effect of loosening legnocelluletic bonds and solublize some of the hemicelluloses content. The nutritive value of treated rations as TDN were the highest for biological treated wheat straw, bean and clover straw being 64.37%, 66.17% and 69.07%, where they significantly higher ($P<0.05$) than their control groups (60.21%), (62.34%) and (64.03%), respectively. Increasing feed intake of biological treated roughages was accompanied with increasing values of TDN and DCP which mainly attributed to the increase in digestibility of CP and other nutrients. Differences in TDN and DCP ($P<0.05$) values between the biological treated and control rations were 6.91, 6.14 and 7.87% for TDN and 16.40, 16.65 and 24.30% for DCP of wheat, bean and clover straws, respectively. The observed increase in digestibilities of most nutrients of including biological treated roughages may be attributed to its high digestible and metabolizable energy content compared to their contents of control groups (Table 2). Phillips *et al.*, (1995) concluded that increasing diet fat content encouraged digestibility coefficients of all nutrients especially CP and CF by growing lambs. Also, DCP and calculated energy content (digestable and metabolizale energy) were higher ($P<0.05$) with fungus treatments than the control groups. These results agree with Azzam (1992), Singh and Gupta (1994), Hammouda (1996) and Kholif *et al.* (2005). They reported that, biological treatment of roughages could increase the digestibility coefficients for most nutrients and thus their feeding values as TDN and DCP compared with untreated materials.

Feeding trial:

Data presented in Table (3) illustrated that DM intake increased with calves consumed biological treated roughages to a level made total feed intake was higher significantly ($P<0.05$) than those fed control groups. The average DM intake expressed as (kg/h/d) increased by 4.96, 5.49and 8.22% for biological treated wheat, bean and clover straws, respectively, compared with control ration groups. However, when DM intake was related to metabolic body weights (kg DM/kg $W^{0.75}$) the intake was slightly increased by increasing treated roughages offered. This might be attributed to the higher treated roughage ratio led to increase DM intake. Increased in feed intake may be attributed to best palatability of biological treated straws. Feed intake expressed as DE or ME (MJ/kg DM) appeared the same previous trend and increased with animals received rations containing biological treated straws. In this respect, Taie *et al* (1998) and Suliman and Marzouk (2006), as they found that feeding high energy diets resulted in greater daily body weight gain.

Table (2): Digestion coefficients and nutritive values of the experimental rations.

Item	Wheat straw		Bean straw		Clover straw		±SE
	Untreat.	Treated	Untreat.	Treated	Untreat.	Treated	
	R1	R2	R3	R4	R5	R6	
DM	63.07^{c}	66.46^{a}	62.76^{a}	67.56^{b}	63.21^{c}	66.70^{b}	3.22*
OM	71.23^{b}	77.89^{a}	62.44^{e}	68.25^{c}	62.64^{e}	67.13^{d}	3.41*
CP	60.95^{d}	63.98^{b}	62.72^{a}	67.84^{b}	62.55^{c}	68.98^{a}	3.25*
CF	62.82^{d}	67.75^{c}	67.53^{e}	68.88^{b}	62.82^{d}	67.75^{a}	2.42*
EE	72.13^{c}	74.30^{b}	72.12^{c}	77.84^{a}	72.13^{c}	75.30^{b}	3.16*
NFE	63.98^{e}	69.80^{d}	65.58^{e}	72.80^{b}	70.38^{c}	76.80^{a}	2.28*
NDF	66.12^{b}	75.31^{a}	47.65^{d}	54.63^{c}	47.83^{d}	53.76^{c}	3.98*
ADF	64.54^{b}	69.95^{a}	41.32^{d}	43.35^{c}	42.08^{d}	44.15^{c}	4.27*
ADL	41.2^{d}	54.75^{a}	48.45^{e}	50.84^{b}	48.32^{c}	49.70^{ab}	3.57*
Cellulose	69.88^{b}	73.95^{a}	52.21^{d}	58.53^{c}	53.18^{d}	58.61^{c}	2.51*
Hemicellose	76.59^{b}	82.63^{a}	62.92^{d}	67.62^{c}	62.25^{d}	66.80^{c}	2.11*
Nutritive values:							
DCP%	7.56^{c}	8.80^{b}	8.77^{b}	10.23^{a}	8.89^{b}	11.05^{a}	0.45*
TDN%	60.21^{e}	64.37^{c}	62.34^{d}	66.17^{b}	64.03^{c}	69.07^{a}	3.42*
DE (MJ/kg DM)*	1206.53	1234.39	1059.30	1148.66	1056.27	1121.01	---
ME (MJ/kg DM)**	989.35	1012.20	868.63	941.90	866.14	919.23	---

*DE and **ME, calculated according to MAAF (1975) using equations being DE (MJ/kg DM) = Digestible organic matter (DOM X 19) & ME (MJ/kg DM) = DE X 0.82.

a, b, c, d and *e* Means with different superscripts on the same row are different at ($P<0.05$).

These results were disagree with those findings by Deraz (1996) and Fouad *et al.* (1998) who observed that chemical and biological treatments increased markedly voluntary DM intake of corn stalks compared with mechanically treated corn stalks, also, Khorshed (2000) and Sabbah *et al.* (2006) who mentioned that reduction in feed intake of biological treated roughages may be attributed to the increased NH_3-N concentration in blood. Meanwhile, when intake measured as TDN kg/h/d was significantly ($P<0.05$) increased with calves fed biological treated rations of wheat, bean and clover straws than those fed the control rations. The lowest value was recorded with control group of wheat straw. The differences were significantly ($P<0.05$). The values of feed intake as TDN kg/h/d were 5.654, 6.099 and 6.804, for biological treated wheat, bean and clover straws, respectively, while there were 5.039, 5.447 and 5.829 kg/h/d, respectively for the control wheat, bean, clover straws groups. Same trend significantly ($P<0.05$) was observed with DCP intake (kg/h/d) as shown in Table (3).

Daily gain and feed conversion:

Performance of the growing crossbred Frisian calves (Table 3) indicated that calves fed diet containing biological treated straws (wheat, bean and clover) were heavier ($P<0.05$) by 5.99, 12.31 and 18.20%, respectively over those fed the control diets. The highest daily gain (kg/d) was obtained with biological treated clover straw (1.721 kg/d) followed by the biological treated bean straw (1.524 kg/d) and biological treated wheat straw (1.328 k/d), respectively, while the control groups recorded 1.253, 1.357 and 1.456 kg/d for wheat, bean and clover straw, respectively. The differences among groups were significantly ($P<0.05$). These results may be due to their higher intake (total protein and energy intake for treated groups (Table 3). In this respect, these results are in agreement with those reported by Deraz (1996) and Sabbah (2006) showed that growing lambs fed on fungal treated roughages recorded highest daily gain compared with control groups.

Feed conversion expressed as kg DM/kg tended to significantly ($P<0.05$) higher with treated straw. The same significant trend was observed with feed conversion as kg TDN/kg gain with bean and clover straw treatment, while treated wheat straw appeared the opposite trend.

Table (3): Performance of growing crossbred Friesian calves fed biological treated roughages.

Item	Experimental Rations						±SE
	Wheat straw		Bean straw		Clover straw		
	Untreat.	Treated	Untreat.	Treated.	Untreat.	Treated	
	R1	R2	R3	R4	R5	R6	
No. of Animals	8	8	8	8	8	8	—
Duration of trail, days	183	183	183	183	183	183	—
Av. Initial weight, kg	187.5^{a}	189.0^{a}	190.0^{a}	188.0^{a}	189.5^{a}	191.0^{a}	3.58
Av. Final weight, kg	412.5^{f}	432.0^{e}	438.4^{d}	467.0^{b}	455.9^{c}	506.0^{a}	3.45*
Total gain	225.0^{f}	243.0^{e}	248.4^{d}	279.0^{b}	266.4^{c}	315.0^{a}	3.16*
Av. Daily gain, kg	1.253^{e}	1.328^{d}	1.357^{d}	1.524^{b}	1.456^{c}	1.721^{a}	0.60*
Feed consumption: As fed							
Roughage, kg/h/d	3.200^{d}	3.450^{c}	3.292^{d}	3.585^{b}	3.562^{b}	3.905^{a}	0.15*
Concentrate, kg/h/d	6.000^{d}	6.210^{c}	6.284^{c}	6.550^{b}	6.454^{b}	6.970^{a}	0.17*
Av. Daily feed intake, kg/h/d DM basis:							
Roughage	2.924^{d}	3.122^{c}	3.051^{c}	3.290^{b}	3.262^{b}	3.543^{a}	0.13*
Concentrate	5.435^{d}	5.620^{c}	5.687^{c}	5.928^{b}	5.841^{b}	6.308^{a}	0.07*
Total DM intake	8.369^{d}	8.784^{e}	8.738^{c}	9.218^{b}	9.103^{b}	9.851^{a}	0.12*
Daily DM intake, kg $W^{0.75}$	0.090^{b}	0.119^{a}	0.117^{a}	0.120^{a}	0.119^{a}	0.122^{a}	0.04*
Av. Daily TDN intake, kg	5.039^{d}	5.654^{e}	5.447^{c}	6.099^{b}	5.829^{a}	6.804^{a}	0.08*
Av. Daily DCP intake, kg	0.633^{e}	0.773^{d}	0.766^{d}	0.943^{b}	0.809^{9c}	1.088^{a}	0.01*
Av. daily DE (MJ/kg DM)	10097	10842	9256	10588	9615	11043	—
Av. daily ME (MJ/kg DM)	8279	8891	7590	8682	7884	9055	—
Feed efficiency:							
Kg DM/kg gain	6.679^{e}	6.614^{c}	6.439^{d}	6.048^{b}	6.252^{c}	5.724^{a}	0.07
Kg TDN/kg gain	4.021^{b}	4.258^{e}	4.014^{b}	4.001^{b}	4.003^{b}	3.953^{a}	0.03
Kg DCP/kg gain	0. 505^{a}	0.582^{e}	0.564^{b}	0.618^{d}	0.556^{b}	0.632^{d}	0.01

a, b, c, d and e Means with different superscripts on the same row are different at ($P<0.05$).

With respect to kg DCP/kg gain, the control groups showed better efficiency. This might be due to higher DCP consumed with treated groups. Deraz (1996), Fouad *et al* (1998) and Sabbah *et al* (2006) found that animals fed biological treated roughages were the most efficient groups followed by those fed chemically treated roughages. Rates of improvement in feed conversions as kg DM/kg gain were 0.97, 6.07 and 8.44% for groups fed rations containing biological treated wheat, bean and clover straw, respectively.

Biological treatment can utilize lignin along with cellulose and other components of the substrate. These organisms grow slowly and degrade the structural carbohydrates of crop residues (Langer *et al.*, 1980). In addition, biological treatments are clear environment besides less possible negative Sid effects.

***Economical efficiency*:**

Accordingly, feed cost per kg gain and economical efficiency was better with rations containing biological treated bean and clover straws than those containing biological treated wheat straw and other control rations (Table 4). These results due to mainly for, high price of wheat straw 520.00 L.E. compared with the price of bean and clover straws 400 L.E. each (Table 4). It was noticed that the highest in feed cost /kg gain 10.98 L.E. for ration containing biological treated wheat straw, while ration containing clover straw was cheaper than other groups. These results agree with finding with Deraz (1996), Fouad *et al* (1998) and Sabbah *et al* (2006) who noticed that the lowest feed cost was recorded with animals fed biological treated roughages. Also, results in (Table 4) indicated that economic efficiency improved by 19.91 and 28.17% for rations containing bean and clover straws, respectively, while no improvement in rations containing untreated or biological treated wheat straw.

Table (4): Feed cost and economical efficiency of growing calves fed different types of biological treated roughages and concentrate.

Item	Experimental Rations					
	Wheat straw		Bean straw		Clover straw	
	Untreat.	Treated	Untreat.	Treated	Untreat.	Treated
	R1	R2	R3	R4	R5	R6
Feed cost/kg gain (L.E)*	10.06	10.98	9.59	9.01	9.24	8.52
Price of the weight gain **	20.05	21.25	21.71	24.38	23.30	27.54
Return	7.47	7.73	8.69	10.65	9.84	12.88
Economical efficiency***	1.99	1.94	2.26	2.71	2.52	3.23

*Based on free market prices of feed ingredients 2008, the cost of the experimental rations was estimated as the total prices of the ingredients used in the concentrate feed mixture and roughages, bearing, 1820, 520, 480 and 480 L.E., respectively, and the cost of biological treatment was 125 L.E./ton). Prices of one kg body weight on selling 16.00 L.E.

**Economical efficiency= a ratio between price of weight gain and costs of feed consumed.

It could be concluded that, feeding rations containing biological treated straws (wheat, bean and clover) with (*Trichoderma harzinaum F-418* fungi) *ad-libitum* with 2% of LBW concentrate feed mixture (2% of LBW of growing crossbred Friesian calves), resulted in superior nutrition status and better daily gain, feed conversion and economical efficiency, as compared with control groups.

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الأداء الانتاجى للعجول الفريزيان المغذاة على أعلاف خشنة معاملة
١- القيمة الغذائية و أداء الحيوانات

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تهدف هذه الدراسة إلى اختبار تأثير التغذية على الأعلاف الخشنة المعاملة بيولوجيا مع مخلوط العلف المركز فى علائق العجول الفريزيان الخليطة النامية على القيمة الغذائية و أداء الحيوانات . استخدم فى هذه الدراسة ٤٨ عجل فريزيان خليط بعمر ٦- ٧ شهور و متوسط وزن حى ١٨٩.١٧± ٣.٥٨ كجم. قسمت الحيوانات إلى ثلاثة مجموعات تجريبية كل منها ١٦ عجل و قسمت كل مجموعة الى تحت مجموعتين (٨ حيوانات فى المجموعة). وزعت المجموعات التجريبية على ستة علائق تجريبية: (الأولى و الثالثة و الخامسة) عليقة مقارنة (كنترول) غذيت على ٢٪ من وزن الجسم مخلوط علف مركز + تبن قمح و تبن فول و تبن برسيم حتى الشبع على التوالى. بينما غذيت المجموعات الثانية و الرابعة و السادسة على العلف المركز بنسب ٢٪ من وزن الجسم الحى + الأتبان السابقة المعاملة بيولوجيا بفطر (*Trichoderma harzinaum F-418* fungi) على التوالى حتى الشبع. امتدت تجربة التغذية إلى ١٨٣ يوم حيث تضمنت تقدير كمية الغذاء المأكول و معاملات الهضم و القيمة الغذائية و معدلات النمو و الكفاءة التحويلية و الاقتصادية للحيوانات و كان من النتائج المتحصل عليها من هذة الدراسة. زادت معاملات الهضم الظاهري لكل المركبات الغذائية و كذلك القيمة الغذائية و الطاقة الممثلة للعلائق المحتوية على اتبان معاملة بيولوجيا بدرجة معنوية (٥٪) عن مجموعات الكنترول.كانت معاملات هضم الألياف الخام و مكونات الألياف للعلائق المحتوية على أتبان معاملة بيولوجيا أعلى بدرجة معنوية (٥٪) عن علائق الكنترول. كان المأكول اليومى معبرا عنة بالكجم / رأس / يوم أو كجم مادة جافة منسوبة لحيز الجسم التمثيلى أعلى معنويا (٥٪) مع العجول التى غذيت على علائق تحتوى على اتبان معاملة بيولوجيا عن العجول التى غذيت على علائق المقارنة. سجلت العجول التى غذيت على علائق على أتبان معاملة بيولوجيا زيادة معنوية (٥٪) عن مجموعات المقارنة و كان متوسط النمو المحقق (١.٣٢٨ & و ١.٥٢٤ و١.٧٢١) كجم / يوم للحيوانات التى غذيت على على اتبان معاملة بيولوجيا مقابل (١.٢٥٣ و ١.٣٥٧ و ١.٤٥٦ كجم/ يوم لمجموعات الكنترول (الأولى و الثالثة و الخامسة) على التوالى. كانت الكفاءة التحولية محسوبة كمادة جافة لكل كجم نمو فى عجول العليقة الثانية و و الرابعة و السادسة و المحتوية على علائق معاملة بيولوجيا أفضل عن العجول التى غذيت على علائق الكنترول و عند حساب الكفاءة على أساس المركبات الغذائية المهضومة /كجم نمو كانت الكفاءة مع كل من تبن الفول و تبن البرسيم أفضل بينما لم تظهر كفاءة مع تبن القمح . كانت الكفاءة الأقتصادية بالنسبة للعجول التى تم تغذيتها على علائق تحتوى اتبان معاملة بيولوجيا (ما عدا تبن القمح) أفضل من العجول التى غذيت على العلائق الأخرى. من هذة الدراسة يمكن ان يوصى بالتغذية على الأتبان المعاملة بيولوجيا حتى الشبع و مخلوط العلف المركز (٢٪ من وزن الجسم الحى) فى علائق عجول الفريزيان الخليطة النامية حيث تستطيع تحسين القيمة الغذائية و النمو اليومى و الكفاءة الغذائية و الاقتصادية