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EFFECT OF PROBIOTICS AND WALKING STRESS ON SOME PHYSIOLOGICAL AND HEMATOLOGICAL PARAMETERS OF HASSANI GOATS

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ABSTRACT

In endeavor to relieve the walking stress burden on Hassani goats during summer and winter seasons in El- Shalateen- Halaieb- Abo Ramad triangle. Probiotics (10g/h/d, Biovet - YC) were supplemented to the goats' diet. Twenty male Hassani goats, from the experimental flock of the Hedrba station belonging to Desert Research Center, were subjected to walk 10 km in 4 hours daily. The walking stress trial lasted for four days. Ten Hassani goats were fed a diet supplemented with probiotics for 28 days before and during the walking trials followed by 2 days for recovery. Meteorological data in terms of ambient temperature (AT) and relative humidity (RH) were recorded at 08.00 and 14.00 hrs. Additionally, thermo- cardio- respiratory responses in terms of rectal (RT), skin (ST) temperatures, respiration (RR) and heart (HR) rates were daily recorded before and after the walking trial. Likewise, hematocrit percentage (Ht), hemoglobin concentration (Hb), erythrocytes count (RBC's) were determined in blood and mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC) were calculated.

The results indicated that summer season had significant ($P<0.01$) higher values of RT, ST, Hb, PCV, RBC's and MCV and non-significant higher values of RR and HR than those of winter season. However, the values of MCH and MCHC in winter exceeded significantly ($P<0.01$) those in summer. Concerning the walking stress effects, the results revealed significant increments in the mean values of thermo- cardio-respiratory responses, PCV, MCV, MCHC ($P<0.01$) and Hb ($P<0.05$) but non-significant decrease in MCH value.

Probiotics supplementation during walking reduced significantly the mean values of RT, RR ($P<0.05$) and ST ($P<0.01$) while a non-significantly reduction was observed in HR value. Moreover, probiotics caused significant ($P<0.01$) increases in Hb and Ht values and non-significant increases in RBC's, MCV and MCH. However, there was a non- significant reduction in MCHC values. It could be concluded that probiotics supplementation for walking stressed goats during summer and winter seasons might be an avenue to minimize the walking perils facing the Hassani goats raised under the harsh conditions of the El- Shalateen- Halaieb- Abo Ramad triangle.

Keywords: Hassani goats, Probiotics, Walking, Thermo- cardio- respiratory responses, Hematological parameters

INTRODUCTION

El- Shalateen- Halaieb- Abo Ramad triangle, as a subtropical region, is located in the southeastern of the eastern desert of Egypt and has a vital strategic importance to the country. It looks like a triangle with a bottom side of about 300 km parallel to 22˚ latitude (the Egyptian- Sudanese borders). The source of income of most inhabitants of this region depends mainly on ranges animals due to the aridity, since the resources of conventional agricultural activities are not available (El- Shaer *et al.*, 1997).

The native rangelands constitute the only feed resources in the triangle region all the year round. The annual rainfall varies greatly from year to year in rate, distribution and duration. Animals in this area are subjected to several constraints; long drought period, scarcity of natural range plants. In the arid and semi- arid areas, animals frequently have to walk long distances between grazing areas. The distance animals have to walk in search of feed varies according to prevailing climatic conditions. Experimental evidence of the effects of walking stress on goats around the year is lacking, despite the fact that they are an important livestock resource and live in large numbers in semi-arid areas. The goat production makes a major contribution to the inhabitant' s economy.

Therefore, the objective of this study was to eliminate the effects of walking stress on thermo- cardio- respiratory responses and hematological parameters of Hassani goats raised under such desert conditions during summer and winter seasons through probiotics supplementation.

MATERIALS AND METHODS

This study was undertaken in El- Shalateen- Halaieb- Abo Ramad triangle, Hedrba Valley Station which belongs to Desert Research Center (DRC) to investigate the effect of probiotics supplementation on thermo- cardio-respiratory responses and hematological parameters of goats subjected to walking stress during summer and winter seasons. Twenty male Hassani goats aged 18- 24 month and averaged 20.45± 0.35 kg body weight were subjected to four days walking stress for 10 km. Hassani goats were divided into two equal groups. The first group served as control while the second was fed a diet supplemented with probiotics (10 g/ head/ day; Biovet- YC, according to Fayed, 2001) for 28 days prior to the initiation of the walking trial and recovery period. Hassani goats were fed their nutrient requirements according to Kearl (1982).

Ambient temperature (AT, °C) and relative humidity (RH, %) were recorded in summer and winter seasons at 08.00 and 14.00 hrs. using digital thermo-hygrometer.

Rectal temperature (RT, °C) by using a standard clinical thermometer, respiration rate (RR, breaths/ min) by counting the flank movements in minute and skin temperature (ST, °C) by using an electronic digital telethermometer as well as heart rate (HR, beats/ min) by using stethoscope were daily recorded before and after walking stress.

Daily blood samples were withdrawn, from all animals into 10 ml heparinized tubes just before and immediately after exercising. 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 determined as described by Abdel Kader (1979). The means of corpuscular volume (MCV, fl), corpuscular hemoglobin (MCH, pg), corpuscular hemoglobin concentration (MCHC, %) were calculated as follows: 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, (Jain,1993).

5- Statistical analysis:

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

RESULTS AND DISCUSSION

1- The meteorological data:

There are considerable diurnal and seasonal changes in AT. The average increase in AT from the morning (08.00 hr.) to the afternoon (14.00 hr.) was higher in summer season than that of winter being 5.87 and 3.25 ˚C, respectively (Table 1). However, the summer averages of AT were greater than that of winter averages by 10.63 and 13.25 ˚C in the morning and the afternoon, respectively.

On the contrary, the average relative humidity (RH%) showed inverse seasonal and diurnal trends to that of AT, being higher in the morning than the afternoon. The decreases in RH% value were higher in winter season (-10.37%) than that in summer season (- 9.75%). In addition, considerable seasonal variations in RH% were observed. Mean values of RH% were higher in winter season than in summer season (Table 1).

In respect to the experiment location, in Hedrba Valley Station, El- Rayes (2005) reported similar trends of the changes in AT and RH% from the morning to the afternoon or from summer to winter.

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.	33.38	22.75	**+ 10.63**
14.00 h.	39.25	26.00	**+ 13.25**
Change[1]	**+ 5.87**	**+ 3.25**	
Relative humidity (RH; %)			
08.00 h.	30.88	65.50	**- 34.62**
14.00 h.	21.13	55.13	**- 34.00**
Change[1]	**- 9.75**	**- 10.37**	

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

2- Thermo- cardio- respiratory responses:

Irrespective of the walking stress effects, the results demonstrated that summer season had higher mean values of thermo- cardio- respiratory responses than those recorded for winter season with differences being highly significant for RT and ST and non- significant for RR and HR (Table 2). Similar trends of RT, ST and RR were reported by El- Nouty *et al*. (1990) on Arabian goats, El- Ganaieny *et al*. (2001) and Shaker (2003) on Baladi goats, Shedeed (2005) on Syrian Gabali goats being higher in summer than that of winter. Nandy *et al.* (2001) and El-Rayes (2005) found seasonal differences in HR and the values were higher in summer than in winter.

Practicing walking stress elevated significantly the means of all thermo-cardio- respiratory responses (Table 2). Kasa *et al*. (1995) recorded an increase in RT of Saanen goats as a result of exercise. Moreover, Kasa *et al*. (1999) reported that the RR increased after exercise in the Saanen and Toggenburg goats breeds.

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

Item	Summer			Winter			Overall		physical Mean	±SE
	C	P	Mean	C	P	Mean	C	P		
Rectal temperature:			**			**	*		**	
Initial	39.28	39.15	**39.22aA**	38.55	38.37	**38.46aB**	38.91aA	38.76aB	**38.84a**	
Walking	39.58	39.57	**39.58bA**	39.27	39.23	**39.25bB**	39.42bA	39.40bA	**39.41b**	0.024
Recovery	39.18	39.17	**39.18aA**	39.07	39.08	**39.08cB**	39.13cA	39.13cA	**39.13c**	
±SE	0.048		0.033	0.048		0.033	0.033			
SXT ^{ns}	**39.35**	**39.30**		**38.96**	**38.89**					0.028
T mean*							**39.15A**	**39.09B**		0.020
S mean**			**39.32a**			**38.93b**				0.020
Skin temperature:			**			**			**	
Initial	36.03	36.01	**36.02aA**	33.35	32.51	**32.93aB**	34.69	34.26	**34.47a**	
Walking	36.86	36.90	**36.88bA**	36.79	36.35	**36.57bA**	36.82	36.63	**36.72b**	0.103
Recovery	36.84	36.32	**36.58bA**	36.62	36.29	**36.46bA**	36.73	36.31	**36.52b**	
±SE	0.205		0.143	0.205		0.143	0.143			
SXT ^{ns}	**36.58**	**36.41**		**35.58**	**35.05**					0.117
T mean**							**36.08A**	**35.73B**		0.083
S mean**			**36.49a**			**35.32b**				0.083
Respiration rate:			**			**			**	
Initial	25.40	23.60	**24.50aA**	23.09	18.90	**20.99aB**	24.25	21.25	**22.75a**	
Walking	64.00	61.80	**62.90bA**	62.56	61.40	**61.98bA**	63.27	61.60	**62.44b**	0.692
Recovery	34.50	34.30	**34.40cA**	39.60	37.60	**38.60cB**	37.05	35.95	**36.50c**	
±SE	1.385		0.980	1.385		0.980	0.978			
SXT ^{ns}	**41.30**	**39.90**		**41.74**	**39.30**					0.799
T mean*							**41.52A**	**39.60B**		0.565
S mean ^{ns}			**40.60**			**40.52**				0.565
Heart rate:			**			**			**	
Initial	73.60	72.70	**73.15aA**	68.45	68.40	**68.42aB**	71.03	70.55	**70.78a**	
Walking	74.40	72.40	**73.40aA**	75.00	73.40	**74.20bA**	74.70	72.90	**73.80b**	0.453
Recovery	67.20	69.60	**68.40bA**	71.10	69.40	**70.25cB**	69.15	69.50	**69.33c**	
±SE	0.907		0.641	0.907		0.641	0.641			
SXT ^{ns}	**71.73**	**71.56**		**71.52**	**70.40**					0.524
T mean ^{ns}							**71.73**	**70.98**		0.370
S mean ^{ns}			**71.65**			**70.96**				0.370

ns, non-significant *, P< 0.05 **, P< 0.01 C, Control group P, probiotics group S, season T, treatment
Means in a certain item having different letters differ significantly (P<0.05).

Entin and Rawson (1999) reported that at the onset of exercise animals increased ventilation to match or exceed the metabolic requirement. Galal *et al*. (1988) found in Damascus and Barki goats and their crosses that walking 7 km under direct AT increased significantly their RT. Ahmed and Abdelatif (1992) reported that RR increased in desert rams following exercise. In addition, Oppong *et al.* (1990) reported that exercise produced significant elevations in RT and RR in lambs. Kumar *et al*. (2000) reported that the skin blood flow of male Murrah buffaloes increased after treadmill exercise with an average increase of 2- 4 times over pre- exercise values.

The skin blood flow increase could be due to increase in body temperature as a result of exercise resulted from metabolic heat production. Wenger *et al*. (1975) reported that, blood flow is augmented as a function of core temperature and skin temperature. Similar impacts of walking stress were reported on different kind of animals; Evans *et al.* (1992) reported that the mean values of camel heart rate after exercise were 4.4 times the resting value. Kobeisy *et al.* (2004) recorded that RT, ST and RR of Saidi ewes raised as a result of exercise. Parrott *et al.* (1999) mentioned that exercising sheep for 20 minutes resulted in a rapid and pronounced (approximately 2 °C) RT rise. Bruckmaier and Blum (1992) found that the values of RT of male Simmental calves tended to increase during exercise. It is worthy to mention that, the summer walking stress had a greater effect on goats than winter walk. Theses significant differences due to the interaction heat stress X walking stress might be attributed to the AT increment from winter to summer (Table 1).

In attempt to relive these impacts of walking stress, probiotics supplementation reduced the mean values of thermo- respiratory responses for probiotics goats and non- significant reduction of HR mean values comparing with their control counterparts indicating the ability of probiotics to improve the thermal ability of treated animal under different stresses. These results would be confirmed by Huber *et al.* (1994) who suggested that the fungal metabolites influence the temperature control centers in cows. In harmony, cows fed diets with A. oryzae lowered their RT values than their controls (Huber and Higginbotham, 1985; Marcus *et al.*, 1986 and Higgginbotham *et al.*, 1993). In constancy, Campbell and Glade (1989) recorded lower heart rate during exercise workout for horse fed a diet with yeast compared to hores fed a diet without yeast. Thus, inclusion of yeast in diets of exercising horses seemed to improve their aerobic metabolic capacity, which may be related to the improved nitrogen retention or fermentation profile.

Apple *et al.* (1994) reported that with increasing exercise intensity, HR increases linearly in response to greater oxygen demand by exercising muscles. However, the decreases in thermo- cardio- respiration responses values were more pronounced in probiotics goats which might refer to its favourable effects of improving the thermal ability of treated animals. Similar results were reported by Higginboham *et al.* (1993). In addition, the ST values of goats in winter were lower than those of summer which might be due to the effect of low AT (Table 1). In harmony, Entin *et al.* (1998) reported that ambient temperature affected RT and ST of sheep during exercise.

In spite of the non-significant effect of the bi-interaction between season X treatment of between period X treatment (except of RT) and the tri-interaction among season X period X treatment, the supplementary of probiotics resulted in reducing all mean values of the thermo- cardio- respiratory responses (Table 2). The obtained results would be supported by those reported by Higginbotham *et al.* (1994) and Bertrand and Grimes (1997). Moreover, Gomez- Alarcon *et al* (1990 and 1991) revealed that probiotics reduce the RR during periods of hot ambient temperature.

3- Hematological parameters:

The mean values of hematological parameters (Hb, PCV and RBc's) and blood indices (MCV, MCH and MCHC) of which Hassani goats varied significantly from summer to winter, summer season had significantly (P<0.01) higher Hb, PCV, RBC's and MCV values, while MCH and MCHC values showed an inverse trend where winter values exceeded summer values (Tables 3 and 4).

Table (3): The least square means (±SE) of hematological parameters of Hassani goats as affected by walking stress and probiotics (Biovet- YC) during summer and winter seasons

Item	Summer			Winter			Overall		Physica	±SE
	C	P	Mean	C	P	Mean	C	P	Mean	
Hb:			**			**			**	
Initial	10.52	10.64	**10.58aA**	10.12	10.21	**10.22aB**	10.32	10.48	**10.40a**	
Walking	10.54	10.68	**10.61aA**	10.24	10.41	**10.32bB**	10.39	10.55	**10.47a**	**0.030**
Recovery	10.15	10.30	**10.23bA**	10.14	10.27	**10.20aA**	10.15	10.28	**10.22b**	
±SE	0.060		0.042	0.060		0.042	0.042			
SXT ^{ns}	**10.41**	**10.54**		**10.17**	**10.33**					**0.035**
T mean**							**10.29A**	**10.43B**		
S mean**			**10.47a**			**10.25b**				**0.025**
Ht:			**			**			**	
Initial	31.90	32.90	**32.40aA**	27.18	27.60	**27.39aB**	29.54	30.25	**29.90a**	
Walking	30.00	31.80	**30.90bA**	29.56	29.90	**29.73bB**	29.78	30.85	**30.31a**	**0.234**
Recovery	31.60	32.80	**32.20aA**	30.00	30.90	**30.45bB**	30.80	31.85	**31.33b**	
±SE	0.461		0.326	0.461		0.326	0.318			
SXT ^{ns}	**31.17**	**32.50**		**28.91**	**29.47**					**0.266**
T mean**							**30.04A**	**30.98B**		
S mean**			**31.83a**			**29.19b**				**0.188**
RBC's:									*	
Initial	8.29	8.35	**8.32**	7.65	7.87	**7.76**	7.97	8.11	**8.04ab**	
Walking	8.26	8.30	**8.28**	7.85	7.97	**7.91**	8.06	8.14	**8.10a**	**0.040**
Recovery	8.21	8.06	**8.13**	7.69	7.87	**7.78**	7.95	7.96	**7.96b**	
±SE	0.080		0.056	0.080		0.056	0.055			
SXT*	**8.25a**	**8.23a**		**7.73b**	**7.90c**					**0.046**
T mean ^{ns}							**7.99**	**8.07**		
S mean**			**8.25a**			**7.82b**				**0.033**

ns, non-significant ***, P< 0.05** ****, P< 0.01**
C, Control group **P, probiotics group** **S, season**
T, treatment **Hb, hemoglobin concentration**
Ht, hematocrit **RBC's, red blood cells**
Means in a certain item having different letters differ significantly (P<0.05).

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

Item	Summer			Winter			Overall		Physical	±SE
	C	P	Mean	C	P	Mean	C	P	Mean	
MCV:			**			**			**	
Initial	38.51	39.41	**38.96aA**	35.63	35.06	**35.34aB**	37.07	37.24	37.15a	
Walking	36.34	38.33	**37.33bA**	37.67	37.56	**37.91bA**	37.00	37.95	37.47a	**0.355**
Recovery	38.57	40.70	**39.64aA**	39.07	39.32	**39.19aA**	38.82	40.01	39.41b	
±SE	0.700		0.459	0.700		0.459	0.484			
SXT*	**37.80a**	**39.48b**		**37.45a**	**37.32a**					**0.404**
T mean ns							**37.63**	**38.40**		**0.286**
S mean**			**38.64a**			**37.38b**				
MCH:										
Initial	12.70	12.75	**12.72**	13.27	13.11	**13.19**	12.99	12.93	12.96	
Walking	12.77	12.87	**12.82**	12.06	13.08	**13.07**	12.91	12.98	12.94	**0.078**
Recovery	12.38	12.78	**12.58**	13.20	13.07	**12.13**	12.79	12.92	12.86	
±SE	0.154		0.109	0.154		0.109	0.106			
SXT ns	**12.62**	**12.80**		**13.18**	**13.08**					**0.089**
T mean ns							**12.42**	**12.94**		**0.063**
S mean**			**12.71a**			**13.13b**				
MCHC:			**			**			**	
Initial	33.02	32.35	**32.68aA**	37.35	37.45	**37.40aB**	35.18	34.60	35.04a	
Walking	35.21	33.64	**34.42bA**	34.72	34.84	**34.78bA**	34.97	34.24	34.60a	**0.287**
Recovery	32.28	31.46	**31.87aA**	33.93	33.90	**33.61cB**	33.10	32.38	32.74b	
±SE	0.567s		0.401	0.567		0.401	0.391			
SXT ns	**33.50**	**32.48**		**35.33**	**35.20**					**0.327**
T mean ns							**34.42**	**33.84**		**0.232**
S mean**			**32.99a**			**35.26b**				

ns, non-significant *, P< 0.05, P< 0.01 C, Control group P, probiotics group S, season T, treatment**
MCV, mean corpuscular volume
MCH, mean corpuscular hemoglobin
MCHC, mean corpuscular hemoglobin concentration
Means in a certain item having different letters differ significantly (P<0.05).

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*. (1990) 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. Similarly, Smith and Sherman (1994) reported in adult Indian goats that PCV was higher in summer than in winter leading to higher Hb and RBC's count. Sarwer and Majeed (1997) observed that PCV, Hb and RBC's were positively correlated to each other while MCH and MCHC were positively correlated. Moreover, PCV were negatively correlated with MCHC and MCH. 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).

Subjection Hassani goats to walking stress caused slight increases in Hb, Ht, RBC's and MCV values in both experimental groups during summer and winter seasons and it caused decreases in MCH and MCHC values (Tables 3 and 4). The increments in Hb, Ht and RBC's values in winter due to practising walking were greater than those in summer. Badawy *et al.* (2003) revealed that the hematological parameters (Hb, Ht and RBC's) were increased in sheep and goats due to practising walking and added that goats were slightly affected by forced walking comparing with sheep. Bruckmaier and Blum (1992) reported that HB and Ht increased during treadmill. Moreover, Apple *et al.* (1994) recorded increases on HB and Ht values in exercising lambs. The increment in Hb, Ht and RBC's values might be an attempt to increasing O2 carrying capacity to increase the metabolic rate under walking stress conditions. With sympathetic neural activation during exercise, the spleen contracts and discharges erythrocytes into the circulation and increases hematocrit (Detweiler, 1984).

The spleen is an important reservoir of erythrocytes called upon when the body has a greater need for oxygen in the tissues. Increases in hematocrit and hemoglobin concentrations are critical mechanisms enabling the ruminants to increase oxygen transportation to exercising muscles (Kuhlmann *et al.* 1985). Mundie *et al.* (1991) reported a 44% increase in Hb concentration during maximal exercise in sheep. Furthermore, Bird *et al.* (1981) found that hematocrit and hemoglobin increased with seconds of commencing treadmill exerciser and concluded that these increases were due to splenic discharge of erythrocytes. In consistency, Kobeisy *et al.* (2004) reported that HB increased as a result of exercise in Saidi ewes.

Providing probiotics during walking stress resulted in increasing the hematological parameters and blood indices mean values as the probiotics goats exceeded the values of their controls counterparts (Tables 3). These increments in the hematological parameters were higher in winter than in summer. 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 group B, affecting positively blood forming processes (Kander, 2004). Similarly, 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. Moreover, Bomba *et al.* (1998) and Miller *et al.* (1982) noted an increase in hemoglobin level and the erythrocyte count in piglets receiving Lactobacillus sp. However, there were no significant differences between the experimental groups in hematological parameters and blood indices mean values (Tables 3 and 4).

CONCLUSION

From the forementioned results, it could be concluded that providing probiotics in diets of goats raised under the harsh conditions of the El-Shalateen- Halaieb- Abo Ramad triangle would improve their thermal ability through controlling the changes might occur in thermo- cardio- respiratory responses and improving the hematological reactions are used from the walking stress during summer and winter seasons.

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تأثير البروبيوتك وإجهاد المشى على القياسات الفسيولوجية وبعض مكونات الدم للماعز الحسانى

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فى محاولة لتخيف العبء الفسيولوجى على ذكور الماعز الحسانى الناتج عن إجهاد المشى أثناء موسمى الصيف والشتاء فى مثلث الشلاتين- حلايب- أبورماد، تمت إضافة البروبيوتك إلى علائقها في تجربة حقلية لمدة ٣٤ يوم حيث اختيرعشرون ذكر ماعز حسانى من القطيع التجريبي بمحطة بحوث حدربة التي تقع على الحدود المصرية السودانية والتابعة لمركز بحوث الصحراء. قسمت الحيوانات الى مجموعتين متساويتين: المجموعة الاولى غذيت على عليقة خالية من البروبيوتك (مجموعة مقارنة) بينما المجموعة الثانية غذيت على عليقة تحتوي على البروبيوتك (**بيوفيت –YC** بمعدل ١٠جم/ راس/ يوم) لمدة ٢٨ يوم قبل وأثناء وبعد التعرض لاجهاد المشى. حيث تم دفع الحيوانات للمشى لمسافة ١٠ كيلومتر فى أربعة ساعات يومياً لمدة أربعة أيام متتالية أعقبها يومان فترة راحة لإعادة الحيوانات لحالتها. تم تسجيل البيانات الارصادية وهي درجة حرارة البيئة و الرطوبة النسبية مرتين يوميا (٨ صباحاً ، ٢ ظهرا) كما تم تسجيل القراءات الفسيولوجية (درجة حرارة كل من المستقيم والجلد بالاضافة الى معدل التنفس ومعدل ضربات القلب) يوميا قبل وبعد اجهاد المشى. كما تم تقدير بعض مكونات الدم (نسبة الهيماتوكريت، تركيز الهيموجلوبين، عدد كرات الدم الحمراء وباستخدام معادلات حسابية تم حساب كلا من متوسط حجم كريات الدم الحمراء، متوسط كمية الهيموجلوبين داخل كريات الدم الحمراء، متوسط تركيز الهيموجلوبين داخل ١٠٠سم٣ من كريات الدم الحمراء المنضغطه).

* أوضحت النتائج أن فصل الصيف سجل قيم أعلى عن فصل الشتاء لكل من درجة حرارة المستقيم والجلد - تركيز هيموجلوبين الدم- نسبة الهيماتوكريت- عدد كرات الدم الحمراء- متوسط حجم كريات الدم الحمراء ($P<0.01$) و كل من معدل التنفس- معدل ضربات القلب بشكل غير

معنوى. وفى المقابل فأن فصل الشتاء سجل قيماً أعلى عن فصل الصيف لكل من متوسط كمية الهيموجلوبين داخل كريات الدم الحمراء- - النسبة المئويه لمتوسط تركيز الهيموجلوبين داخل كريات الدم الحمراء المنضغطه ($P<0.01$).

* أدى الاجهاد الناتج عن المشى الى زيادة كل من درجة حرارة المستقيم والجلد - معدل التنفس وضربات القلب- تركيز الهيموجلوبين- نسبة الهيماتوكريت- متوسط حجم كريات الدم الحمراء- متوسط تركيز الهيموجلوبين داخل كريات الدم الحمراء المنضغطه ($P<0.01$) كما زاد عدد كرات الدم الحمراء بشكل معنوى ($P<0.05$). بينما انخفض متوسط كمية الهيموجلوبين داخل كريات الدم الحمراء ولكن بشكل غير معنوى.
*إضافة البيروبيوتك الى علائق الماعز الحسانى أثناء التعرض لاجهاد المشى ادى الى إنخفاض معنوى لكل من درجة حرارة المستقيم ومعدل التنفس ($P<0.05$) وكذلك درجة حرارة الجلد ($P<0.01$) بينما لم يكن الانخفاض فى معدل ضربات القلب معنويا. علاوة على ذلك أدت إضافة البروبيوتك أدى الى زيادة معنوية ($P<0.01$) فى تركيز الهيموجلوبين ونسبة الهيماتوكريت وكذلك زيادة غير معنوية فى عدد كرات الدم الحمراء، متوسط حجم كريات الدم الحمراء، متوسط كمية الهيموجلوبين داخل كريات الدم الحمراء المنضغطه، كما أظهرت النتائج انخفاض غير معنوى فى متوسط تركيز الهيموجلوبين داخل كريات الدم الحمراء.

الخلاصة: خلصت التجربة الى ان أستخدام البروبيوتك في علائق الحيوانات الصحراوية المتأثرة باجهاد المشى أثناء موسم الصيف والشتاء من الممكن ان يكون احد السبل لتقليل الاثار الضارة لاجهاد المشى اثناء عملية الرعى والتى تواجه الماعز الحسانى المرباة تحت الظروف البيئية القاسية لمثلث حلايب- شلاتين- أبو رماد اقصى جنوب شرق الصحراء الشرقية لمصر.