Egyptian J. Nutrition and Feeds (2017), 20(1): 29-39

IMPACT OF PROBIOTICS SUPPLEMENTATION ON SOME PRODUCTIVE PERFORMANCE, DIGESTIBILITY COEFFICIENT AND PHSIOLOGICAL RESPONCES OF BEEF BULLS UNDER HEAT STRESS CONDATIONS

A. Y. Kassab, H. A. Hamdon and A.A. Mohammed

Department of Animal Production, Faculty of Agriculture, New valley, Univ. of Assiut,71526, Egypt.

(Received 10/1/ 2017, Accepted 27/2/ 2017)

SUMMARY

This experiment was carried out in the New valley Governorate during May tell September 2016 in privet farm. Twelve crossbreed beef bulls average 252.98 to 255.66 kg body weight (BW) were used in this study. Animals were divided randomly into three groups (4 animal/group). The first group (G1) served as control. The second and the third groups (G2 and G3) were supplemented with commercial probiotics at a rate of 0.5 to 1.00 gm/ kg of concentrate mixture, respectively. The animals were fed individually on concentrate fed mixture, berseem hay and wheat straw to cover the requirement of DM and TDN for average body weight and daily gain of beef. Experimental period lasted 150 days. Digestibility coefficients of different nutrients and nutritive values (TDN and DCP %) of the experimental rations were calculated. Blood samples were collected from each animal at day 0, 75 and 150 of experiment period. Serum samples of all animals were assayed for determenation of triiodothyronine (T3), thyroxine (T4), total protein, albumin, glucose, aspartate aminotransferase (AST) and alanine aminotransferase (ALT) concentrations. Body weight (BW) of animals was recorded at the beginning of experimental period and monthly thereafter. Total gain, daily gain and daily average feed intake were calculated. Thus, value of feed efficiency was calculated. Monthly average of ambient temperature, relative humidity and temperature humidity index were calculated during the experimental period. Monthly of THI values in the present study during experimental period from May to September recorded more than 74. Thus, animal suffered from heat stress. Also, the present results indicated that supplementation of probiotics in the diet of beef bulls led to positive effect on rectal temperature and respiration rate in G3 and G2 compared to control group G1. Values of rectal temperature and respiration rate during experimental period were decreased in G2 and G3 as a result of supplementation of probiotics in comparison with G1, but the differences were not significant. The present results indicated beneficial effect of feeding beef bulls on diets supplemented with probiotics to eliminate heat stress. Digestibility coefficients of different nutrients improved in treatments. The best values of digestibility coefficients of nutrients were recorded in G3 followed by G2 and the lowest values were recorded in control group (G1). Also, supplementation of probiotics led to significant ($P<0.05$) effect on total digestible nutrients (TDN) and digestible crude protein (DCP) in G3 in comparison with G2 and G1. Final BW of beef bulls and daily gains recorded the higher value in G3 followed by G2 and the lower value of was recorded in G1. At the same time, feed intake and feed efficiencies in G3 recorded higher values in comparison with G2 and G1. The results indicated that the mean concentrations of total protein, albumin, glucose, AST, ALT, T3 and T4 were increased in G2 and G3 in comparison with G1. The present results illustrated that improvement of net profit as a result of supplementation probiotics in G2 and G3. From the present results it can be concluded that supplementation of probiotics in the diet of beef bulls improved growth performance, nutrient digestibility and physiological response under heat stress conditions. Such improvement is due to a positive effect on blood metabolites parameters as physiological responses

Keywords: *probiotics, growth, digestibility and physiological responses, heat stress, beef bulls*

INTRODUCTION

There are numerous growth promoter substances supplements to the animal feed to improve the animal production and potentially reduce the cost of animal breeding. The growth promoter substances include antibiotic growth promoters as flavomycin, probiotics, acidifiers, enzymes, herbal products, beta agonists, microflora enhancer and immunomodulators. Probiotic preparations have shown promising results in a variety of animal production areas. Generally, probiotics can be added to feed or water as momo or mixed cultures of live microorganisms (Todorov et al., 2007). Many strains of bacteria including Bacillus subtilis had the generally recognized as safe (GRAS) status from the US food and drug administration. Probiotics have many beneficial effects to the host animal by improve dry matter intake, body weight gain and feed conversion ratio in ruminants (Abdel-Salam et al., 2014; Hussein, 2014; Ghazanfar et al., 2015 and Saleem & Zanouny, 2016). Also, supplementation of probiotics in the ration of animal led to beneficial effects on live microorganisms such as Lactobacillus and Bacillus which help enhancement the ruminal microorganism population (Lopez, 2000). In additions supplementation probiotics in animal feed had a positive effect on nutrient synthesis and their bio-availability (Oyetayo and Oytayo, 2005), on feed utilization (Khalid et al., 2011) and also on nutrients absorption (Antunovic et al., 2006; Whitley et al., 2009). However, little research has been conducted on the positive effect of use probiotics in animal ration under heat stress conditions. The present study were carried out in the New Valley Governorate, which located in Upper Egypt in western desert between 25º; 42& 30º; 47 E longitude, 22º 30& 29º 30N latitude and lies 77.8m altitude above the sea level. The climate of this area is arid and dry, essentially that of the desert. Rainfall is almost negligible and the maximum ambient temperature and relative humidity ranged from 42 to 46°C and 18 to 33%, respectively during summer days (Kassab and Mohammed, 2014).Thus, the present study aim to evaluate the effects of a commercial probiotic supplementation on feed intake, some growth performances, nutrients digestibility and physiological responses of beef bulls under heat stress conditions.

MATERIALS AND METHODS

Animal and management:

This experiment was carried out in the New valley Governorate during May tell September 2016 in privet farm. Twelve crossbreed beef bulls average 252.98 to 255.66 ± 3.19 kg body weight (BW) were used in this study. Animals were divided randomly into three groups (4 animal/group). The first group (G1) served as control group unsupplemented with probiotics. The second and the third groups (G2 and G3) were supplemented with commercial probiotics (ANFATOX) at a rate of 0.5 to 1.00 gm/ kg of concentrate mixture, respectively. The animals were kept separately in pens and fed individually on concentrate fed mixture (CFM), hay and wheat straw to cover the requirement of DM and TDN for average body weight and daily gain of beef according to NRC (2000) requirements. Experimental period lasted 150 days. Each 1 kg of probiotics contains: 50gm Mannan Oligosaccharide (M.O.S), 3x10 cfu/g Bacillus subtills, 60gm Propiotic acid, 15gm Benzoic acid,15gm Acetic acid, 15gm Sorbic acid, 15gm citric acid, 50gm activated charcoal, 100gm liver extract, 800gm hydrated sodium calcium aluminosilicate (HSCAS) and 5gm Silicon dioxide. Fresh water was available freely during all the day time. Digestibility coefficient of different nutrients and nutritive values of experimental ration and some blood parameters were determined during the study.

Digestibility coefficient and nutritive values:

This experiment was carried out to evaluate the effect of probiotics supplementation on digestibility coefficient and nutritive values of experimental rations. Fecal sample from each animal was collected at the last week of the experimental period twice daily at 07:00 am and 02:00 pm directly from the rectum, and then it was frozen until analysis. Representative fecal samples (about 10%) from each animal were dried at 70 °C in air- oven for constant weight. Fecal and rations samples were ground through 1 mm mill screen and mixed together then analyzed for DM, OM, CP, CF and EE according (A.O.A.C., 1990). Digestibility coefficients of DM, OM, CP, CF, EE and NFE were determined using acid insoluble ash (AIA %) as natural marker according to Van Keulen and Young (1977). The nutritive values (TDN and DCP %) of the experimental rations were calculated.

Blood sampling analysis:

About 10 mL of blood samples via jugular venipuncture were collected from each animal at day 0, 75 and 150 of experiment period. The collected blood samples were quickly kept in ice pack and sent to the laboratory. Serum samples were obtained by centrifugation of blood samples for 15 minutes at 3,000 r.p.m, then dispensed into two 1.5 ml Eppendorf tubes and stored at -20 °C for blood metabolites analysis. Serum samples of all animals were assayed for, triiodothyronine (T3) and thyroxine (T4) concentrations using radioimmunoassay (RIA) technique. Total protein, albumin, glucose, aspartate aminotransferase (AST) and alanine aminotransferase (ALT) concentrations were determined using appropriate commercial test kits. The concentrations were measured using standard protocols (Photometer 5010 v5+).

Growth performance:

Effects of probiotics supplementation on some productive performance of beef bulls were investigated. Body weight (BW) of animals was recorded at the beginning of experimental period and monthly thereafter. Final BW, total gain and daily gain were calculated. Total feed intake as dry matter from concentrate feed mixture, hay and wheat straw were calculated during the experimental period. Values of daily average feed intake, gain and feed efficiency (gain divided on feed intake) were calculated.

Climatic conditions:

Ambient temperature and relative humidity were recorded simultaneousy during the experimental period. A mercury centigrade thermometer was used to measure ambient temperature, while a hygrometer hanging from the roof of the shed at a level of about 2.5 meters from the ground was used to measure relative humidity. Monthly averages of air temperature and relative humidity were calculated at May, June, July, August and September. Also, monthly THI values for the experimental sites were calculated using the equation of Mader et al., (2006).

THI= [0.8 x air temperature] + [(%relative humidity/100) x(air temperature – 14.4)] +46.4.

Thermal responses:

Rectal temperature (RT, °C) was measured using a clinical thermometer. Respiration rat (RR) was expressed as the number of respirations per minute (breaths/minute) and was measured by counting the flank movements in one minute using a stop watch. Complete inward and outward movement of the flank was counted as one breathe and was recorded per minute. All of these parameters were taken every 10 days at afternoon (12-2 p. m).

Statistical analysis:

Data were analyzed using General Linear Model (GLM) procedure of SAS (SAS, 2004) according to the following model:

$Y_{ij} = \mu + T_i + E_{ij}$

Yij=The observation,

μ = The overall mean,

Ti = Effect of treatments

Eij= Standard error

Duncan's multiple range tests, Duncan (1955) was used to compare between means of the control and treated groups.

RUSELTS AND DISCUSSION

Climatic conditions

Average values of ambient temperature (AT) , relativity humidity (RH) and temperature humidity index (THI) during experimental period (May to September) in New Valley are presented in Table (1). The present results indicated that values of ambient temperature, relativity humidity and temperature humidity index were ranged from 31.03 to 36.83, 22.33 to 35.00 and 75.39 to 82.12, respectively. Also, the overall mean of the previous parameters were 34.22, 27.80 and 79.23 during the experimental period, respectively. The maximum AT, RH and THI values were recorded in July, September and August. Data in the present study illustrated that animals during the experimental period suffered from heat stress. Generally, heat stress is a combination of many environmental factors (West, 2003 and Bohmanova et al., 2006). Temperature humidity index is the most common parameter describing the level of heat stress (Bohmanova et al., 2006). THI value more than 74 means that animals are suffering from heat stress (Mader et al., 2006). Monthly of THI values in the present study during experimental period from May to September recorded more than 74. Thus, animal suffered from heat stress.

Table (1): Ambient temperature, relativity humidity and temperature humidity index (LSM ±SE) during experimental period in New Valley.

Months	Ambient temperature (AT)	Relativity humidity (RH)	Temperature humidity index (THI)
May	31.16±0.51	24.67± 1.15	75.39 ± 0.40
June	35.53± 0.51	22.33±1.15	79.52±0.40
July	36.83 ± 0.51	27.67±1.15	82.07±0.40
August	36.53±0.51	29.33±1.15	82.12±0.40
September	31.03 ±0.51	35.00±1.15	77.04±0.40
Overall mean	34.22±0.88	27.80±1.98	79.23±0.69

Thermal responses

Rectal temperature (TR) and respiration rate (RR) as indicator thermal responses of beef bulls during the experimental period are presented in Table (2). The present results indicated that supplementation of probiotics in the diet of beef bulls led to positive effect on rectal temperature and respiration rate in G3 and G2 compared to control group G1. Values of rectal temperature and respiration rate during experimental period were decreased in G2 and G3 as a results of supplementation of probiotics in comparison with G1, but the differences were not significant. The present results are in agreement with Mostafa et al., (2014). They reported that additive of probiotics in dairy cow rations led to decreasing RT and RR during pre- partum and post –partum period of dairy cattle compared to untreated group. Also, the differences were not significant. The present results indicated beneficial effect of feeding beef bulls on diets supplemented with probiotics to eliminate heat stress. Also, the present results indicated that increasing of AT, RH and THI led to increasing RT of beef bulls. As the same time increasing RT values were linked with increasing RR. The present results are in agreement with Meriem Rajab et al., 2016). They reported that the relationship between AT, THI and RT in Holstein cows.

Table (2): Effect of probiotics supplementation on thermal responses (LSM±SE) of beef bulls during experimental period.

Months	Treatments		
	G1	G2	G3
No. animals	4	4	4
		Rectal temperature, (°C)	
May	38.30 ±0.76	38.22 ± 0.94	38.14 ± 0.39
June	38.55 ± 0.57	38.47 ± 0.69	38.41± 0.36
July	38.75 ± 0.59	38.57 ± 0.48	38.51 ± 0.22
August	38.70 ± 0.54	38.62 ± 0.67	38.53 ± 0.17
September	38.50 ± 0.38	38.34 ± 0.53	38.27 ± 0.64
Overall mean	38.56±0.25	38.44±0.17	38.37± 0.13
		Respiration rate (time/min.)	
May	25.33 ± 1.15	25.25 ± 1.16	25.15± 1.10
June	25.60 ± 1.14	25.41 ± 1.18	25.32± 1.19
July	26.12± 1.11	26.00± 1.44	25.92± 1.24
August	26.10± 1.40	26.02± 1.64	25.95± 1.23
September	25.44± 1.25	25.23± 1.22	25.08± 1.15
Overall mean	25.72± 1.21	25.58± 1.93	25.48± 0.82

G1=Control; G2 =Probiotics supplementation (0.5g/kg CFM) ; G3 = Probiotics supplementation(1.00g/kg CFM)

Chemical analyses of experimental ingredients

The proximate analysis of different nutrients of concentrate feed mixture (CFM), hay and wheat straw are presented in Table (3). Concentrate feed mixture recorded the highest values of CP , while the lowest value recorded in the wheat straw. At the same time wheat straw recorded the highest values of

(CF), while CFM recorded the lowest value. Results of chemical analyses of hay and wheat straw were nearly similar to that obtained by CLFF (2001) and Kassab &Hamdon (2014).

Table (3): Chemical composition of ingredients on dry matter (DM) basis.

Item	Items %						
	DM	OM	CP	EE	CF	NFE	Ash
CFM	88.76	93.79	15.76	2.39	14.12	61.52	6.21
Hay	91.18	88.66	16.54	2.11	29.21	40.80	11.34
Wheat straw	90.35	89.05	1.79	1.12	38.71	47.43	10.95

CFM; Concentrate feed mixture composed of white corn 50%; wheat bran 30%; soybean meal 17%; limestone 2%; sodium chloride 0.5% and premix 0.5%.

Digestibility coefficients and nutritive values of experimental rations

Data presented in Table (4) showed that digestibility coefficient of different nutrients and nutritive values of experimental rations. The present results indicated that supplementation of probiotics in the rations in G2 and G3 improved the digestibility coefficients of dry matter (DM), organic matter (OM), crude protein (CP), crude fiber (CF), ether extract (EE) and nitrogen free extract (NFE). The best values of digestibility coefficients of the previous deferent nutrients were recorded in G3 followed by G2 and the lowest values were recorded in control group (G1). The improved of nutrients digestibility with probiotic supplementation may be due to increased ruminal cellulotytic microbial population (Ghazanfar et al., 2015). The present results are in agreement with others (Haddad and Goussous, 2005; Whitley et al., 2009; Mukhtar et al., 2010 and Hillal et al., 2011; Ghazanfar et al., 2015; El-Katcha et al., 2016; Saleem and Zanouny, 2016 and Saleem et al., 2017). They reported that supplementation of probiotics in rations ruminants had positive effect on digestibility coefficients of differentt nuterints. On the other hand, Ding et al., (2008) in weaned lambs and Whitley et al., (2009) in goats reported that supplementation probiotics did not affect the digestibility of DM, OM and CP compared to control group. Differences in the previous results may be due to animal used, methods of administration and level and type of addition of probiotics (Whitley et al., 2009).

Also, the present results illustrated that supplementation of probiotics led to significant ($P<0.05$) effect on total digestible nutrients (TDN) and digestible crude protein (DCP) in G3 in comparison with G2 and G1. The improvement of TDN and DCP due to improvement digestibility coefficients of different nutrients and digestible coefficient crude protein, respectively. The present results are in agreement with Saleem and Zanouny, (2016) and Saleem et al., (2017)

Table (4): Effect of probiotics supplementation on digestibility coefficient of different nutrients and nutritive values (LSM±SE) of experimental rations.

Item	Treatments		
	G1	G2	G3
No. animals	4	4	4
	Nutrients digestibility coefficient, %		
DM	69.34 ± 2.76	71.88 ± 1.94	72.1 ± 2.39
OM	71.33 ± 1.57^{b}	72.54 ± 1.69^{ab}	73.14 ± 1.36^{a}
CP	70.79 ± 0.59^{b}	71.98 ± 1.48^{ab}	72.62 ± 1.2^{a}
CF	60.67 ± 1.54	62.29 ± 1.67	62.16 ± 1.17
EE	71.10 ± 1.38	72.81 ± 1.53	72.61 ± 1.64
NFE	71.38 ± 1.68	72.81 ± 1.42	73.10± 1.40
	Nutritive values, %		
TDN	63.16 ± 1.15^{b}	65.03 ± 1.16^{ab}	65.26 ± 1.10^{a}
DCP	10.02 ± 0.44^{b}	10.59 ± 0.47^{ab}	10.78 ± 0.43^{a}

a and b: Values with the different superscripts in the same row differ at $P<0.05$.

G1=Control; G2 =Probiotics supplementation (0.5g/kg CFM) ; G3 = Probiotics supplementation(1.00g/kg CFM)

Growth performance

Data to study the effect of probiotics supplementation on some productive performance are presented in Table (5). Body weight recorded insignificant differences among groups at the beginning of the experimental period, while it significantly (P<0.05) increased in G3 in comparison with G2 and G1. Generally, final BW of beef bulls recorded the higher value in G3 followed by G2. The lower value of final BW recorded in G1. The present results indicated that the increase of BW at the end of experimental period was 7.35% and 2.80% in G3 and G2 compared to G1. Also, the present results showed the effect of probiotics supplementation on total gain and daily gain of beef bulls. Total gain and daily gain recorded significant (P<0.05) increase in G3 in comparison with G2 and G1. At the same time the present results illustrated that feed intake in G3 recorded higher values in comparison with G2 and G1. The improvement of BW, total gain and daily gain in G3 due to positive effect of probitics supplementation on feed intake, TDN and DCP. The present results are in agreement with Whitley et al., 2009; Saleem and Zanouny, 2016; Yunus, 2016; Saleem et al., 2017. Also, in the study by El-Katcha et al., 2016 reported that growing lamb received Bacteria probiotic supplementation in drinking water result in higher final BW and weight gain.

Also, the present results illustrated that supplementation of probiotics led to significant (P<0.05) effect on feed efficiency in G3 in comparison with G2 and G1. The improvement of feed efficiency due to improvement total gain and daily gain. The present results are in agreement with El-Katcha et al., 2016. They found that growing lamb received supplementation of probiotics showed better feed efficiency.

Table (5): Effect of probiotics supplementation on some productive performances (LSM ± SE) of beef bulls.

Item	Treatments		
	G1	G2	G3
No. of animal	4	4	4
Initial Body weight, kg	255.66 ± 3.19	252.98 ± 3.19	254.47 ± 3.19
Final body weight, kg	433.16 ± 8.77^{b}	445.40 ± 8.77^{ab}	465.04 ± 8.77^{a}
Total gain, kg	177.50 ± 7.47^{b}	192.42 ± 7.47^{ab}	210.57 ± 7.47^{a}
Daily gain, kg	1.18 ± 0.05^{b}	1.28 ± 0.05^{ab}	1.40 ± 0.05^{a}
Daily feed intake*, kg	9.12 ± 0.32	9.24 ± 0.32	9.43 ± 0.32
Feed efficiency	0.129 ± 0.002^{b}	0.138 ± 0.002^{ab}	0.148 ± 0.002^{a}

a,b: Values with the different superscripts in the same row differ at P<0.05.
G1=Control; G2 =Probiotics supplementation (0.5g/kg CFM) ; G3 = Probiotics supplementation(1.00g/kg CFM)
Daily feed intake from concentrate diets, hay and wheat straw.
Feed efficiency calculated by dividing daily gain (kg) on daily feed intake (kg/d).

Blood metabolites

Data to study the effect of probiotics supplementation on some serum blood metabolites in beef bulls are presented in Table (6). Blood serum total protein and albumin concentrations of bulls at the beginning, at 75 and 150 days of experimental period were not significantly different. Generally, data in the present study indicated that the mean values of total protein and albumin concentrations were increased in G2 and G3 in comparison with G1 as a results of probiotics supplementation. Kummer *et al*., (1981) reported that blood serum total protein and its fractions can be used as indicator to evaluate the ruminant nutritional status and physiological changes.The increase of the previous parameters in G2 and G3 may be due to increase of digestibility coefficient of CP expressed as DCP. The present results are in agreement with Yousef and Zaki 2001; Kuhn, 2002; Shahen *et al.*, 2004; Kassab, 2007; Zanouny 2011; Kassab & Hamdon 2014 and Saleem & Zanouny, 2016. They found that the increase in digestibility coefficient of crude protein might be the reason for the increase in serum total protein and its fractions. Also, the present results are agreement with Saleem & Zanouny, 2016; Yunus, 2016 and Saleem et al., 2017. They found that the supplementation of propiotics led to an increase in total protein and its fractions.

The effect of supplementation probiotics on glucose concentrations values in different experimental groups are presented in Table (6). At the beginning of experimental period values of glucose concentrations in different groups recorded nearly similar results. After 75 and 150 days during the experimental period glucose values concentrations were increased in G2 and G3 in comparison with

G1. The highest values were recorded in G3, while the lowest value recorded in G1. The improvement of glucose values in G2 and G3 compared with G1 may be due to the positive effect of supplementation probiotics on the nutritive values expressed as TDN (Table, 4). Results obtained by Abd El-Latif (2003) in growing Friesian calves and Kassab and Hamdon (2014) in beef bulls, reported that there are correlation between energy in the diet and glucose concentration in blood. Moreover, increase of glucose concentrations in G2 and G3 compared with G1 may be, also, due to higher carbohydrate metabolism as a result of higher thyroid hormones secretion. Results of increasing glucose concentration in G3 and G2 compared with G1 as a results of probiotics supplementation are in agreement with the results of Saleem and Zanouny (2016) and Yunus (2016).

Table (6): Effect of probiotics supplementation on some blood metabolites (LSM ± SE) of beef bull.

Item	Periods	Treatments		
		G1	G2	G3
No. of anmals		4	4	4
Total protein, g/dl	Day 0	7.11 ± 0.19	7.12 ± 0.19	7.14 ± 0.19
	Day 75	7.50 ± 0.28	8.00 ± 0.28	8.17 ± 0.28
	Day 150	7.59± 0.28	7.99 ± 0.28	8.00 ± 0.28
Albumin, g/dl	Day 0	3.10 ± 0.08	3.14 ± 0.08	3.16± 0.08
	Day 75	3.30 ± 0.06	3.42 ± 0.06	3.58 ± 0.07
	Day 150	3.29 ± 0.07	3.52 ± 0.07	3.55± 0.07
Glucose, mg/dl	Day 0	64.15 ± 2.17	64.25 ± 2.17	64.27 ±2.17
	Day 75	70.95 ± 1.63	72.69 ± 1.63	73.78 ±1.63
	Day 150	72.57 ± 1.58	73.55 ± 1.58	74.52 ±1.58
AST, U/l	Day 0	62.25 ± 1.98	62.35 ± 1.98	62.37±1.98
	Day 75	67.85± 2.84	68.82 ± 2.84	69.19±2.84
	Day 150	76.13 ± 6.76	78.32 ± 6.76	79.79 ±6.76
ALT, U/l	Day 0	5.43 ± 0.22	5.44 ± 0.22	5.43 ± 0.22
	Day 75	5.72 ± 0.29	5.85 ± 0.29	5.95 ± 0.29
	Day 150	6.66 ± 0.30	6.83± 0.30	6.76 ± 0.30
T3, µg/dl	Day 0	79.11 ± 2.85	79.23 ± 2.85	79.28 ±2.85
	Day 75	84.44 ± 4.48	86.45 ± 4.48	87.06 ±4.48
	Day 150	87.59 ± 5.21	89.26 ± 5.21	91.26 ± 5.21
T4, µg/dl	Day 0	3.08 ± 0.21	3.13 ± 0.21	3.18 ± 0.21
	Day 75	3.85 ± 0.32	4.12 ± 0.32	4.25 ± 0.32
	Day 150	4.66 ± 0.46	4.92 ± 0.46	4.99 ± 0.46

G1=Control; G2 =Probiotics supplementation (0.5g/kg CFM) ; G3 = Probiotics supplementation(1.00g/kg CFM), AST= Aspartate aminotransferase , ALT= Alanine aminotransferase , T3= Triiodothyronine , T4= Thyroxine.

The effect of probiotics supplementation on AST and ALT concentrations values are presented in Table (6). At the beginning of experimental period activity of AST and ALT recorded similar results. The highest value of AST and ALT at 75 or 150 days recorded in G3, while the lowest value was recorded in control group (G1). The concentration of AST and ALT recorded in the present study are in agreement with the normal ranges of AST and ALT activities (U/l) recorded previously in cattle by Stojevic *et al.*, (2005). They reported that the normal ranges of AST and ALT activities are 19.2 to 84.90 and 4.2 to 29.7, respectively. Thus, the present results indicated that the supplementation of probiotics did not affect the physiological functions of the important organs, practically the liver function.

Blood serum triiodothyronine (T3) and thyroxine (T4) hormone concentrations of beef bulls at the beginning, at 75 and 150 days are illustrated in Table (6). The differences in triiodothyronine and thyroxine concentrations were not significant at the beginning of experimental period. But, secretion of T3 and T4 at 75 and 150 days increased in G2 and G3 in comparison with G1. In addition, the data revealed that the highest values of T3 and T4 were recorded in G3 followed by G2, while values of T3 and T4 in G1 recorded the lowest values. The increase in the secretion of the thyroid hormones in G2 and G3 may be due to 1- The increase of carbohydrate, fat and protein metabolism 2- The increase of TDN intake as an indicator for energy metabolism. Also, the increase in the thyroid hormones secretion may be due to there was a positive relationship between energy intake and the concentration of the thyroid hormones as it was reported in literature by Ahmed, 2003; Kassab, 2007; Toshihiro 2010; Zanouny ,2011 and Kassab and Hamdon, 2014.

Economical efficiency

Table (7) illustrated that the effect of supplementation probiotics on economical efficiency of experimental rations. The present results indicated that total feed intake cost (cost of concentrate, cost of hay, cost of wheat straw and probiotics) were 2786, 2878 and 2974 L.E. for G1, G2 and G3, respectively. In addition, the net profit (total price of total gain- total feed cost) recorded 2539, 2895and 3343 L.E. for G1, G2 and G3, respectively.

The results indicated that improvement of net profit as a result of supplementation probiotics in G2 and G3. The highest values of net profit were recorded in G3 followed by G2, while the lowest value was recorded in G1. The highest values of net profit in G3 due to higher total gain and daily gain obtained in this group as results of increase of feed intake. The present results are in agreement with those Kassab and Hamdon (2014).

Table (7): Economical efficiency of fattening beef bulls by probiotics supplementation.

Item	Treatments		
	G1	G2	G3
Total gain, kg	177.50	192.42	210.57
Price (1) of total gain	5325	5773	6317
Feed intake of concentrate, kg	670	655	652
Price (2) of concentrate	1875	1833	1826
Feed intake of hay, Kg	354	380	395
Price (3) of hay	531	570	593
Feed intake of wheat straw, kg	422	454	472
Price (4) of wheat straw	380	409	425
Price (5) of probiotics	--	66	130
Total price (6)	2786	2878	2974
Net profit, L.E.	2539	2895	3343
Improvement, %	100	114	132

G1=Control; G2 =Probiotics supplementation (0.5g/kg CFM) ; G3 = Probiotics supplementation(1.00g/kg CFM)
Total price (6) = Price (2) + Price (3) + Price (4)+ Price (5)
Net profit = Price (1) – Total price (6).
Price of kg/ (L.E): Gain=30, Concentrate= 2.80, Hay= 1.5, Wheat straw= 0.9, Probiotics=200.

The time of experiment (May to September2016)

CONCLUSION

From the present results it can be concluded that supplementation of probiotics in the ration of beef bulls improved growth performance and nutrients digestibility under heat stress conditions. Such improvement is due to a positive effect on blood metabolites parameters as physiological responses.

REFERENCES

A O A C. (1990). Association of Official Analytical Chemists, Official methods of analysis. 16th ed. Arlington, USA.

Abd El-Latif, E.S.K. (2003). Nutritional studies on beef cattle. M.Sc. Thesis, Fac. Agric., Cairo Univ., Egypt.

Abdel-Salam A.M., M. M. Zeitoun and M.M. Abdelsalam (2014). Effect of synbiotic supplementation on growth performance, blood metabolites, insulin and testosterone and wool traits of growing lambs. J Biol Sci; 14:292-8.

Ahmed, S. K. .S. (2003). Studies on energy and protein allowances in ration for pregnant and milk producing buffaloes. Ph.D. Thesis, Fac. Agric., Ain Shams University. Egypt.

Antunovic Z, M. Speranda and D. Amidzic (2006). Probiotic application in lambs nutrition. Krmiva. 4:175-180.

Bohmanova, J., I. Misztal and J. B. Cole (2006). Temperature-humidity indices as indicators of milk production losses due to heat stress. J. Dairy Sci., 90:1947–1956.

CLFF (2001). Feed composition tables for animal and poultry feed stuffs used in Egypt. Central lab. for Food and feed, Agric. Res. Center, Ministry of Agriculture, Egypt.

Ding J., Zhou Z. M., L.P. Ren and Q. X. Meng (2008). Effect of monensin and live yeast supplementation on growth performance, nutrient digestibility, carcass characteristics and ruminal fermentation parameters in lambs fed steam-flaked corn-based diets. Asian-Australas J. Anim Sci., 21:547-554.

Duncan, D.B. (1955). Multiple Range and Multiple F- test. Biometrics, 11:1.

El-Katcha, M. I., M. A. Soltan and M. S. Essi (2016). Effect of Pediococcus spp. supplementation on growth performance, nutrient digestibility and some blood serum biochemical changes of fattening lambs. Alex. J. Vet. Sci., 49:44-54.

Ghazanfar, S., M. I. Anjum, A. Azim and I. Ahmed (2015). Effects of dietary supplementation of yeast (*Saccharomyces cerevisiae*) culture on growth performance, blood parameters, nutrient digestibility and fecal flora of dairy heifers. J. Anim. Plant Sci., 25:53-59

Haddad, S. G. and S. N Goussous (2005). Effect of yeast culture supplementation on nutrient intake, digestibility and growth performance of Awassi lambs. J. Anim. Feed Sci. Technol., 118:343-348.

Hillal H., G. El-Sayaad and M. Abdella (2011). Effect of growth promoters (probiotics) supplementation on performance, rumen activity and some blood constituents in growing lambs. Arch. Tierz., 6:607-617.

Hussein, A. F. (2014). Effect of biological additives on growth indices and physiological responces of weaned Najdi ram lambs. J. of Experimental Biology and Agricultural Sciences, 2 (6): 597-607.

Kassab, A. Y. and A. A. Mohammed (2014). Ascorbic acid administration as anti-stress before transportation of sheep. Egyptian J. Anim. Prod.,51 (1): 19-25.

Kassab, A. Y. and H. A. Hamdon (2014). Effect of anabolic androgenic synthetic steroid (boldenone undecylenate) on productive performance and some blood parameters of beef bulles. Egypt. J. Nutr. and Feeds, 17 (2): 225-236.

Kassab, A.Y.M. (2007). Effect of protected protein on productive and reproductive performance of Sohagi sheep. Ph.D. Thesis, Faculty of Agriculture El-Minia University, Egypt.

Khalid, M. F., M. Shahzad, A. M. Sarwar, A. U. Rehman, M. Sharif, and N. Mukhtar (2011). Probiotics and lamb performance: A review. Afr. J. Agric. Res., 6: 23: 5198-5203.

Kuhn, C. M. (2002). Anabolic steroids. Recent Progress in Hormone Res. 57, 411–434.

Kummer, N., U.B. Snigh and D.N. Verma (1981). Effect of different level of dietary protein and energy on growth of male buffalo calves. Indian J. Anim. Sci., 51:513.

Lopez, J. (2000). Probiotics in animal nutrition. Asian-Australas. J. Anim. Sci., 13(Suppl Issue):12-26.

Mader, T.L., M.S. Davis and T. Brown-Brandl (2006). Environmental factors influencing heat stress in feedlot cattle. J. Anim. Sci., 84:712-719.

Meriem, a. a, R. Sadraoui, T. Najar and M. Ben M Rad (2016). A complex interrelationship between rectal temperature and dairy cow performance under heat stress conditions. Open J. Ani. Sci., 6: 24-30.

Mostafa, T. H., F. A. Elsayed, M. A.. Ahmed and M. A. Elkholany (2014). Effect of using some feed additives (TW- probiotics) in dairy cow rations on production and reproductive performance. Egyptian J. Anim. Prod.,51 (1): 1-11.

Mukhtar N., M. Sarwar, M. U. Nisa and M. A. Sheikh (2010). Growth response of growing lambs fed on concentrate with or without ionophores and probiotics. Int. J. Agric. Biol.,12:734-738.

NRC (2000). National Research Council. Nutrient requirements of beef cattle. 6th ed., National Academy of Science, Washington, DC.

Oyetayo V. O. and F. L. Oyetayo (2005). Potential of probiotics as biotherapeutic agents targeting the innate immune system. Afr. J. Biotech., 4:123-127.

Saleem, A. M., A. I. Zanouny, A. M. Singer (2017). Growth performance, nutrients digestibility, and blood metabolites of lambs fed diets supplemented with probiotics during pre- and post-weaning period. Asian- Australasian J. of Anim. Sci., 30:1-8.

Saleem, A. M., and A. I. Zanouny (2016). Effect of two levels of probiotics supplementation on performance, digestibility and some blood constituents in weaned lambs. Egypt. J. Nutr. and Feeds, 19 (2): 265-275.

SAS (2004). Statistical Analysis System. SAS statistics. Guide release, version 8.00 TS level OOMO, SAS Institute Inc., Cary, NC, USA.

Shahen, G. F., A. A. Zaki and H. M. Yousef (2004). Effect of feeding level on growth nutrient digestibility and feed efficiency for buffalo calves. Egypt. J. Nutr. Feeds., 7: 11.

Stojevic, Z, J. Pirsljin, S. Milinkovic-Tui, M. Zelar-Tuk and B. B. Lgubic (2005). Activities of AST, ALT and gge in clinically healthy dairy cow during lactation and in the drying period. Veterinarski Arhiv., 75:67-73.

Todorov N., I. Krachunov, A. Alexandrov and D. Djuvinov (2007). Guide on animal nutrition. Sofia Bulgaria: Matkom

Toshihiro, I. (2010). Thyroid hormone and atherosclerosis. Vasc Pharmacol. Mar-April, 52(3-4):151-156.

Van Keulen, J. and B.A. Young (1977). Evaluation of acid insoluble ash as a natural marker in ruminant digestibility studies. J. Anim. Sci., 47: 2.

West, J.W. (2003). Effects of heat stress on production in dairy cattle. J. Dairy Sci., 86:2131-2144.

Whitley N. C., D. Cazac, B. J. Rude, D. Jackson-O'Brien and S. Parveen (2009). Use of commercial probiotics supplement in meat goat. J. Anim. Sci., 87:723-728.

Yousef, H. M. and A. A. Zaki (2001). Effect of barley radical feeding on body weight gain and some physiological parameters of growing Friesian crossbred calves. Egypt. J. Nutr. Feeds, 6 (Special Issue): 465.

Yunus, A. A. (2016). Effect of probiotic (RE3) supplement on growth performance, diarrhea incidence and blood paramenters of N Dama calves. M.Sc. Thesis, Fac. Agric., University of Science and Technology, Kumasi, Ghana.

Zanouny, A. E. I. (2011). Studies on some productive and physiological traits in Ossimi sheep. Ph.D. Thesis, Faculty of Agriculture, El-Minia University, Egypt.

تاثير إضافة البروبيوتك على بعض خصائص النمو ومعاملات الهضم والاستجابات الفسيولوجية لعجول التسمين تحت ظروف الإجهاد الحراري

أيمن يوسف كساب ، حاتم عبد القادر محمد حمدون و عبد الناصر احمد محمد

قسم الإنتاج الحيواني - كلية الزراعة بالوادي الجديد - جامعة أسيوط – أسيوط – مصر.

اجريت هذه التجربة فى احدى المزارع الخاصة بمحافظة الوادى الجديد خلال الفترة من مايو الى سبتمبر 2016م. استخدم فى هذه الدراسة عدد 12 عجل تسمين خليط وكان متوسط اوزانهم بين 252.98 الى 255.66 كجم. قسمت هذه الحيوانات عشوائيا الى ثلاث مجموعات بواقع (4 حيوانات فى كل مجموعة). استخدمت المجموعة الاولى (G1) ككنترول .اما المجموعة الثانية والثالثة (G2-G3) تم اضافة البروبيوتك التجارى بمعدل 0.5 و1.00 جم /كجم علف مركز على التوالى وقد تم تغذية الحيوانات فرديا على العلف المركز و دريس البرسيم وتبن القمح لتغطية الاحتياجات الغذائية من المادة الجافة والمركبات الغذائية المهضومة طبقا لمتوسطات الوزن ومعدلات نمو العجول. وقد استغرقت مدة التجربة 150 يوم وقد تم خلال هذه الدراسة تقدير معاملات الهضم وكذلك القيمة الغذائية للعلائق فى صورة مجموع مركبات غذائية مهضومة (TDN) وبروتين خام مهضوم (DCP) تم اخذ عينة من الدم من كل حيوان فى بداية التجربة (صفر , 75 , 150)يوم من بداية التجربة. وقد تم الحصول على سيرم الدم من العينات لتقدير تركيز الترااليودوثيرونين (T3) والثيروكسين (T4) والبروتين الكلى والالبيومين والجلكوز و AST و ALT . تم وزن الحيوانات من بداية التجربة ثم شهريا حتى نهاية التجربة و تم حساب الزيادة الكلية فى الوزن وكذلك معدل الزيادة اليومية وكذلك تم حساب معدل الغذاء اليومى المأكول وبالتالى تم حساب الكفاءة الغذائية. وقد تم خلال التجربة تسجيل المتوسط الشهرى لكل من درجة حرارة الجو ونسبة الرطوبة وتم حساب دليل الحرارة والرطوبة (THI) خلال فترة التجربة. وقد اظهرت النتائج ان THI خلال فترة التجربة من مايو الى سبتمبر سجلت متوسط اعلى من 74 وهذا يعنى ان الحيوانات خلال فترة التجربة تقع تحت تاثير الاجهاد الحرارى. كما اظهرت النتائج ان اضافة البروبيوتك الى علائق عجول التسمين ادت الى تاثير ايجابى (نقص) درجة حرارة المستقيم ومعدل التنفس وذلك فى المجموعة الثانية والثالثة مقارنة بالمجموعة الاولى حيث ادت المعاملات الى انخفاض فى درجة حرارة المستقيم ومعدل التنفس فى المجموعة الثانية والثالثة مقارنة بالمجموعة الاولى ولكن لم تكن الفروق معنوية وبالتالى اظهرت النتائج الفائدة الايجابية عند تغذية العجول على العلائق المضاف اليها البروبيوتك وذلك عن طريق تخفيف الاجهاد الحرارى الناتج عن ارتفاع درجة حرارة الجو والرطوبة وكذلك دليل الحرارة والرطوبة.

كما ان المعاملات ادت الى تحسين معامل هضم المركبات الغذائية المختلفة وكذلك TDN و DCP حيث ان المعاملات سجلت افضل النتائج فى تلك المقاييس فى المجموعة الثالثة والثانية مقارنة بالمجموعة الاولى. كما سجل الوزن النهائى لعجول التسمين اعلى قيمة فى المجموعة الثالثة مقارنة بالمجموعة الثانية والاولى . كما ان اضافة البروبيوتك ادى الى زيادة موجبة فى معدل الزيادة اليومية فى الوزن والى زيادة المأكول وتحسين صافى الربح فى المجموعة الثالثة مقارنة بالمجموعة الثانية والاولى وقد ادى ذلك الى زيادة معنوية ($P<0.05$) فى الكفاءة الغذائية . واظهرت النتائج ايضا زيادة قيم كل من البروتين والالبيومين والجلكوز وAST و ALT و T3 و T4 فى المجموعة الثالثة مقارنة بالمجموعة الثانية والاولى.

ومن هذه الدراسة نستطيع ان نستخلص أن إضافة البروبيوتك إلى علائق عجول التسمين يؤدى إلى التحسين في النمو تحت ظروف الإجهاد الحراري وهذا التحسين يرجع الى التأثير الايجابي على مركبات الدم كمقياس للاستجابات الفسيولوجية.