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EFFECT OF BIOLOGICAL FEED ADDITIVES ON THERMOREGULATION AND SOME HEMATOLOGICAL PARAMETERS OF HASSANI GOATS

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ABSTRACT

This study was conducted to investigate the effect of feeding diets containing probiotics for 28 days during summer and winter seasons on thermo- cardio- respiratory responses as well as hematological parameters of Hassani goats raised under the conditions of El-Shalateen- Halaieb- Abo Ramad triangle. Twenty Hassani goats Bucks (aged18-24months) with average body weight 20.45±0.355 kg. were used. Animals were divided randomly into two equal groups. The first group served as a control group. The other group was fed a diet supplemented with probiotics (10 g/ head/ day; Biovet- YC). Meteorological data in terms of ambient temperature (AT) and relative humidity (RH) were recorded. In addition, thermo- cardio- respiratory responses in terms of rectal (RT), skin (ST) temperatures, respiration (RR) and heart (HR) rates were recorded twice daily at 08.00 and 14.00 hrs. Likewise, hematocrit percentage (Ht), hemoglobin concentration (Hb) and erythrocytes count (RBC's) were determined. The mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC) were calculated.

The results revealed that, thermo- cardio- respiratory responses, Hb, Ht, RBC's and MCV were higher ($P<0.01$) in summer than in winter season. However, the mean values of MCHC and MCH in winter season exceeded those recorded in summer ($P<0.01$).

Probiotics supplementation reduced significantly ($P<0.01$) the mean values of RT and RR, while HR was not significantly changed. In addition, the mean value of ST was increased ($P<0.05$) by feeding probiotics. Fudhermore, feeding diets with probiotics increased RBC's (P0.01), Ht ($P<0.05$) and Hb while reduced MCH ($P<0.01$), MCV and MCHC. It is worthy to confirm that the improvement observed in the thermo- respiratory responses due to probiotics supplementation was more pronounced in summer season than in winter season but for the hematological parameters, it was more obvious in winter season than in summer season.

It could be concluded that probiotics supplementation might be an avenue for animals raised in such desert conditions to improve their thermal and hematological ability.

Keywords: Hassani goats, Probiotics, physiological responses, Hematological parameters

INTRODUCTION

Hasssni goats are exposed to extreme climatic conditions either during summer and winter seasons in El- Shalateen- Halaieb- Abou Ramad triangle. This triangle located in the southeastern of the eastern desert of Egypt parallel to 22° latitude (the Egyptian- Sudanese borders), occupies approximately 18000 Km2 and contained total number 12356 heads of goats (according to the latest official statistics of the Agricultural Department of the Red Sea governorate, 2000). The most inhabitants of this region depend mainly on animals as the main source of income, since the resources of conventional agricultural activities are not available (El- Shaer *et al.*, 1997). Animals in this subtropical area are put under several constraints; long drought period, insufficiency of natural range plants and their low feeding value and wide spread of parasites. Such constraints lead to lessen animal's productivity. Under stressful environments, performance of animals is restricted by their physiological abilities to thermoregulation. Earlier work reported the benefits of feed probiotics in improving performance of lambs subjected to heat stress (Williams *et al.*, 1987).

Therefore, this study aimed at detecting the effects of probiotics supplementation during summer and winter seasons on thermo- cardio- respiratory responses and hematological parameters of Hassani goats raised under such desert conditions prevailing in El- Shalateen- Halaieb- Abou Ramad triangle.

MATERIALS AND METHODS

This work was undertaken to study the effect of probiotics supplementation on thermo- cardio- respiratory responses and hematological parameters of Hassani goat bucks in summer and winter seasons. Twenty Hassani goats aged 18- 24 months and 20.45± 0.35kg average body weight were divided into two equal groups. The first group was served as control while the second was fed a diet supplemented with probiotics (10 g/ head/ day; Biovet- YC) for 28 days according to (Fayed, 2001). Hassani goats were fed their nutrient requirements according to Kearl (1982). Clean fresh water was accessible twice a day.

Ambient temperature (AT, °C) and relative humidity (RH, %) were recorded using digital thermo-hygrometer. Moreover, Respiration rate (RR, rpm) by counting the frequency of flank movements per minute (breaths/min), rectal temperature (RT, °C) by using a standard clinical thermometer and skin temperature (ST, °C) by using an electronic digital telethermometer as well as heart rate (HR, bpm) by using stethoscope were recorded daily at 08.00 and 14.00 hrs.

Blood samples were withdrawn weekly from all animals into 10 ml heparinized tubes. Hemoglobin concentration (Hb) according to Drabkin and Austin (1932) as well as packed cell volume (PCV, %) were immediately determined in the fresh blood. The erythrocytes count (RBC's) was calculated as described by Abdel Kader (1979). The means of corpuscular volume (MCV, fl), mean corpuscular hemoglobin (MCH, pg) and mean corpuscular hemoglobin concentration (MCHC, %) were calculated according to Jain,(1993):

MCV(fl)= (PCV X 10)/ RBC's $X10^6/mm^3$, MCH(pg)= (Hb X 10)/ RBC's $X10^6/mm^3$ and MCHC (%)= (Hb X 100)/ PCV

Statistical analysis:

Data were analyzed using General Linear Model Procedure (SAS, 1998).

RESULTS AND DISCUSSION

1- The meteorological data:

The values of ambient temperature increased from winter to summer season by 11.20 and 13.39 °C on average in the morning and the afternoon, respectively. The ambient temperature values in summer were higher than the comfort temperature zone of Egyptian Baladi goats as it was reported to be between 20 to 30 °C (El-Sherbiny *et al.*, 1983) at the both daytimes. However, in winter the values of AT were in the comfort temperature zone (Table 1). These seasonal changes in AT were recorded by many investigators e.g., Badawy, (1998), Gawish (1998), Shaker, (2003), Shedeed (2005) and El- Rayes (2005).

Table (1): Mean values of meteorological data recorded during summer and winter seasons

Variable	Summer	Winter	Change[2]
Ambient temperature (AT; °C)			
08.00 h.	34.25	23.05	+ 11.20
14.00 h.	40.71	27.32	+ 13.39
Change*	+ 16.46	+ 4.27	
Relative humidity (RH; %)			
08.00 h.	30.75	64.35	- 33.60
14.00 h.	21.18	52.95	- 31.77
Change[1]	- 9.57	- 11.40	

[1] Change due to the daytime   [2] Change due to season

Values of ambient temperature in both experimental seasons tended to increase from the morning (08.00hr.) to the afternoon (14.00hr.). However, the diurnal changes in AT mean values from 08.00 to 14.00 hr varied according to the season being 16.46 °C in summer and 4.27 °C in winter season (Table 1).

Such diurnal changes in AT were reported by many authors, *e.g.*, Azamel *et al.* (1996), Badawy (1998), Gawish (1998), El-Sayed *et al.* (1999), El-Ganaieny *et al.* (2001) and El- Rayes (2005).

As expected, the mean values of RH% had an inverse diurnal trend to that of AT, being higher in winter and lower in summer season even in the morning and in the afternoon. The changes in RH% mean values from summer to winter seasons were 33.60 and 31.77 %, in the morning and the afternoon, respectively. These results were in agreement with those reported by Azamel *et al.* (1996), Badawy (1998), Gawish (1998), El-Sayed *et al.* (1999), El-Ganaieny *et al.* (2001), Shaker, (2003), Shedeed (2005) and El-Rayes (2005).

On the other hand, the RH% values were higher in the morning and lower in the afternoon in both experimental seasons (Table 1). Similar findings were reported by Badawy (1998), Gawish (1998), El-Shafie (1997) and El-Ganaieny *et al.* (2001).

The obtained results demonstrated that RH values decreased by 9.57 and 11.40% from 08.00 to 14.00 hr. for summer and winter seasons, respectively.

Table (2): The least square means (±SE) of thermo-cardio- respiratory responses of Hassani goats as affected by probiotics supplementation during summer and winter seasons

Item		RT	ST	RR	HR
Pre-treatment:		(± 0.029)	(± 0.098)	(± 0.264)	(± 0.510)
Summer		39.47	36.60	30.65	71.58
Winter		39.06	34.52	26.05	66.30
Δ^1		+ 0.41	+ 2.08	+ 4.60	+ 5.28
Season (S):		(± 0.017)**	(± 0.075)**	(± 0.214)**	(± 0.329)**
Summer		39.24 a	36.10 a	28.13 a	71.49 a
Winter		38.68 b	34.27 b	22.29 b	69.91 b
Δ^1		+ 0.56	+ 1.83	+ 5.84	+ 1.58
Time (T):		(± 0.017)**	(± 0.075)**	(± 0.214)**	(± 0.329)**
08.00 hr.		38.77 a	33.73 a	20.68 a	69.14 a
14.00 hr.		39.15 b	36.62 b	29.74 b	72.26 b
Δ^3		+ 0.38	+ 2.89	+ 9.06	+ 3.12
Probiotics (P):		(± 0.017)**	(± 0.075)*	(± 0.214)**	(± 0.329)^{ns}
Control		39.01 a	35.07 a	25.70 a	71.10 a
Probiotics		38.92 b	35.29 b	24.71 b	70.30 a
Δ^2		- 0.09	+ 0.22	- 0.99	- 0.80
S X P X T:		(± 0.035)^{ns}	(± 0.150)**	(± 0.428)^{ns}	(± 0.659)^{ns}
Summer:					
Control:	08.00hr.	39.16 ^{aA}	34.11 ^{aA}	23.50 ^{aA}	70.45 ^{aA}
	14.00hr.	39.40 $^{b(A)}$	37.09 $^{b(A)}$	33.60 $^{b(A)}$	72.95 $^{b(A)}$
	Δ^3	+ 0.24	+ 2.98	+ 10.10	+ 2.50
Probiotics:	08.00hr.	39.09 ^{aA}	36.64 ^{aB}	22.35 ^{aB}	70.20 ^{aA}
	14.00hr.	39.32 $^{b(B)}$	36.54 $^{b(B)}$	33.05 $^{b(A)}$	72.35 $^{b(AB)}$
	Δ^3	+ 0.23	- 0.10	+ 10.70	+ 2.15
Winter:					
Control:	08.00hr.	38.48 ^{aB}	32.26 ^{aC}	18.70 ^{aC}	68.20 ^{aB}
	14.00hr.	38.99 $^{b(c)}$	36.81 $^{b(AB)}$	27.00 $^{b(B)}$	72.80 $^{b(A)}$
	Δ^3	+ 0.51	+ 4.55	+ 8.30	+ 4.60
Probiotics:	08.00hr.	38.37 ^{aC}	31.93 ^{aC}	18.15 ^{aC}	67.70 ^{aB}
	14.00hr.	38.90 $^{b(C)}$	36.03 $^{b(C)}$	25.30 $^{b(C)}$	70.95 $^{b(B)}$
	Δ^3	+ 0.53	+ 4.10	+ 7.15	+ 3.25

*** : P<0.05 ** : P<0.01 Δ^1; changes due to season Δ^2; changes due to probiotics Δ^3; changes due to daytime RT, rectal temperature; °C. ST, skin temperature; °C. RR, respiration rate; breaths/ minute. HR, heat rate, beats/ minute**

In the same column means in a certain item having different letters differ significantly (p<0.05).

2- Thermo- cardio- respiratory responses:

With reference to season effect, the results demonstrated that all thermo-cardio- respiratory responses elevated significantly (P<0.01) from winter to summer season either for both day times (the morning and the afternoon) or for the two experimental groups (Table 2). These findings might be due to the differences observed in ambient temperature where summer had higher AT as compared with that of winter season (Table 1). Significant seasonal variations in thermo- cardio- respiratory responses were reported on goats and sheep (El-Shafie, 1997; Tutida *et al.*; 1999; El- Ganaieny *et al.*, 2001; Shaker, 2003; Shedeed, 2005; Nandy *et al.*, 2001 and El-Rayes, 2005) where the thermo- cardio- respiratory responses values were higher in summer than in winter.

Regarding the day- time effect, all thermo- cardio- respiratory responses increased significantly (P<0.01) from 08.00 to 14.00 hrs. in both experimental seasons with higher magnitude changes in winter than that in summer. These results might be attributed to the increment recorded in ambient temperature from the morning to the afternoon (Table 1). Similar trends of diurnal changes in the mean values of thermo- cardio- respiratory responses were reported by Badawy *et al.* (1999), El-Ganaieny *et al.* (2001), Azamel *et al.* (1996) and El-Shafie (1997).

Concerning probiotics effects, goats fed on diets with probiotics had significantly (P<0.01) lower values of RT and RR and significantly (P<0.05) higher values of ST than their counterparts of control group. Moreover, probiotics goats had non- significant lower HR values than control ones (Table 2). The higher values of ST of probiotics goats than those of non-probiotics ones might be due to the effect of probiotics in enhancing energy production of treated goats where direct fed microbial supplements were found to increase the levels of propionate indicating an increase in energy precursors (Beauchemin *et al.*, 2003). The mean values of the thermo-cardio- respiratory responses of probiotics goats were lower than those of control ones in both seasons. These differences were more pronounced in summer season (Tables 2). The obtained results would be supported by those reported by Higginbotham *et al.* (1994) and Bertrand and Grimes (1997).

In the morning, the mean values of thermo- cardio- respiratory responses of probiotics group were lower than those of control one even in summer and in winter seasons. However, the advantage of providing probiotics is so clear in the afternoon where the mean values of RT, RR and HR in goats fed probiotics were lower even in summer and winter seasons (Table 2). On the other hand, the mean values of diurnal change in RT and ST for non-probiotics goats were higher than those of their counterparts fed probiotics even under shaded or sun exposed groups. These results demonstrated that providing probiotics for goats improved their heat tolerance. Animals in several studies fed extract of A. oryzae had lower RT and RR or both than their controls (Higginbotham *et al.*, 1993; Marcus *et al.*, 1986; Huber and Higginbotham, 1985; Bertrand and Grimes, 1997; Higginbotham *et al.*, 1994; Gomes- Alarcon *et al.*, 1990 & 1991 and Mertens, 1979). Meyers (1974) and Huber *et al.* (1994) suggested that fungal metabolites influence temperature control centers in cows.

3- Hematological responses:

Regardless probiotics supplementation effect, the present results revealed that season had significant (P<0.01) effect since summer had significant higher values of Hb, Ht and RBC's than those of winter season (Table 3). In agreement, Jain (1993) and Juma *et al.* (2001) reported higher blood parameters (Hb, PCV and RBC's) in goats in the hot summer than in winter. El-Nouty *et al.* (1989) stated that the rise in AT in summer (from 21.8-24.8 °C in spring to 31.6-35.8 °C in summer) was associated with a significant increase in PCV of goats.

Table (3): The least square means (±SE) of some hematological responses of Hassani goats as affected by probiotics during summer and winter seasons

Item	Hb	Ht	RBC's
Pre-treatment:	(± 0.058)	(± 0.280)	(± 0.080)
Summer	9.74	25.60	7.14
Winter	10.20	30.45	7.73
Δ^1	0.46	4.85	0.59
Season (S):	(± 0.028)**	(± 0.232)**	(± 0.052)**
Summer	10.58 a	31.83 a	8.26 a
Winter	10.18 b	27.63 b	7.90 b
Δ^1	+ 0.40	+ 4.20	+ 0.36
Probiotics (P):	(± 0.028)^{ns}	(± 0.232)*	(± 0.052)**
Control	10.35	25.38 a	7.95 a
Probiotics	10.41	30.08 b	8.21 b
Δ^2	+ 0.06	+ 0.70	+ 0.26
S X P X T:	(± 0.040)^{ns}	(± 0.328)^{ns}	(± 0.074)*
Summer:			
Control	10.58	31.50	8.21 a
Probiotics	10.58	32.15	8.32 b
Δ^2	0.00	+ 0.65	+ 0.11
Winter:			
Control	10.12	27.25	7.70
Probiotics	10.24	28.00	8.10
Δ^2	+ 0.12	+ 0.75	+ 0.40

Δ^1; changes due to season Δ^2; changes due to probiotics Hb, hemoglobin concentration; g/dl
Ht, hematocrit percentage; % RBC's, erythrocyte count; $X10^6$/mm
In the same column any two means in a certain item having different letters differ significantly (P<0.05).

The supplementation of probiotics produced increases in the mean values of Hb, Ht (P<0.05) and RBC's (P<0.01) as the probiotics goats exceeded the values of their controls (Tables 3). These results would be explained as the supplementation of probiotics resulted in better iron salt absorption from the small intestine also probiotics were found to produce vitamins B, affecting positively blood-forming processes (Kander, 2004). Bomba *et al.* (1998) and Miller *et al.* (1982) noticed an increase in hemoglobin level and the erythrocyte count in piglets receiving Lactobacillus sp. Moreover, Zomborszky *et al.* (1998) reported that the RBC's had increased by 36.67 and 22.08 %, respectively in Suffolk ewes and ewe lambs fed thermolysed brewer's yeast.

Concerning the interaction between season X probiotics, the probiotics goats had higher mean values of Hb, Ht and RBC's than those of non-probiotics ones either in summer and winter seasons. On the other hand, the changes due to the probiotics supplementation were higher in winter than those in summer season (Table 3). These findings might be an attempt to increasing O_2 carrying capacity to increase the metabolic rate. With sympathetic neural activation, the spleen contracts and discharges erythrocytes into the circulation and increases hematocrit (Detweiler, 1984). However, the mean values of Ht and Hb of experimental goats were within the normal range reported for goats form 22 to 38 (%) with an average of 28 (%) for Ht and from 8 to 12 (g/dl) with an average of 10 (g/dl) for Hb (Jain, 1993).

4- Blood indices:

Concerning the season effect, the mean values of mean corpuscular volume (MCV) of summer exceeded significantly ($P<0.01$) that of winter season (Table 4). On the other hand, winter season had higher values of mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC) ($P<0.01$) than those of summer (Table 4). This might be due to the significant ($P<0.01$) decrement occurred in Ht in winter season as compared to summer season (Table 3), which in turn resulted in decreasing the mean values of MCH and MCHC. In agreement, Jain (1993) and Juma *et al.* (2001) reported higher blood parameters (Hb, PCV and RBC's) in goats in the hot summer than in winter. Sarwer and Majeed (1997) observed that MCH and MCHC were positively correlated. Moreover, Ht was negatively correlated with MCHC and MCH. Because of probiotics supplementation, the mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC) decreased. These decreases were non-significant for MCV and MCHC and highly significant for MCH (Table 4).

During summer and winter seasons, results demonstrated that all blood indices values were decreased in probiotics goats comparing with their counterparts fed non-probiotics. These findings were in partial agreement with those reported by Aboderin and Oyetayo (2006) where rat fed probiotics had higher values of MCH and MCHC and lower values of MCV, which might be due to the higher increase observed in Hb values due to feeding probiotics.

CONCLUSION

It could be concluded that probiotics would be an avenue of improving thermal ability of animals raised under the harsh conditions of the El- Shalateen- Halaieb- Abo-Ramad triangle as indicated by controlling their thermo- cardio- respiratory responses and the changes might take place in their hematological parameters.

Table (4): The least square means (±SE) of some blood indices of Hassani goats as affected by probiotics during summer and winter seasons

Item	MCV	MCH	MCHC
Pre-treatment:	(± 0.529)	(± 0.179)	(± 0.466)
Summer	36.13	13.74	38.22
Winter	39.48	13.22	33.55
Δ[1]	3.35	0.52	4.67
Season (S):	(± 0.312)**	(± 0.089)ns	(± 0.283)**
Summer	38.52 a	12.81	33.27
Winter	35.02 b	12.92	36.94
Δ[1]	+ 3.50	- 0.11	- 3.67
Probiotics (P):	(± 0.312)ns	(± 0.089)**	(± 0.283)
Control	36.96	13.03 a	35.43
Probiotics	36.60	12.69 b	34.82
Δ[2]	- 0.34	- 0.34	- 0.59
S X P X T:	(± 0.441)ns	(± 0.127)ns	(± 0.400)ns
Summer:			
Control	38.39	12.89	33.68
Probiotics	38.65	12.72	32.96
Δ[2]	- 0.26	- 0.17	- 0.72
Winter:			
Control	35.48	13.17	37.19
Probiotics	34.55	12.66	36.69
Δ[2]	- 0.93	- 0.51	- 0.50

Δ[1]; changes due to season Δ[2]; changes due to probiotics MCV, mean corpuscular volume, fl

MCH, mean corpuscular hemoglobin, pg MCHC, mean corpuscular hemoglobin concentration; %

In the same column any two means in a certain item having different letters differ significantly (P<0.05).

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تاثير الإضافات الغذائية البيولوجية على التنظيم الحرارى وبعض القياسات الهيماتولوجية للماعز الحسانى

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أجريت هذه الدراسة في محطة بحوث حدربه على الحدود المصرية السودانية والتابعة لمركز بحوث الصحراء بهدف دراسة تأثيراستخدام البروبيوتك (بيوفيت-YC) على التنظيم الحراري وبعض قياسات الدم للماعز الحسانى وذلك لمدة ٢٨ يوما خلال فصلى الصيف والشتاء بمثلث الشلاتين- حلايب- أبو رماد. ضمت الدراسة عشرون ذكر ماعز حسانى تم تقسيمهم الى مجموعتين متساويتين: استخدمت المجموعة الأولى كمجموعة ضابطة بينما المجموعة الثانية استخدمت كمجموعة معاملة حيث تم إضافة البروبيوتك لعليقتها بمعدل (١٠جم/ راس/ يوم). تم تسجيل البيانات الارصادية (درجة حرارة البيئة، الرطوبة النسبية) مرتين يوميا كما تم قياس

الصفات الفسيولوجية (درجة حرارة كل من المستقيم والجلد بالاضافه إلى معدل التنفس ومعدل ضربات القلب) مرتين يوميا ٨ صباحا ، ٢ ظهرا . تم جمع عينات الدم وتقدير كل من نسبة الهيماتوكريت، تركيز الهيموجلوبين، عدد كرات الدم الحمراء وباستخدام المعادلات تم حساب كل من متوسط حجم كريات الدم الحمراء، متوسط كمية الهيموجلوبين داخل كرة الدم الحمراء، متوسط تركيز الهيموجلوبين داخل ١٠٠سم٣ من كريات الدم الحمراء المنضغطه.

* أظهرت النتائج أن فصل الصيف سجل قيما أعلى عن فصل الشتاء لكل من درجة حرارة المستقيم والجلد – معدل التنفس وضربات القلب- تركيز هيموجلوبين الدم- نسبة الهيماتوكريت- عدد كرات الدم الحمراء- متوسط حجم كريات الدم الحمراء ($P<0.01$) بينما فى فصل الشتاء كانت قيم كل من متوسط تركيز الهيموجلوبين داخل كريات الدم الحمراء ($P<0.01$)- متوسط كمية الهيموجلوبين داخل ١٠٠سم٣ كريات الدم الحمراء المنضغطه أعلى من فصل الصيف بصرف النظر عن إضافة البروبيوتك.

* إضافة البروبيوتك إلى علائق الماعز الحسانى خلال موسمي الصيف والشتاء أدت الى إنخفاض معنوى لكل من درجة حرارة المستقيم ومعدل التنفس ($P<0.01$) ولم تتأثر معدل ضربات القلب معنويا. أما بالنسبة لدرجة حرارة الجلد فان إضافة البروبيوتك سبب زيادة في حرارة الجلد بشكل معنوى ($P<0.05$).

* كان لإضافة البروبيوتك تأثيرا معنوياعلى زيادة عدد كرات الدم الحمراء ($P<0.01$)، نسبة الهيماتوكريت ($P<0.05$) وكذلك فى تركيز هيموجلوبين الدم.فى حين أن النتائج أظهرت انخفاضا فى كل من متوسط كمية الهيموجلوبين داخل كريات الدم الحمراء ($P<0.01$)، متوسط حجم كريات الدم الحمراء، وكذلك فى متوسط تركيز الهيموجلوبين داخل ١٠٠سم٣ كريات الدم الحمراء المنضغطة.

من المهم التاكيد على أن تأثير إضافة البروبيوتك على القياسات الفسيولوجية (درجة حرارة المستقيم والجلد – معدل التنفس وضربات القلب) كان اكثر وضوحا فى الصيف عن الشتاء بينما كان العكس تماما بالنسبة لقياسات الدم حيث كان التأثير أقوى فى الشتاء عن الصيف.

<u>الخلاصة:</u>

خلصت التجربة الى ان أضافة البروبيوتك (بيوفت -YC) لعلائق الماعز الحساني من الممكن أن يكون أحد الوسائل الفعالة للحيوانات المرباة تحت الظروف الصحراوية لتخفيف العبء الحراري ولتحسين أدائها الفسيولوجى تحت الظروف الصحراوية.