NUTRITIONAL EVALUATION OF A NEW FUNGAL-YEAST PROBIOTIC FORTIFIED WITH NATURAL ANTIOXIDANTS ON PERFORMANCE OF LAMBS. 2- BODY WEIGHT GAIN, FEED CONVERSION EFFICIENCY, CARCASS CHARACTERISTICS AND BODY COMPOSITION OF TWO LOCAL BREEDS OF SHEEP RAISED UNDER TWO DIFFERENT CLIMATIC CONDITIONS.

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SUMMARY

The nutritional effect of the new locally-made probiotic (Effective Microorganisms with Medicinal Herbs – EMMH) was studied on growth performance, carcass characteristics and body composition of two local breeds of sheep (Rahmany and Farafra) raised under two different climatic conditions. The first feeding trial was carried out on 32 heads of male Rahmany lambs raised in El-Serw Experimental Station (Domitta Governorate–North Western Egypt) and the second trial was carried out on 24 heads of male Farafra lambs raised in Mallawy Experimental Station (El-Minya Governorate – Upper Egypt). Lambs of both breeds were of three months old with an initial average body weight of 18.04 ± 0.53 Kg and 18.53 ± 0.11 Kg for Rahmany and Farafra lambs, respectively. The period length of the first trial was 168 days and the second one 126 days, during which animals were divided into four similar groups, where each group was individually fed on one of four experimental diets supplemented with EMMH at 0, 0.3%, 0.4% and 0.5% of the concentrate feed mixture (CFM). The daily feeding level for all experimental groups were as follows: Rahmany: 2.5% of body wt. CFM + 1.0% body wt. Berseem hay + *ad lib.* chopped Rice Straw. Farafra: 3.0% of body wt. CFM + *ad lib.* chopped Rice Straw. At the end of each feeding trial, three representative lambs of each group were slaughtered to evaluate their carcass characteristics and body composition. The results indicated that the daily voluntary intake of rice straw was improved ($P<0.05$ and $P<0.01$ for Rahmany and Farafra lambs, resp.) with diets contained EMMH. Daily water consumption was decreased ($P<0.01$) by both breeds of lambs with feeding diets contained EMMH. Average daily gain (ADG) and feed conversion efficiency were improved ($P<0.01$) for both breeds with feeding diets contained EMMH and the effect on weight gain was more pronounced with increasing the supplementation level of EMMH. In comparison with control diets, ADG and feed conversion were increased by 30% and 12% for Rahmany lambs and 47% and 19% resp. for Farafra lambs, respectively with feeding diet contained 0.5% EMMH. The dressing percentage of slaughtered animals was improved by 10% for Rahmany and 6.6% for Farafra lambs fed 0.5% EMMH diet than those fed control diets, however edible offals relative to empty body weight showed comparable values among groups for the two experimental breeds. Non-edible offals and trimmings calculated relative to fasting body weight showed significant decrease ($P < 0.01$) for lambs fed EMMH supplemented diets than control for the two breeds of lambs. Knife separable fat calculated relative to carcass weight was lower ($P<0.05$) in Rahmany lambs fed EMMH supplemented diets than control, while Farafra slaughtered lambs showed comparable values of separable fat among experimental groups. The eye muscle area was increased ($P < 0.05$) in lambs fed EMMH supplemented diets for both breeds (Rahmany and Farafra) and a remarkable increase of eye muscle area was noticed with increasing the EMMH supplementation level. Chemical analysis of *Longissmus dorsi* muscle ribs showed higher ($P<0.01$) protein and lower ($P<0.01$) extracted fat contents for both breeds of sheep fed EMMH supplemented diets, while moisture and ash contents were not differed among groups for both Rahmany and Farafra slaughtered lambs. It is concluded that, the tested probiotic EMMH was useful in improving body weight gain; feed conversion efficiency and carcass properties of growing local lambs and the best results were achieved with 0.5% supplementation level of EMMH.

Keywords: *Probiotic; antioxidants; Rahmany lambs; Farafra lambs; carcass characteristics.*

INTRODUCTION

A wide variety of feed supplements are currently being marketed for different productive purposes of live-stock. These supplements do not always provide the necessary effectiveness, safety and viability guarantees. These nutritional mixes should be examined to determine the nature, importance and appropriate use both in the interest of performance, benefits and in the interest of public health. Since year 2006, many countries tended to prohibit antibiotic feed additives at sub-therapeutic dosage as growth promoters (AGPs) for different animal spices because of their side effects on health for both animal and human. Now-a-days probiotics, prebiotics, exogenous enzymes vitamins, proteinated minerals and medicinal herbs become safe alternatives to AGPs. For example, Probiotics are a live microbial feed supplements that beneficially affect the host animal by improving its intestinal microbial balance (Fuller, 1989). On the other hand, the natural feed additives of plant origin particularly, medicinal herbs are known to contain photogenic compounds that have antibacterial, antifungal, antiviral and antioxidant properties (Wolter, 1995). The use of dietary additives is gaining momentum because of their beneficial effects on growth rate and feed utilization efficiency (Mohan *et al.*, 1996). Growth promoting comes from the specific dynamic action of anabolic substances, antipathogenes, non-specific chemicals and rumen fermentation modifiers (Galbraith et al., 1983 and Williams and Newhold, 1990).

Regardless of the beneficial effects of some feed additives on ruminants productivity, the results are not always convenient and reliable. Eventually, animal specie, breed type, sex, age, environmental and managerial conditions, feeding system and feeding adequacy, method of feed additive supplementation and appropriate dosage, all are factors influencing the results of using such additives. Therefore, in this study, we tried to investigate the growth promoting effect of a new-locally made probiotic fortified with a mixture of medicinal plants on two Egyptian breeds of lambs raised under two different climatic conditions.

MATERIALS AND METHODS

This study was conducted to evaluate the nutritional impact of a new locally made probiotic (EMMH) on growth performance and carcass characteristics of two breeds of local sheep raised under two different climatic conditions. The tested probiotic is a co-culture of two strains of fungi (*Trichoderma reesei* and *Aspergillus oryzae*) with dry baker's yeast (*Saccharomyces cerevisiae*) and the product is fortified with mixture of medicinal herbs. Each Kg of this product provides 2,200,000 U digestive enzymes, 7.5×10^8 cell of live yeast and 125 mmol antioxidants.

The feeding trials in the two experimental sites:

Two feeding trials were carried out on two breeds of Egyptian sheep (Rahmany and Farafra) in two farms affiliate the Animal Production Research Institute – Agriculture Research Center (Fig1). The first trial was conducted in El-Serw Experimental Station (Domitta Governorate – 31.28 N. and 31.45 E.) on 32 heads of Rahmany male lambs aged three mths. old with an average initial body weight of 18.04 ± 0.53kg. The second trial was conducted in Mallawy Experimental Station (El-Minya Governorate – 28.06 N. and 30.45 E.) on 24 heads of Farafra male lambs (Egyptian Oasis breed) aged three mths. old with an average initial body weight of 18.53 ± 0.11 kg. The period length of the first trial was 168 days and the second one 126 days, during which animals were divided into four similar groups, where each group was individually fed on four experimental diets supplemented with EMMH at 0, 0.3%, 0.4% and 0.5% of the concentrate feed mixture (CFM).

Table (1): Metrological data of the two experimental sites during the two feeding periods.

Experimental site	Feeding period, day	Range of Ambient temperature, °C		Range of relative humidity, %	
		Min.	Max.	Min.	Max.
El-Serw	168	14.9	24.5	58.1	82.7
Malawy	126	15.0	39.0	29.0	94.0

Each value was a mean of two daily records of minimum and maximum ambient temperature and relative humidity for each experimental location

The EMMH probiotic was thoroughly hand mixed for each supplementation level with 50 Kg of ground CFM before being mechanically mixed with the rest 950 Kg to obtain one ton of each 0.3, 0.4 and 0.5% EMMH supplemented CFM. New batches each of one ton were routinely prepared during the two feeding trials. The daily amounts of unsupplemented or EMMH supplemented CFM with berseam hay for Rahmany lambs were offered at 8.00 a.m., while rice straw for both breeds was allowed at 10.00 a.m. Clean drinking water in buckets was freely available. During the whole experimental periods all animals were biweekly weighed to adjust the daily offered amounts of feeds. Feed refusals of mostly roughages were daily collected, sun dried, weekly weighed and recorded to calculate the actual feed intake individually. Table (2) summarizes the feeding level for each experimental group of both breeds (Rahmany and Farafra). The daily amounts of feeds were calculated to cover the growth requirements of sheep according to ARC (1984).

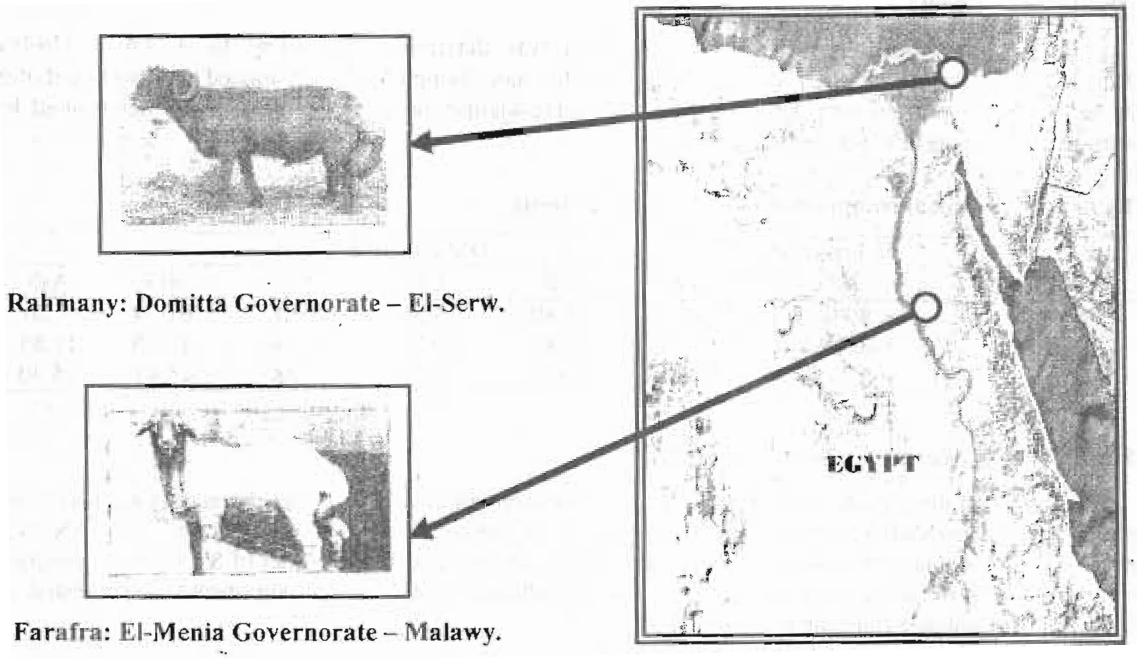

Fig. (1): Location of the two experimental sites and phenotype of the two experimental breeds of lambs.

Table (2): **Experimental feeds and level of feeding for Rahmany and Farafra lambs.**

Feed	Rahmany	Farafra
CFM*	2.5% of Body wt.	3% of Body wt.
Berseem hay	1.0% of Body wt.	-
Rice straw**	*ad lib.*	*ad lib.*

** Concentrate feed mixture (CFM) was consisted of 35% ground yellow corn, 25% undecorticated cotton seed meal, 5% soybean meal, 15% wheat bran, 12% rice bran, 5% cane molasses, 2% lime stone and 1% common salt.*
*** Chopped 5-10 cm length.*

Slaughter Technique:

At the end of each feeding trial, three representative animals chosen randomly from each group were fasted for 18hrs and weighed before being slaughtered to evaluate their carcass characteristics and body composition. Fasting body weight was immediately recorded before the slaughter process. When bleeding was completed, the blood was collected and weighed individually. Slaughtered animals were skinned, dressed out and the hot carcass weight was recorded. Weight of gastro-intestinal tract (G.I.T) contents was calculated as the difference between full and empty G.I.T. to estimate the empty body weight. Edible affals (heart, liver, spleen, defatted, kidneys and testicles) and non-edible affals (lungs and trachea, clean empty G.I.T. and visceral fat) were separately weighed and recorded. Trimmings including head, hide, four legs, blood and G.I.T. contents were weighed and recorded for each slaughtered animal. The main carcass cuts (fore and hind quarters, neck, rack, brisket, flank and loin) were separately weighed and recorded. Knife separable fat was recorded as the sum weight of tail fat, kidney fat and visceral fat. Dressing percentage was calculated as the following equation:

Dressing percentage = {Hot carcass weight / Empty body weight, kg} × 100.

Body composition:

The three best ribs (9^{th}, 10^{th} and 11^{th}) of each slaughtered animal were separated and weighed. Each rib was deboned and dissected into lean meat and fat. Yields of bone, meat and fat of the three ribs were weighed separately to detect the physical body composition.

The eye muscle lean area (*Longissimus dorsi*) of the last rib was placed on calk paper and the finger print area was measured in square centimeter using the planemeter according to Henderson et al. (1966). Fresh lean meat and fat of the three ribs of each animal were mixed, minced, oven dried at 60°C for 24 hrs. and kept in polyethylene bags under -4°C for further chemical analysis.

Analytical Methods:

Chemical composition of experimental feeds was determined according to A.O.A.C. (1995). Nitrogen free extractive (NFE) was calculated by difference. Samples of dried minced meat were defatted by Soxhlet and protein was determined by the micro-kjeldahyle method and ash was determined by muffle furnace at 600°C for three hrs.

Table (3): Chemical composition of experimental feeds.

Item	Moisture %	DM composition, %					
		OM	CP	CF	EE	NFE	Ash
CFM	8.70	92.80	14.80	13.80	2.81	61.39	7.20
Berseem hay	10.27	88.15	13.87	29.73	1.35	43.20	11.85
Rice straw	9.37	84.70	4.07	33.74	1.48	45.41	15.30

Statistical Procedures:

Data concerning body weight gain, feed conversion efficiency, carcass characteristics and body physical and chemical composition were subjected to statistical analysis applying one way ANOVA procedure according to Snedecor and Cochran (1980). The general linear model of SAS (2001) program was used in processing measured parameters. Significant differences among means were tested at ($P<0.05$) by Duncan's multiple range test (1955).

RESULTS AND DISCUSSION

Feed intake and water consumption:

Daily dry matter intake and water consumption by Rahmany and Farafra lambs in experimental feeding groups are presented in Table (4). The total DM intake calculated relative to body weight was increased ($P<0.05$) with rations contained the probiotic (EMMH) by both breeds of sheep (Rahmany and Farafra). Voluntary intake of rice straw by Rahmany and Farafra lambs during the two feeding trials are shown in Figs. (2 and 3). Dietary roughage portion as % of total DM intake was significantly ($P < 0.05$) increased with increasing the EMMH supplementation level from 0.3 to 0.5% of CFM in an ascending order by Rahmany lambs. In similar trend, roughage intake by Farafra lambs was significantly ($P<0.01$) increased from 24.83 to 28.87% of total DM intake under the administration of EMMH. The difference between the two breeds of voluntary roughage intake (from 40.35 to 42.65% of DMI for Rahmany and from 24.83 to 28.87% of DMI for Farafra) could be mainly regarded to the lower restricted amount of CFM offered to Rahmany lambs (2.5% of body wt.) than that fed by Farafra (3% of body wt.).

It seems that, the exogenous fibrolytic enzymes provided by EMMH supplementation levels might have a role in enhancing the rate of fiber digestion which in turn promoted the intake of roughage feed by both breeds of sheep. Similar conclusion had been reached by Morgavi *et al.* (2001); Rojo-Rubio *et al.* (2001); Gutierrez *et al.* (2005) and El-Kady *et al.* (2006), however in such previous studies feed intake did not always influenced by exogenous enzymes supplementation. On the contrary, Mahrous *et al.* (2005) and Abou-Ammou *et al.* (2008) found that the biological treatment of rice straw and corn cops increased dry matter intake (g/h/d) of growing lambs.

Daily water consumption calculated relative to DM intake (Drinking water, L/Kg DMI) showed remarkable decrease ($P<0.01$) with rations contained the EMMH by both breeds of sheep, (see Table, 4). However, water consumption of Farafra lambs raised under the Upper Egypt hot climatic condition was much higher than Rahmany raised under the moderate environmental temperature of the Western Nile valley zone. The lower water consumption of sheep fed diets supplemented with probiotics or other feed additives did not previously discussed in available literature. It is time; to give some attention in future studies to the influence of feed additives on water consumption and water balance of ruminant animals to explore the relationship between feed additives and water in nutrients digestion and metabolism.

Table (4): Daily DM intake and water consumption of Rahmany and Farafra lambs fed experimental rations.

Item	Experimental groups				MSE	Sign.
	Control	0.3%	0.4%	0.5%		
		Rahmany				
Mean body wt., kg	$25.64^{c}\pm1.26$	$28.14^{b}\pm0.80$	$28.81^{ab}\pm1.22$	$29.05^{a}\pm0.98$	0.37	**
DMI, g/d						
CFM	578	621	637	648	-	-
Berseem hay	227	244	250	254	-	-
Rice straw	164	192	216	228	-	-
Roughage of DMI, %	$40.35^{c}\pm0.99$	$41.25^{b}\pm0.66$	$42.25^{a}\pm1.11$	$42.65^{a}\pm0.53$	0.21	*
DMI of body wt., %	$3.79^{b}\pm0.08$	$3.76^{b}\pm0.08$	$3.83^{ab}\pm0.09$	$3.89^{a}\pm0.05$	0.01	*
Water consumption, L/d	3.83	3.81	3.87	3.85	-	-
Water consumption, L/kg DMI	$3.95^{a}\pm1.01$	$3.60^{b}\pm0.08$	$3.51^{b}\pm0.06$	$3.40^{c}\pm0.06$	0.03	**
		Farafra				
Mean body wt., kg	$25.31^{c}\pm0.17$	$25.93^{c}\pm0.66$	$27.04^{b}\pm0.05$	$28.60^{a}\pm1.53$	0.24	*
DMI, g/d						
CFM	648	678	696	734	-	-
Rice straw	214	226	262	298	-	-
Roughage of DMI, %	$24.83^{c}\pm0.03$	$25.00^{c}\pm0.29$	$27.35^{b}\pm1.30$	$28.87^{a}\pm0.89$	0.38	**
DMI of body wt., %	$3.41^{c}\pm0.07$	$3.49^{bc}\pm0.07$	$3.55^{ab}\pm0.08$	$3.61^{a}\pm0.06$	0.02	*
Water consumption, L/d	5.22	5.01	5.15	4.78	-	-
Water consumption, L/kg DMI	$6.05^{a}\pm0.45$	$5.54^{b}\pm0.31$	$5.37^{b}\pm0.24$	$4.63^{c}\pm0.23$	0.21	**

a, b and c: Means within the same row with different superscripts differ ($P<0.05$).

** = Significant difference at ($P<0.05$). ** = Significant difference at ($P<0.01$). - = not statistically analyzed.*

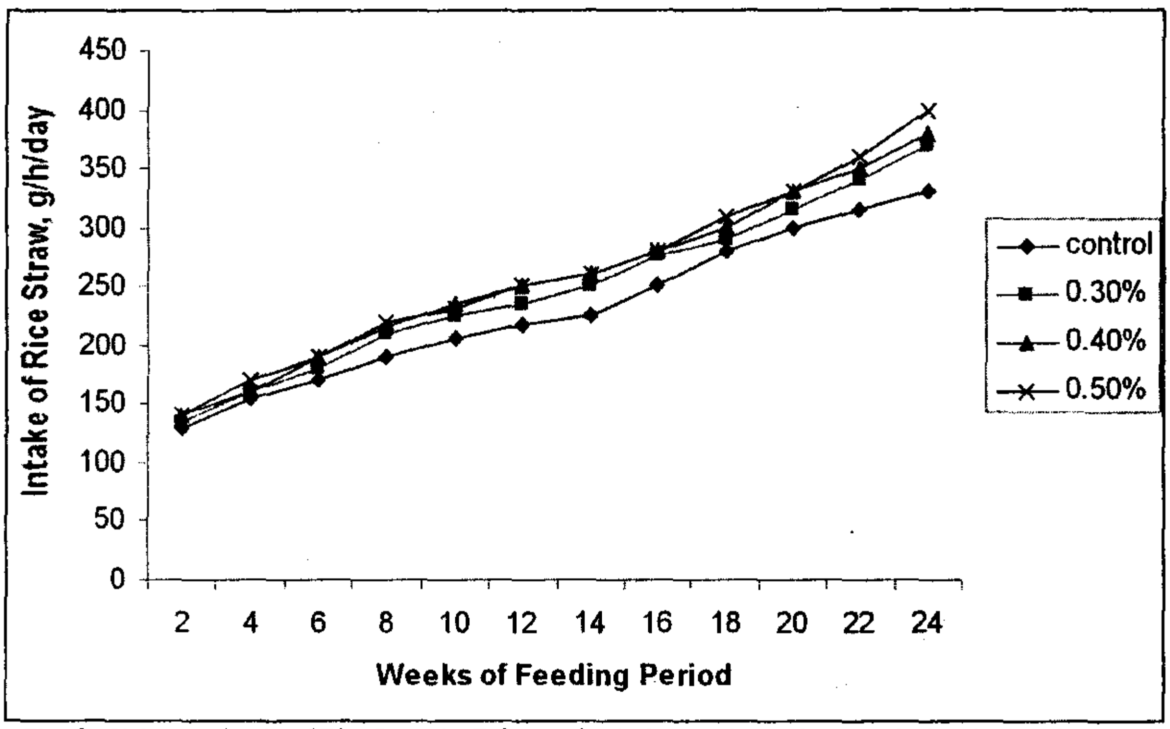

Fig. (2): Voluntary intake of Rice Straw by Rahmany lambs in experimental groups during the first feeding trial.

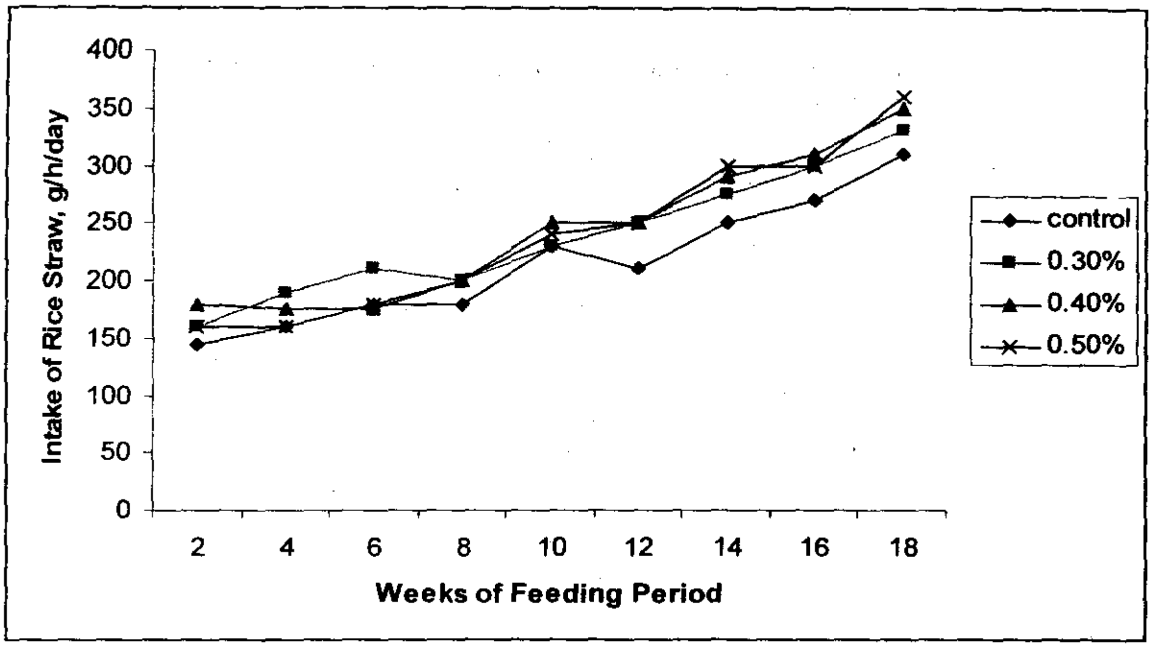

Fig. (3): Voluntary intake of Rice Straw by Farafra lambs in experimental groups during the second feeding trial.

Body weight gain and feed conversion efficiency:

Data in Table (5) illustrate that total weight gain and average daily gain were significantly higher (P<0.01) for both Rahmany and Farafra lambs fed EMMH supplemented rations. Feed conversion efficiency as well was significantly (P < 0.01) improved for both breeds of sheep with EMMH diets. Moreover, the influence of the feed additive on body weight gain and feed conversion was more pronounced as the level of EMMH supplementation increased. It is worthy to note that, the average daily gain (ADG) of Rahmany lambs was ascendingly increased from 121.09 to 126.49 and 126.30 g/d for groups fed 0.3, 0.4 and 0.5% EMMH supplemented rations vs. 96.54 g/d for the control group, which equivalent nearly 30% more weight gain than control group for lambs fed 0.5% supplemented diet. This trend was also noticed with Farafra lambs where their average daily gain was increased from 107.15 for control to 157.75 g/d for the 0.5% EMMH group equivalent to nearly 47% more weight gain than control.

Table (5): Body weight gain and feed conversion of Rahmany and Farafra lambs feed experimental rations.

Item	Experimental groups				MSE	Sign.
	Control	0.3%	0.4%	0.5%		
		Rahmany				
No. of animals	8	8	8	8	-	-
Initial weight (kg)	17.53±0.35	17.97±0.37	18.22±0.36	18.43±0.65	0.18	NS
Final weight (kg)	33.75^{b}±1.36	38.31^{a}±1.13	39.47^{a}±1.63	39.66^{a}±1.36	0.48	**
Total weight gain (kg)	16.22^{b}±0.43	20.34^{a}±0.98	21.25^{a}±1.31	21.23^{a}±0.07	0.40	**
Average daily gain (g)	96.54^{b}±2.56	121.09^{a}±5.84	126.49^{a}±7.83	126.30^{a}±4.01	2.39	**
Total DMI (kg/h/d)	0.969^{c}±0.04	1.057^{b}±0.04	1.164^{a}±0.04	1.130^{a}±0.04	0.01	**
Feed conversion (kg DM/kg gain)	10.05^{a}±0.37	8.74^{b}±0.57	8.74^{b}±0.50	8.95^{b}±0.22	0.12	**
		Farafra				
No. of animals	6	6	6	6	-	-
Initial weight (kg)	18.58±0.66	18.54±0.87	18.33±0.98	18.67±1.77	0.12	NS
Final weight (kg)	32.08^{c}±0.78	33.33^{c}±1.03	35.75^{b}±0.93	38.54^{a}±1.07	0.54	**
Total weight gain (kg)	13.50^{c}±1.12	14.79^{c}±0.75	17.42^{b}±1.85	19.87^{a}±0.94	0.56	**
Average daily gain (g)	107.15^{c}±8.95	117.38^{c}±5.67	138.25^{b}±14.7	157.75^{a}±7.51	4.47	**
Total DMI (kg/h/d)	0.862^{c}±0.03	0.904^{c}±0.03	0.958^{b}±0.02	1.032^{a}±0.05	0.01	**
Feed conversion (kg DM/kg gain)	8.10^{a}±0.73	7.71^{ab}±0.49	7.00^{bc}±0.79	6.56^{c}±0.64	0.17	**

a, b and c: Means within the same row with different superscripts differ (P<0.05).
*NS = non-significant difference ** = Significant difference at (P<0.01)*

The development of body weight of Rahmany and Farafra lamb during the two feeding trials is given in Figs. (4 and 5). The feed conversion efficiency was improved by nearly 11% for Rahmany and 19% for Farafra lambs with rations contained 0.5% EMMH than control groups.

These results were in agreement with results of Abdel-Momin *et al.* (2002), who found that the average daily gain was higher ($P<0.05$) for lambs fed 0.05% yeast culture in comparison with those fed 0.025% or control diet. Hafez *et al.* (2001) reported that using yeast culture alone or with selenium as feed additives in ration of goat kids tended to increase total and daily gain. Ali (2005) found that, average daily gain was significantly ($P<0.05$) improved for animals fed probiotic supplemented diets (207 and 175 g/d) compared with animals fed the control diet (115 g/d). Allam *et al.* (2005) found that, daily gain did not significantly influenced by the addition of different natural antioxidants. However, the highest values occurred with groups fed thyme and rosemary ration. They added that the feed conversion was more efficient with rosemary followed by thyme and fennel than control diet, however the difference between groups did not attain significancy. On the contrary, some previous studies (Drennan, 1990; and Kamalamma *et al.*, 1996) reported that body weight gain was not affected significantly by yeast culture supplementation. Moreover, El-Shafie *et al.* (2007) found noticeable decrease in body weight gain of sheep with increasing the replacement level of concentrates with fungal treated rice straw.

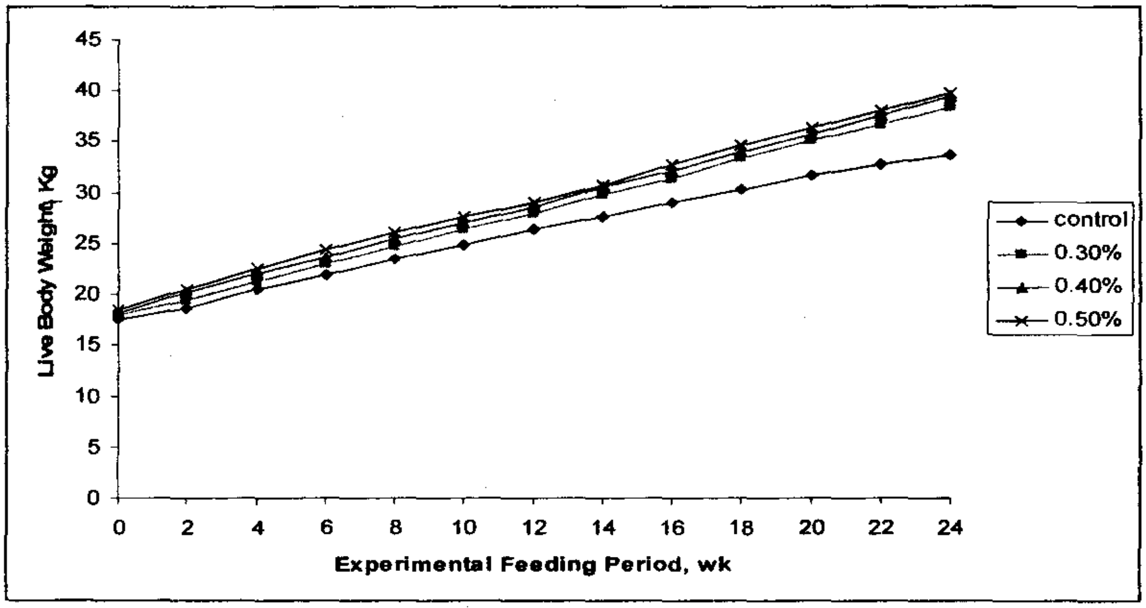

Fig. (4): Body weight development of Rahmany lamb fed the four experimental; diets.

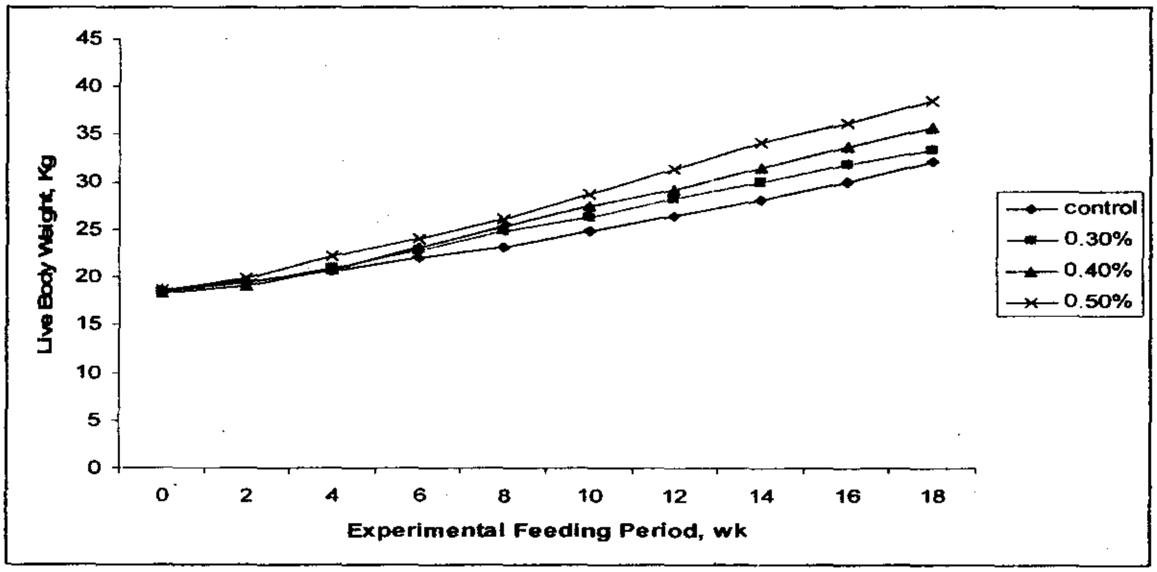

Fig. (5): Body weight development of Farafra lamb fed the four experimental; diets.

Carcass characteristics of slaughtered lambs:

Fasting and empty body weight, hot carcass weight, dressing percentage, edible and non-edible offals of slaughtered Rahmany and Farafra lambs in different experimental groups are given in Tables (6 and 7). It was obviously clear that fasting body weight, empty body weight and dressing percentage were higher (P<0.01) for both breeds of sheep fed EMMH supplemented diets than control, while no difference was noticed among groups of Farafra lambs concerning the prime cuts. Edible offals weight calculated relative to empty body weight were nearly similar in all groups for both Rahmany and Farafra slaughtered lambs. Whereas, there was a significant (P<0.01) decrease of non-edible offals and trimmings for either Rahmany or Farafra slaughtered lambs of groups fed EMMH supplemented diets. The decrease of trimmings relative to fasting weight was nearly 5% for both breeds fed 0.5% EMMH diet in comparison with those fed control diets. Such result might reveal that the tested feed additive (EMMH) promote nutrients to build up body muscular tissues rather than other non-edible organs. Knife separable fat (Table 8) tended to be lower in carcasses of lambs fed EMMH supplemented diets than those fed control diets, however Rahmany lambs were more influenced by the tested feed additive than Farafra lambs with concerning fat deposition.

Table (6): Carcass characteristics of Rahmany lambs in experimental groups.

Item	Experimental groups				MSE	Sign.
	Control	0.3%	0.4%	0.5%		
No. of animals	3	3	3	3	-	-
Fasting body weight, kg	33.33^{b}±1.52	38.00^{a}±1.00	39.50^{a}±1.32	39.83^{a}±1.04	0.84	**
Empty body weight, kg (a)	29.75^{c}±1.84	32.74^{b}±0.65	33.91^{ab}±1.42	35.30^{a}±0.79	0.69	**
Hot carcass weight, kg (b)	14.52^{c}±1.01	16.97^{b}±0.30	17.92^{ab}±0.57	19.02^{a}±1.01	0.53	**
Dressing (b/a),%	48.80^{b}±1.10	51.83^{a}±0.75	52.85^{a}±1.03	53.97^{a}±1.70	0.64	**
Dissected carcass traits, kg:						
Fore quarters	2.63	3.14	3.35	3.76	-	-
Hind quarters	4.58	5.27	5.62	6.01	-	-
Neck	1.05	1.21	1.04	1.12	-	-
Rack	2.58	3.08	3.29	3.30	-	-
Brisket	0.60	0.69	0.79	0.84	-	-
Flank	0.74	1.02	1.02	1.02	-	-
Loin	1.04	1.29	1.37	1.50	-	-
Kidney fat	0.05	0.03	0.06	0.08	-	-
Tail fat	1.25	1.24	1.38	1.39	-	-
Prime cuts wt., kg	10.83	12.78	13.69	14.57	-	-
Total	14.52	16.97	17.92	19.02	-	-
Prime cuts of carcass,%	74.59±0.20^{b}	75.31±0.27^{ab}	76.06±0.08^{a}	76.60±0.45^{a}	0.46	*
Edible offals, kg:						
Heart	0.17	0.17	0.18	0.18	-	-
Liver	0.56	0.60	0.60	0.63	-	-
Spleen	0.04	0.05	0.05	0.06	-	-
Defatted kidneys	0.09	0.10	0.12	0.12	-	-
Testicles	0.21	0.22	0.23	0.24	-	-
Total	1.07	1.14	1.18	1.23	-	-
Edible offals of empty body wt.,%	3.60±0.18	3.48±0.18	3.48±0.10	3.48±0.03	0.03	NS
Non-edible offals and trimmings (NEOT), kg:						
Lungs and trachea	0.53	0.64	0.70	0.76	-	-
Clean empty G.I.T.	2.77	3.12	2.91	2.92	-	-
Visceral fat	0.06	0.06	0.09	0.09	-	-
Trimmings	14.38	16.07	16.70	15.81	-	-
Total	17.74	19.89	20.40	19.58	-	-
NEOT of FBW,%	53.22^{a}±0.94	52.34^{a}±0.47	51.65^{a}±0.27	49.16^{b}±1.31	0.50	**

a, b and c: Means within the same row with different superscripts differ (P<0.05).
*NS = non-significant difference. * = Significant difference at (P<0.05). ** = Significant difference at (P<0.01).*
Trimmings include: head, hide, legs, blood and G.I.T. contents. - = not statistically analyzed

Table (7): Carcass characteristics of Farafra lambs in experimental groups.

Item	Experimental groups				MSE	Sign.
	Control	0.3%	0.4%	0.5%		
No. of animals	3	3	3	3	-	-
Fasting body weight, kg	32.00^{b}±1.49	33.33^{b}±0.91	35.70^{b}±1.26	38.50^{a}±1.00	0.70	**
Empty body weight, kg (a)	26.62^{d}±1.80	28.50^{c}±0.60	30.41^{b}±1.38	32.70^{a}±0.70	0.61	**
Hot carcass weight, kg (b)	13.36^{b}±1.00	14.72^{b}±0.28	15.82^{b}±0.50	17.49^{a}±1.00	0.52	**
Dressing (b/a),%	50.18^{b}±1.00	51.65^{ab}±0.70	52.01^{ab}±1.00	53.50^{a}±1.62	0.59	**
Dissected carcass traits, kg:						
Fore quarters	2.41	2.75	2.90	3.35	-	-
Hind quarters	4.30	4.38	5.25	5.82	-	-
Neck	0.92	1.10	1.12	1.20	-	-
Rack	2.70	3.00	2.90	2.89	-	-
Brisket	0.63	0.95	0.70	0.85	-	-
Flank	0.75	0.80	0.88	1.01	-	-
Loin	0.95	1.00	1.25	1.48	-	-
Kidney fat	0.05	0.05	0.06	0.08	-	-
Tail fat	0.65	0.69	0.76	0.81	-	-
Prime cut wt, kg	10.36	11.13	12.30	13.54	-	-
Total	13.36	14.72	15.82	17.49	-	-
Prime cuts of carcass,%	77.54±0.25	75.61±0.20	77.75±0.07	77.42±0.40	0.40	NS
Edible offals, kg:						
Heart	0.16	0.17	0.17	0.18	-	-
Liver	0.56	0.56	0.61	0.61	-	-
Spleen	.04	0.05	0.04	0.05	-	-
Defatted kidneys	0.08	0.10	0.09	0.12	-	-
Testicles	0.21	0.23	0.24	0.23	-	-
Total	1.05	1.11	1.15	1.19	-	-
Edible offals of empty body wt.,%	3.94±0.15	3.89±0.16	3.78±0.10	3.64±0.10	0.02	NS
Non-edible offals and trimmings (NEOT), kg:						
Lungs and trachea	0.50	0.54	0.61	0.70	-	-
Clean empty G.I.T.	2.91	2.76	2.82	2.95	-	-
Visceral fat	0.05	0.05	0.06	0.06	-	-
Trimmings	14.13	14.15	15.24	16.11	-	-
Total	17.59	17.50	18.73	19.82	-	-
NEOT of FBW,%	54.97^{a}±0.44	52.50^{a}±0.38	52.46^{a}±0.25	51.48^{b}±0.2	0.51	**

a, b, c and d: Means within the same row with different superscripts differ ($P<0.05$).
*NS = non-significant difference. * = Significant difference at ($P<0.05$). ** = Significant difference at ($P<0.01$).*
Trimmings include: head, hide, legs, blood and G.I.T. contents. - = not statistically analyzed

Mir and Mir (1993) reported that supplementation with yeast culture did not affect carcass characteristics; however, carcasses of yeast fed steers were heavier than the control steers. Lion area and dressing percentage of yeast fed steers were consistently better than the control steers, but the effect was not significant. Salem *et al.* (2000) found that addition of 3 g/h/d yeast culture to growing sheep improved carcass weight, slaughter weight and characteristics. Similarly, Hafez *et al.* (2011) noticed that using of yeast culture alone or with selenium increased hot carcass weight and dressing percentage while, different edible offals were not affected.

In contrast Allam *et al.* (2005) found that the prime cuts percentage (loin, shoulder, hind quarter and rack relative to carcass weight) did not affected by addition of natural antioxidants to growing lambs rations. The percentages of different carcass components of 9th, 10th and 11th rib cuts were found to have no significant difference between groups in lean, fat and bone weights.

Physical and chemical properties of Longissimus dorsi muscle:

Dissected traits of the best ribs 9th, 10th and 11th and chemical analysis of the *Longissimus dorsi* muscle of Rahmany and Farafra slaughtered lambs are shown in Table (9). Lean was significantly ($P<0.05$) increased, while fat was significantly ($P<0.05$) decreased in Rahmany ribs for animals fed the EMMH supplemented diets. Similar trend was also observed for Farafra ribs, however the difference between un-supplemented and EMMH supplemented groups did not attain significancy. Meanwhile, the eye muscle area was significantly ($P<0.05$) increased for both breeds fed EMMH supplemented diets. Chemical analysis of the *Longissimus dorsi* muscle showed higher ($P<0.01$) protein and lower ($P<0.01$) extracted fat contents for both breeds of sheep fed EMMH supplemented diets than control. While moisture and ash contents were of comparable values among groups for both Rahmany and Farafra lambs.

Table (8): Knife separable fat of Rahmany and Farafra carcasses in experimental groups.

Item	Experimental groups				MSE	Sign.
	Control	0.3%	0.4%	0.5%		
		Rahmany				
Tail fat, Kg	1.25	1.24	1.38	1.39	-	-
Kidney fat, Kg	0.05	0.03	0.06	0.08	-	-
Visceral fat, Kg	0.06	0.06	0.09	0.09	-	-
Total fat of carcass wt., %	9.37^a	7.84^b	8.54^b	8.20^b	0.34	*
		Farafra				
Tail fat, Kg	0.65	0.69	0.76	0.81	-	-
Kidney fat, Kg	0.05	0.05	0.06	0.08	-	-
Visceral fat, Kg	0.05	0.05	0.06	0.06	-	-
Total fat of carcass wt., %	5.61	5.37	5.56	5.43	0.09	NS

*NS = non-significant difference. * = Significant difference at ($P < 0.05$).*
a, b: Means within the same row with different superscripts differ at ($P<0.05$). - = not statistically analyzed

Table (9): Physical and chemical properties of *Longissimuss dorsi* muscle of Rahmany and Farafra lambs in experimental groups.

Item	Experimental groups				MSE	Sign.
	Control	0.3%	0.4%	0.5%		
		Rahmany				
Physical:						
Meat (%)	60.18^c±3.90	60.66^c±3.48	62.94^b±3.98	65.28^a±2.23	1.05	*
Fat (%)	23.47^a±2.80	22.66^a±1.43	20.05^b±2.79	18.87^c±2.21	0.81	*
Bone (%)	16.35±1.11	16.68±2.06	17.01±1.20	15.85±0.10	0.35	NS
L.D Area (cm^2)	18.50^b±0.50	19.07^{ab}±1.25	18.50^b±0.75	20.17^a±0.85	0.29	*
Chemical:						
Moisture (%)	66.40±3.39	66.82±2.69	67.03±4.46	68.32±2.75	0.86	NS
CP (%)	59.92^c±1.66	62.37^{bc}±0.87	64.88^{ab}±1.68	71.92^a±2.32	0.05	**
EE (%)	31.70^a±1.32	29.38^{ab}±0.71	27.14^b±1.63	20.05^c±1.77	1.36	**
Ash (%)	3.46±0.19	3.42±0.26	3.58±0.14	3.67±0.20	1.41	NS
		Farafra				
Physical:						
Meat (%)	59.24±0.71	58.89±0.06	59.10±1.23	60.99±0.56	0.41	NS
Fat (%)	24.13±1.27	23.52±1.99	23.63±1.56	22.53±0.73	0.64	NS
Bone (%)	16.63±0.69	17.59±1.96	17.27±0.47	16.48±0.38	0.48	NS
L.D Area (cm^2)	18.27^b±0.08	18.60^{ab}±0.15	18.57^{ab}±0.08	19.47^a±0.53	0.18	*
Chemical:						
Moisture (%)	64.28±2.19	66.27±3.62	66.25±1.90	66.77±2.31	1.14	NS
CP (%)	55.26^c±0.62	59.32^b±0.59	62.08^b±1.20	67.68^a±0.87	1.41	**
EE (%)	36.67^a±0.49	32.72^b±0.19	29.79^c±1.24	23.98^d±1.01	1.44	**
Ash (%)	3.44±0.04	3.47±0.25	3.58±0.16	3.65±0.25	0.08	NS

a, b, c and d: Means within the same row with different superscripts differ ($P<0.05$).
*NS = non-significant difference. * = Significant difference at ($P<0.05$). ** = Significant difference at ($P<0.01$).*

The previous results were in accordance with Hassan and Hassan (2009) on Karadi lambs fed diets supplemented with some medicinal plants and probiotic. Similar results were also noted by El-Mahdy *et al.* (2009) on Friesian calves fed yeast culture and fenugreek seeds.

It could be concluded that, the EMMH which is a multi functional feed additive (fungal enzymes + live yeast + natural antioxidants) was efficient to enhance feed intake particularly the dietary roughage portion, promote body weight and feed conversion efficiency of local sheep (Rahmany and Farafra).It was also effective in improving carcass quality and in decreasing muscular extracted fat. The best results were achieved with the diet supplemented with 0.5% EMMH of the concentrate feed mixture.

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التقييم الغذائي لمعزز حيوى فطرى مع الخميرة ومدعم بمضادات الاكسدة الطبيعية على أداء الأغنام. ٢- الزيادة الوزنية ، كفاءة التحويل الغذائى ، صفات الذبيحة وتركيب الجسم لنوعين من الأغنام المحلية المرباة فى منطقتين مختلفتين مناخياً.

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أجريت هذه الدراسة بهدف تقييم التأثير الغذائي لمعزز حيوي محلي الصنع يحتوي على فطري *T. reesei* و *A. Oryzae* وخميرة حية *S. cerevisiae* ومدعم بمخلوط من النباتات الطبية والعطرية كمصدر لمضادات الأكسدة على أداء النمو ومواصفات الذبيحة لنوعين من ذكور الأغنام المحلية وفي ظروف مناخية مختلفة. أجريت تجربة التغذية الأولى على عدد ٣٢ رأس من الحملان الرحماني في محطة السرو بمحافظة دمياط واستمرت لمدة ١٦٨ يوما، والتجربة الثانية كانت على عدد ٢٤ رأس من حملان الفرافرة بمحطة ملاوي بمحافظة المنيا واستمرت لمدة ١٢٦ يوماً. كان متوسط أوزان الحملان الرحماني في بداية التجربة ١٨،٠٤ ± ٠،٥٣كجم وحملان الفرافرة ١٨،٥٣ ± ٠،١١كجم ومتوسط أعمار كلا النوعين ثلاثة أشهر. تم تقسيم الحيوانات في كلا التجربتين إلى أربعة مجاميع متساوية وتم تغذيتها على أربعة علائق تجريبية احتوت على صفر، ٣، ٤، ٥ كجم معزز حيوي لكل طن من مخلوط العلف المركز، وكانت كمية الأعلاف المقدمة يوميا لكل رأس كما يلي :

الأغنام الرحماني : مخلوط علف مركز بمعدل ٢،٥% من الوزن + دريس برسيم بمعدل ١% من الوزن + قش أرز إلى الشبع.

الأغنام الفرافرة : مخلوط علف مركز بمعدل ٣% من الوزن + قش أرز إلى الشبع.

بعد انتهاء تجارب التغذية تم اختيار ثلاثة حيوانات عشوائياً من كل مجموعة لذبحها وتقييم مواصفات ذبائح كل مجموعة من حيث نسبة التصافي وتوزيع الدهن والتحليل الكيماوى للعضلة العينية.

أوضحت نتائج تجربتي التغذية ما يلي :

- ارتفاع نسبة المأكول من الأعلاف الخشنة لكلا من الحملان الرحماني ($P<0.05$) والفرافرة ($P<0.01$) للمجموعات المغذاة على المعزز الحيوي بالنسبة لمجموعة المقارنة.

- انخفاض نسبة الماء المستهلك لكل كجم من المادة الجافة معنوياً ($P<0.01$) لكلا النوعين من الحملان بزيادة نسبة إضافة المعزز الحيوي باستثناء عامل اختلاف المناخ بين موقعي إجراء التجربة.

- كان معدل الزيادة الوزنية اليومية مرتفع معنوياً ($P<0.01$) لكلا النوعين من الأغنام المغذاة على العلائق المحتوية على المعزز الحيوي بالنسبة لعلائق المقارنة، حيث ارتفع معدل الزيادة الوزنية بمقدار ٣٠% وتحسن معامل التحويل الغذائي بمقدار ١٢% للحملان الرحماني وبمقدار ٤٧% تحسن في معدل الزيادة الوزنية اليومية وتحسن معامل التحويل الغذائي بمقدار ١٩% لحملان الفرافرة المغذاة على العليقة المحتوية على ٠،٥% معزز حيوي بالنسبة لعلائق المقارنة.

- ارتفعت معنوياً ($P<0.01$) نسبة تصافي ذبائح الحملان الرحماني والفرافرة بمقدار ١٠%، ٦،٦% على التوالي المغذاة على العليقة المحتوية على ٥% معزز حيوي بالنسبة لعلائق المقارنة، بينما لم تكن هناك فروق معنوية بين المجموعات لكلا النوعين من الحملان بالنسبة لكمية الأحشاء المأكولة، بينما قلت كمية الأحشاء الغير المأكولة للحملان المغذاة على العلائق المحتوية على المعزز الحيوي.

- ارتفعت ($P<0.05$) نسبة اللحم وانخفضت ($P<0.05$) نسبة الدهن في العضلة العينية كما زادت مساحتها ($P<0.05$) وزادت نسبة البروتين ($P<0.01$) بمقدار ٢٠% وانخفض الدهن المستخلص ($P<0.01$) بنسبة ٣٧% في العضلة العينية للأضلاع ٩، ١٠، ١١ لذبائح الحملان الرحماني المغذاة على العليقة المحتوية على ٥% معزز حيوي بالنسبة لمجموعة المقارنة، بينما لم تظهر فروق معنوية بين المجموعات التجريبية لذبائح حملان الفرافرة بالنسبة لنسب اللحم والدهن والعظم وإن كانت مساحة العضلة العينية قد زادت معنوياً ($P < 0.05$) للحملان المغذاة على المعزز الحيوي، كما أشار التحليل الكيميائي إلى ارتفاع نسبة البروتين في العضلة العينية بمقدار ٢٢% وانخفاض نسبة الدهن المستخلص بنسبة ٣٥% الحملان المغذاة على العليقة المحتوية على ٠،٥% معزز حيوي بالنسبة لمجموعة المقارنة.

يستنتج من النتائج السابقة أن إضافة المعزز الحيوي المختبر في علائق الأغنام المحلية النامية يحسن معدل الزيادة الوزنية اليومية ومعامل التحويل الغذائي ونسبة التصافي في الذبائح ويزيد من نسبة البروتين ويقلل نسبة الدهن المستخلص في لحوم الذبائح، وكانت أفضل نسب الإضافة بمعدل ٥كجم / طن من مخلوط العلف المركز.