Menoufia J. Animal, Poultry & Fish Prod., Vol. 3 December (2019): 137 - 151

EFFECT OF SEASON ON SOME THERMOREGULATION AND BLOOD PICTURE IN DAMASCUS AND ZARABI MALE GOATS

H. Abdel Rahman, Reem S. Mourad, Mervat M. Soliman and A. F. Nebar
Animal Production Department, Faculty of Agriculture, Menofiya University

Received: Sep. 25 , 2019 **Accepted: Sep. 29 , 2019**

ABSTRACT: ***The effect of seasonal variations on some thermoregulation and blood parameters were studied in ten male goats (five Zarabi and five Damascus). Rectal temperature, pulse rate and respiration rates were determined at 7: 00, 12;00 and 19:00 during the middle month of every season. Blood samples were collected and was shortly analyzed after collection for RBCs, WBCs, Hb and PCV. Mean corpuscular volume (MCV), (MCH), and (MCHC) were mathematically calculated. Data were statistically analyzed using SAS (2007). Results indicated that season of the year affected significantly thermoregulation parameters and RBCS indices which were estimated in males of Damascene and Zraibi goats. the highest overall averages of RT, RR and PR were recorded in summer season (39.06°C, 38.4 acts/min and 87.8 beat/min) for the males goats of Damascus and Zarabi and were accompanied by the highest recorded ambient temperature and THI during that season. The highest RBC, Hb, PCV and MCHC values (11.8 × 106 / 11.8l, 9.4 g / dL, 30.9% and 31.7 g / dL) were recorded in winter, and the highest values of MCV and MCH (30.4 fl, 9.0 pg) in summer, however, The highest (11.4 (×103/µL) and lowest (9.1×103/µL) overall average of the total WBC were recorded in spring and winter, respectively in Damascus and Zraibi male blood samples. It could be concluded that season of the year affected significantly hematological and thermoregulation parameters estimated in males of Damascene and Zraibi goats in the present study, however, the values of all parameter were mostly within the physiological range for goats as reported from previous studies.***

Key words: ***Season, goats, thermoregulation, blood picture.***

INTRODUCTION

Goats are multipurpose animals; they produce. milk, meat, skin and fiber, and play a predominant role in the sustenance of the livelihoods of impoverished families especially in the rural areas. Goats contribute a great deal to the agriculture economy of Egypt, where goats contribute about 5% of all the red meat (Galal *et al.* 2005), and less than 1% of the total milk production in Egypt (Soryal & Metawi 2000).

Recent climate change happens in Egypt as in all over the world as a result of global warming that causes a lot of failure in animal performance. In this concern, (Sherien and Yassien 2016) stated that analysis of meteorological data of Egypt climate showed a marked climate change starting the year 2011, explained by an increase in both air temperature and Temperature-Humidity Index (THI), and this change was negatively correlated with total day milk yield of Holstein cows maintained in the Egyptian Delta region. Moreover, obtained results of her study expected the continuous negative effect of climate change till the year 2050. Heat stress has been generally associated with detrimental effects on physiological equilibriums of goats and their various systems (nervous, endocrine and immune) have been implicated with specific responses and reciprocal

regulatory influences (Castanheira *et al.,* 2010).

So, the present study was conducted to investigate the seasonal variations of some thermoregulation parameters (Rectal temperature, Respiration rate and Pulse rate) and some Blood constituents in male Damascus and Zarabi goats.

MATERIALS AND METHODS

Five Zarabi and five Damascus male goats aged from 1.5 – 2.0 years were randomly selected from the goat flock of search farm of the Animal production Department, Faculty of Agriculture – Menofiya University (Shebin El- Kom). The animals were healthy, kept under similar managerial conditions. and housed in 2 separate semi-open pens. The experiment started at December 2016, and lasted for a year. The animals were fed in groups, and were provided with their nutritional requirement according to the feeding system applied in this farm. This included concentrate plus wheat straw plus berseem hay (*Trifolium alexandrium*) during season of the green fodder, the feed allowance was according to NRC (2007). Rations were offered to all animals twice a day of 08:00 a.m. and 3.00 p.m., The feeding allowance were adjust monthly according to changes in body weight. Fresh water was available *ad lib.* for the animals all over the period of the experiment.

Ambient temperature (AT,°C), relative humidity (RH%) were measured at the experimental region at 7:00, 12:oo and 19: 00 hrs and recorded to measure the micro-environment surround the animals. Then, Temperature Humidity Index (THI) was calculated according to the equation of Nigm *et al.,* (2015) as:

THI = 32.783 + 1.478 x AT + 0.056 x RH

Where:

32.783 is the intercept, 1.478 is the regression of THI on AT, 0.056 is the regression of THI on RH, AT is the average of air temperature (°C) and RH is the average of relative humidity (%). The accuracy of this equation (R^2) is 0.995.

Measurements and observations:

1- Thermoregulation responses:

To investigate the effect of season on the physiological responses of the experimental goats, rectal temperature, pulse rate and respiration rates were determined three times /day (at 7:00a.m., 12:00. and 19:00 hrs) during the middle month of every season.

Rectal temperature was measured to the nearest 0.01°C using a standard clinical thermometer inserted into the rectum approximately 10 cm for 2 minutes, respiratory rate was determined by counting the number of abdominal movement per minute, and pulse rate was recorded by placing the finger tips on the femoral arteries of the hind limb for one minute and read from the stopwatch as reported by Sanusi *et al.* (2010).

2- Blood picture:

Blood samples were collected during the middle month of every season Blood samples were collected from the jugular vein of each animal at morning before feeding or drinking in a vial, the vial was heparinized with ethylene diamine tetra acetic acid (EDTA) as an anticoagulant.

ALL parameters of blood picture (Erythrocytes, RBCc, Leucocytes, WBCc, Hemoglobin concentration (Hb) and Packed cell volume (PCV, %), Mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and mean corpuscular hemoglobin concentration (MCHC) were mathematically calculated. Data were statistically analyzed using least squares procedure described by SAS (2007). Through this software, Duncan Multiple

Range Test was applied to test the level of significant among the means.

RESULT AND DISCUSSION

I. Seasonal variation of thermoregulatory parameters in Damascus and Zaraibi goats:

Three thermoregulatory parameters were included in this study as rectal temperature (RT), respiration rate (RR) and pulse rate (PR). Data listed indicated that season (S), time of day (TD) and the interaction of (S X D) had significant ($p < 0.01$) effects on the three considered parameters (RT, RR and PR).

First able, Depending on the obtained result of recorded climatic elements (AT, RH, THI) during various seasons at the experimental region, it could be concluded that climatic condition in summer season characterized by the highest average of AT combined with the highest average of RH, and accordingly with the highest THI level as compared with other seasons. Where, the highest overall average of AT°C, RH % and THI were recorded for summer season (29.1, 68.0 and 79.5) as compared with that of Winter (14.3, 61.4, 57.3), Spring (26.0, 42.3, 66.0) or in Autumn (21.5, 66.1 and 68.1, respectively). And across hours of the day the highest values of considered climatic parameters were recorded at 12.00 for AT and THI (27.5 and 75.6 respectively), However the highest values of RH recorded at 7.00 hrs (79.6%).

a) Rectal temperature (RT):

Irrespective of season of the year, time of the day or other factors could affect RT of the experimental goats, rectal temperature of Damascus and Zarabi male goats in the present study ranged from 38.25°C to 39.42°C (Table, 1). These results are consistent with those obtained by Marai *et al.,* 2007 who stated that rectal temperatures in goats varies from 38.3 and 39.9 ◦C, and appear somewhat similar to that of Fasoro BF.1999) who found rectal temperature of goats ranged between 39.2°C and 39.8°C. However, (Smith and Sherman 2009) observed that normal temperature (°C) of goats ranged from 38.6 to 40.0 ◦C.

It clears that, the highest ($p < 0.01$) overall average of RT was recorded in summer season for males (39.06 °C) of Damascus and Zarabi goats. However, the lowest ones recorded in winter season (38.43°C).

Furthermore, Data in Table (1) indicate that the average of RT in spring season for males (38.67 °C) was significantly lower than that recorded in summer season (39.06) and it was higher ($P< 0.001$) as compared to that recorded in winter season (38.4). The overall average of RT in autumn was significantly lower (38.46) as compared with that recorded in spring (38.67) and summer (39.06), and it was insignificantly higher than that recorded in winter (38,43) goats (Table, 1).

Our results agree with the results of Marai *et al.* (2007) who reported that the rectal temperature was lower in the winter than in the summer, and contradicts with the results of Ceyhan *et al.* (2006) who found that the rectal temperature was higher in the winter and in the first months of the spring than in the summer months .

Across hours of the day, obtained results (Table, 1) proved that as the AT increased, RT of the experimental goats increased. the lowest overall average of RT was significantly ($P< 0.001$) recorded in morning hours at 7:00 hrs in males (38.4 °C) of the Damascus and Zarabi goats , and as expected the highest ones recorded at 12:00 hrs (38.8 °C). The overall average of RT at afternoon hours (19:00 hrs) was significantly higher

(38.67°C) than that recorded at 7:00 hrs (38.4°C), and significantly lower than that recorded at 12:00 hrs (38.85°C).

These obtained results in the present study indicate that as the AT increased, RT of the experimental goats increased. In this regard, Marai, *et al* (2007) and Marai and Haeeb (2010) demonstrated that exposure of animals to high environmental temperature and relative humidity with prolonged direct sunlight induce heat-stress, which is known to adversely affect animal production. This high ambient temperature induces the animals to try to balance the excessive heat load by using different means to dissipate, as much as possible, their latent heat. If all such means fail, the body rectal temperature rises (Marai and Haeeb 2010).

b) Respiration Rate (RR):

The effect of season on RR of males of Damascus and Zarabi goats was significant ($p < 0.01$). Similar conclusion was reported by Kayabasi (2011). At first, frequency of respiration (RR) of males Damascus and Zarabi goats in the present study ranged from 24.8 to 45.0 acts/minute (Table, 2).

Table (1): Seasonal and diurnal changes of Rectal temperature ◦C (RT):of Damascus and Zarabi male goats.

Season (S)	Time of day (D)	Breed (B)		Overall (S x D)
		Damascus	Zarabi	
Winter	07.00 h	38.25±0.4	38.25±0.4	38.25±0.03^{G}
	12.00 h	38.58±0.4	38.59±0.4	38.58±0.03^{DE}
	19.00 h	38.58±0.4	38.33±0.4	38.46±0.03^{F}
Overall (S x B)		38.47±0.02	38.39±0.02	38.43±0.01^{C}
Spring	07.00 h	38.55±0.4	38.52±0.4	38.53±0.03^{FE}
	12.00 h	38.76±0.4	38.73±0.4	38.74±0.03^{C}
	19.00 h	38.73±0.4	38.73±0.4	38.73±0.03^{C}
Overall (S x B)		38.68±0.02	38.66±0.02	38.67±0.01^{B}
Summer	07.00 h	38.70±0.4	38.73±0.4	38.71±0.03^{C}
	12.00 h	39.48±0.4	39.42±0.4	39.45±0.03^{A}
	19.00 h	38.99±0.4	39.06±0.4	39.02±0.03^{B}
Overall (S x B)		39.05±0.02	39.07±0.02	39.06±0.01^{A}
Autumn	07.00 h	38.27±0.4	38.23±0.4	38.25±0.03^{G}
	12.00 h	38.62±0.4	38.67±0.4	38.64±0.03^{CD}
	19.00 h	38.46±0.4	38.50±0.4	38.48±0.03^{F}
Overall (S x B)		38.45±0.02	38.56±0.02	38.46±0.01^{C}
Total		38.7±0.01	38.6±0.01	
Overall (B x D)				
	07.00 h	38.44±0.02	38.43±0.02	38.4±0.01^{C}
	12.00 h	38.86±0.02	38.85±0.02	38.85±0.01^{A}
	19.00 h	38.69±0.02	38.65±0.02	38.67±0.01^{B}

A,B = Values in the same column or row within certain trait with different super scripts are significantly differed ($P < 0.05$).

Table (2): Seasonal and diurnal changes of respiration rate (acts/min) of Damascus and Zarabi male goats

Season (S)	Time of day (D)	Breed (B)		Overall (S x D)
		Damascus	Zarabi	
Winter	07.00 h	25.6±0.5	24.7±0.5	25.1 ± 0.4^{IJ}
	12.00 h	30.5±0.5	31.8±0.5	31.1 ± 0.4^{D}
	19.00 h	27.6±0.5	25.4±0.5	26.5 ± 0.4^{IH}
Overall (S x B)		27.8±0.3	27.3±0.3	27.6 ± 0.23^{C}
Spring	07.00 h	25.0±0.5	23.6±0.5	24.3 ± 0.4^{J}
	12.00 h	30.3±0.5	29.9±0.5	30.1 ± 0.4^{DE}
	19.00 h	29.4±0.5	29.1±0.5	29.2 ± 0.4^{EF}
Overall (S x B)		28.25±0.3	27.51±0.3	27.9 ± 0.23^{C}
Summer	07.00 h	32.8±0.5	32.6±0.5	32.7 ± 0.4^{C}
	12.00 h	44.2±0.5	45.0±0.5	44.6 ± 0.4^{A}
	19.00 h	37.6±0.5	38.1±0.5	37.8 ± 0.4^{B}
Overall (S x B)		38.2±0.3	38.6±0.3	38.4 ± 0.23^{A}
Autumn	07.00 h	29.0±0.5	27.6±0.5	28.3 ± 0.4^{GF}
	12.00 h	34.1±0.5	33.4±0.5	33.8 ± 0.4^{C}
	19.00 h	27.6±0.5	27.7±0.5	27.6 ± 0.4^{GH}
Overall (S x B)		30.2±0.3	29.6±0.3	29.9 ± 0.23^{B}
Total		31.1±0.1	30.7±0.1	
Overall (B x D)				
07.00 h		28.1±0.3	27.1±0.3	27.6 ± 0.2^{C}
12.00 h		34.8±0.3	35.0±0.3	34.9 ± 0.2^{A}
18.00 h		30.5±0.3	30.0±0.3	30.3 ± 0.2^{B}

A, B = Values in the same column or row within certain trait with different super scripts are significantly differed (P< 0.05).

The tabulated data postulated that the highest overall average of RR was recorded in summer season (p< 0.01) for males (38.40 acts/min) of Damascus and Zarabi goats. However, the lowest overall average of RR was counted and recorded (27.60 acts/min) in winter. In addition, the frequency of respiration was insignificantly higher in spring season for males (27.9 acts/min) as compared to that recorded RR in winter (27.6 acts/min) and it was significantly (P < 0.01) lower than that recorded in summer. In general, thermal, nutritional, and walking stress significantly affect the body weight, the respiratory rate, the heart rate, the rectal temperature of the animal (Sejian *et al.,* 2013). Moreover, Srikandakumar *et al.* (2003) found that the respiratory rate per minute increased in hot conditions in Omani sheep. Several studies in sheep stated that, during summer months, the respiration rate is higher than in winter (Abi-Saaband – Saleim, 1995., Fahmy (1994)., Marai *et al.* (1997c)., Marai *et al.,* 2007 and Yorulmaz (2014). Similar observations were recorded also for goats (Kayabasi 2011).

The results of RR measured for the experimental goats pointed out that, the respiratory rate generally increased in parallel with the rise in temperature or THI in the summer. Similar conclusion was recorded by Appleman,1958-Prasetyo., 1984 who indicated that the body temperature and respiration rate of goats increase with rise in ambient temperature. In contrast, Bligh J. 1985 observed that a daily change in respiration rate per minute from the effect of environmental temperature may not be parallel with change in body temperature and pulsation number.

Regarding to the activity of RR across hours of the day. The highest (P< 0.01) overall average of RR was recorded at noon (12:00 hrs) for males (34.91 acts/min) and the least activity of RR was recorded at 7:00 a.m (27.60 acts/min) of the of Damascus and Zarabi goats (Table, 2). And that overall average of RR at 19: hours (30.3 acts/min) was significantly (p< 0.01) lower than that recorded at 12:00 hrs, and higher than that recorded 7: hours. These findings agree with the results of Shalaby (1985), Yousef (1985) and Marai *et al.* (1997c) who found that RR was markedly lower at 8:00 am than at 12:00 pm and 16:00 pm In Egyptian Rahman i, Ossimi and Ossimi×Suffolk crossbred ewes. Similar trend was observed by Sejian *et al.* (2012) who found higher respiration rate in afternoon than morning in Malpura sheep of semi-arid region.

c) Pulse rate (PR , beat/ min):

Pulse rate significantly (p< 0.01) affected by the season of the year (S), hours of the day (D) and the interaction of Sx D, however the effects of breed (B), interaction of SxB, BxD and SxBxD were not significant.

In this concern, the highest significant overall average of (PR) for males (87.80 beat/ min) of Damascus and Zarabi goats was recorded in summer season, followed by that recorded in autumn (8 5.8 beat/ min), spring (70.5 beat/ min) and the lowest one was in winter season (68.8 beat/ min,). The differences among seasons were significant expect the differences of values recorded in winter and spring were not significant as shown in Table (3). It is well documented that pulse rate influenced by various factors such as, season, day timings, ambient temperature, humidity and exercise (Marai *et al.* 2007).

Across hours of the day, The obtained results (Table, 3) illustrate that the highest activity of pulse rate observed and recorded at 12:00 hrs (82.5 beat/ min) as compared to that observed at 7:00 hrs (75.3 beat/ min) or at 19:00hrs (76.9 beat/ min) with significant differences (p<0.01) among hours of the day.

Based on various research findings, pulse rate increases in high environmental temperatures as reported by Marai *et al.* (2007) and Phulia SK, (2010). These findings come into agreement with those of Facanha DAE, (2012) who concluded that the marked acceleration of the heart rate occurred during the hottest part of the day. However, Al-haidary (2004) reported that exposure to heat stress reduced (P<0.01) the daily average of heart rate (115.7 and 85.8±.11 beat /min for the control and heat stress animals, respectively)., and observed the mark reduction of heart rate occurred during the hottest part of the daily cycle (1200- 1700 h).

Finally, as seen, the results arein the same parallel with each other, where it is clearly appears that pattern of seasonal and diurnal changes of measured thermo regulatory responses of (RT, RR and PR) of the experimental animals almost is in harmony with the change in environmental changes of recorded climatic circumstances at the region of the study, especially ambient temperature and calculated thermal humidity index (THI).

Table (3): Seasonal and diurnal changes of Pulse rate (beat/min) of Damascus and Zarabi male goats

Season (S)	Time of day (D)	Breed (B)		Overall (S x D)
		Damascus	Zarabi	
Winter	07.00 h	66.7±1.3	65.9±1.3	66.3±0.8^{E}
	12.00 h	72.1±1.3	72.3±1.3	72.3±0.8^{D}
	19.00 h	68.7±1.3	66.9±1.3	67.8±0.8^{E}
	Overall (S x B)	69.2±0.7	68.4±0.7	68.8±0.5^{C}
Spring	07.00 h	67.6±1.3	67.0±1.3	67.3±0.8^{E}
	12.00 h	72.0±1.3	72.1±1.3	72.0±0.8^{D}
	19.00 h	72.4±1.3	72.2±1.3	72.3±0.8^{D}
	Overall (S x B)	70.6±0.7	70.4±0.7	70.5±0.5^{C}
Summer	07.00 h	83.8±1.3	83.0±1.3	83.4±0.8B^{C}
	12.00 h	97.6±1.3	91.2±1.3	94.4±0.8^{A}
	19.00 h	85.8±1.3	85.4±1.3	85.6±0.8^{B}
	Overall (S x B)	89.0±0.7	86.6±0.7	87.8±0.5^{A}
Autumn	07.00 h	83.6±1.3	84.7±1.3	84.1±0.8B^{C}
	12.00 h	91.1±1.3	91.8±1.3	91.4±0.8^{A}
	19.00 h	80.8±1.3	82.6±1.3	81.7±0.8^{C}
	Overall (S x B)	85.15±0.7	86.40±0.70	85.8±0.5^{B}
	Total	78.5±0.2	77.9±0.2	
	Overall (B x D)			
	07.00 h	75.4±0.6	75.8±0.6	75.3±0.4^{C}
	12.00 h	83.3±0.6	81.8±0.6	82.5±0.4^{A}
	19.00 h	76.9±0.6	76.8±0.6	76.8±0.4^{B}

A, B : Values in the same column or row within certain trait with different super scripts are significantly differed (P< 0.05).

In the present study, results pointed out that the highest the overall averages of RT, RR and PR were recorded in summer season for males (39.06, 38.4 and 87.8) as shown in Tables (1, 2, and 3) of Damascus and Zarabi goats were accompanied with the highest recorded ambient temperature and the highest calculated THI in summer season.

These observations are agreement with those of Yorulmaz (2014) who found that respiratory rate generally increased in parallel with the rise in temperature or THI in the summer, but recessed back to the lowest level in the winter, and to those of Ibrahim (2001) on camels. Moreover, (Alamer and Al-Hazah 2004) concluded that the respiratory rate followed the same pattern of variation as observed with rectal temperature, so, it is suggested that respiration rate and rectal temperature are ideal indicators for quantifying heat stress in several ruminant species (Chauhan *et al.,* 2014). It could be concluded that the seasonal changes of the rectal temperature, respiratory rate and pulse rate are in harmony with the changes in environmental temperature.

II. Seasonal variation in erythrocvtes indices and Leucocytes in males of Damascus and Zarabi goats:

a- RBCs indices:

Total count of erythrocytes, Leucocytes, Heamoglobin and packed cell volume (Table, 4) and for the erthrocytic indices including MCV, MCH, MCHC (Table, 5) in the blood samples obtained from males of Damascus and Zarabi goats were significantly (p< 0.01) affected by season of the year. These results agree with the findings of Tibbo *et al.* (2008) which stated that season affected almost all erythrocyte series in small ruminants. In contrast, Aengwanich *et al.* (2009) reported no significant effect of season on haematological values of crossbred beef cattle at slaughterhouse in northern part of Thailand. According to the available literature, there are several factors include season of the year (Oladele *et al.,* 2005),animal breed (Tibbo *et al.,* 2008a; Tibbo *et al.,* 2008b), biological rhythms (Azeez *et al.,* 2009), age (Olayemi and Nottidge, 2007; Devi and Kumar, 2012), sex (Gabriel *et al.,* 2004; Cetin *et al.,* 2009), pregnancy (Farooq *et al.,* 2011; Okonkwo *et al.,* 2011a), nutritional status (Iyayi, 2001), affect hematological and biochemical profile.

The listed data indicate that the overall average of RBCs, amount of haemoglobin and PCV (ranged from 8.9 - 11.8×106 /µL0, 8.1 -9.6 g/dL, and 26.8 - 30.4%, respectively) in the blood of Damascus and Zarabi goats (Table, 4,5). The highest overall average of RBCs, Hb, PCV and MCHC were recorded in winter season for blood samples obtained from males (11.8 ×106 /µL, 9.4 g/dL, 30.9% and 31.7 g/dl)) of Damascus and Zarabi goats.

The present results of are in agreement with the findings of Holman and Dew (1966) in goats. However, abdelatif, A. *et al.,* (2009) found the highest values of erythrocyte count, packed cell volume (PCV) and haemoglobin concentration (Hb) were during wet summer and the lowest values were in dry summer in Nubian goats, the erythrocyte counts during winter and dry summer did not differ significantly, while the difference in (PCV) was not significant between wet summer and winter. These variations in responses of goats may be attributed to differences in environmental conditions as well as nutritional factors (Pospisil *et al.* 1987).The lowest values of RBCs were recorded (p< 0.01) in summer season for males (9.1×106 /µL) of Damascus and Zarabi goats, However, the lowest value of Hb and PCV were recorded in summer season (8.2 g/dL and 27.1%, respectively)

The lowest values of RBCs, Hb and PCV were recorded in summer season (9.1×106 /µL, 8.2 g/dL and 27.1%, respectively) for males of Damascus and Zarabi goats as shown in Tables (4 and 5). Abdelatif, A. *et al.,* (2009) illustrated that the decline in erythrocyte count and consequently (PCV) and (Hb) could be related to depression of thyroid secretion which is associated with decreased erythropoiesis. A depression of thyroid hormone secretion during summer was reported in goats (Prakash, p 1991) and sheep [Assane, M and Sere, A 1990., and Okab, A *et al.,* 1993).

As for indices of RBCs in the blood of the experimental animals, results show that the highest values of MCV and MCH were recorded in summer season in blood samples for males (30.4 fl,.and 9.0 pg) of Damascus and Zarabi goats (Table, 6). Almost imilar observations noted by Kumar and Pachura, (2000) who reported that MCV, MCH and MCHC were higher in summer, while PCV was lower during winter, conversely, Abdelatif *et al.* (2009) observed that MCV and MCH were significantly higher during winter than in either wet or dry summer in Nubian goats.

Table 4

In addition the lowest values of MCV and MCH were observed in autumn (24.0 fl and 7.1 pg) for males of the experimental goats. While, the lowest values of MCHC were recorded (30.3 g/dl) in spring and summer seasons as shown in Table (5). The low (MCV) value obtained could be related to the negative correlation between size and number of erythroytes [(Holman *et al.,* 1964).

b- Leucocytes (WBCs):

The total count of Leucocytes in the blood samples obtained from males of Damascus and Zarabi goats was significantly ($p< 0.01$) affected by season of the year. However, Abdelatif *et al.* (2009) did not observe any significant effect of season on total count of Leucocytes.

Results in Table (4) revealed that the overall average number of WBCs in that blood samples ranged from 9.6 to 11.4 ×103/µL (Table, 4). The highest overall average of the total WBC was recorded in spring season (11.4 (×103/µL), however, the lowest values of WBC were recorded in winter (9.1×103/µL) in the blood samples obtained from males of Damascus and Zarabi goats. Abdelatif *et al.* (2009) indicated that the total count of Leucocytes showed apparently limited fluctuations ranging between 9.00 x 103/µL in dry summer and 11.93 x 103/µL in winter. Similarly, other workers (Vaidya, M.B. 1970 and Vegula, I. 1985) did not report significant effect of season on total count of Leucocytes in goats.

Table (5): Seasonal variation of Mean corpuscular volume (MCV), Mean corpuscular Hemoglobin (MCH), Mean corpuscular Hemoglobin concentration (MCHC) in males of Damascus and Baladi goats:

Season	MCV (fl)			MCH(pg)			MCHC(g/dl)		
	Damascus	Baladi	Average	Damascus	Baladi	Average	Damascus	Baladi	Average
Winter	25.4±0.4	25.8±0.4	25.6±0.3^{B}	7.9±0.1	8.2±0.1	8.0±0.1^{B}	31.3±0.2	32.1±0.2	31.7±0.1^{A}
Spring	25.5±0.4	26.2±0.4	25.8±0.3^{B}	7.7±0.1	7.9±0.1	7.8±0.1^{B}	30.3±0.2	30.3±0.2	30.3±0.1^{B}
Summer	30.8±0.4	30.1±0.4	30.4±0.3^{A}	8.9±0.1	9.2±0.1	9.0±0.1^{A}	30.3±0.2	30.3±0.2	30.3±0.1^{B}
Autumn	23.8±0.4	24.3±0.4	24.0±0.3^{C}	7.1±0.1	7.2±0.1	7.1±0.1^{C}	30.1±0.2	30.9±0.2	30.5±0.1^{C}
Average	26.4±0.2	26.6±0.2		7.9±.08^{B}	8.1±.08^{A}		30.5±0.1^{B}	30.9±0.1^{A}	

A, B, C = Values in the same column or row within certain trait with different super scripts are significantly differed ($P< 0.05$).

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تأثير الموسم على بعض قياسات الدم ومؤشرات التنظيم الحرارية في الماعز الدمشقي والزرايبى

حلمى عبدالرحمن عبدالهادى، ريم صابر مراد، مرفت مختار سليمان، عبدالله فتحى نيبر

قسم الإنتاج الحيوانى – كلية الزراعة – جامعة المنوفية

الملخص العربى

تمت دراسة تأثير التغيرات الموسمية على بعض المقاييس الفسيولوجية فى الدم وأساليب التنظيم الحراري في عشرة من الماعز الذكور (خمسة الزرابي وخمسة دمشقى). تم قياس درجة حرارة المستقيم ومعدل النبض ومعدل التنفس في الساعة 7:00 و12:00 و 19:00 خلال الشهر الأوسط من كل موسم. تم جمع عينات الدم خلال الشهر الأوسط من كل موسم. تم عمل تحليل دم كامل بعد فترة وجيزة بعد الجمع وتقدير العدد الكلى لكريات الدم الحمراء، العدد الكلى لكريات الدم البيضاء، تركيز الهيموجلوبين (Hb) والمكونات الخلوية للدم (PCV ،٪) ، كما تم حساب متوسط حجم الخلية (MCV) ، متوسط الهيموجلوبين (MCH) ، و متوسط تركيز الهيموجلوبين (MCHC) . تم تحليل البيانات إحصائيا باستخدام برنامج الساس (2007). أشارت النتائج إلى أن موسم السنة قد أثر بدرجة معنويةعلى كل من أساليب أو معايير التنظيم الحراري وكذلك مقاييس الدم التي تم تقديرها ف ذكور الماعز الدمشقي والزرايبي. ولقد أظهرت النتائج ان أعلى معدلات أساليب التنظيم الحرارى وهى درجة حرارة المستقيم(RT)، معدل التنفس (RR) ومعدل النبض(PR) كانت في موسم الصيف (39,06 درجة مئوية ، 38,4 حركة / دقيقة و 87,8 نبضة / دقيقة,على التوالى) لذكورالماعز الدمشقى والزرايبى ,وكان ذلك مصحوبا بتسجيل أعلى درجات حرارة للجو وكذلك اعلى قيم لل THI خلال هذا الموسم. تم تسجيل أعلى قيم لـ RBC و Hb و PCV و MCHC (11.8 × 106 / ميكرولتر ، 9,4 جم / دل ، 30,9 ٪ و 31,7 جم / دل)) في فصل الشتاء ، وأعلى قيم لـ MCH MCV (30.4 fl ، 9.0 pg) مع ذلك ، في الصيف ، وتم تسجيل أعلى قيم لـ MCV و MCH (30,4 fl ، و 9,0 pg) في موسم الصيف , بينما تم تسجيل أعلى قيمة (11.4 (× 103 / ميكرولتر) وأقل قيمة (9.1 × 103 / ميكرولتر) لعدد كريات الدم البيضاء (WBC) في فصلي الربيع والشتاء ، على التوالي في عينات الدم المأخوذة من ذكور الماعز الدمشقى والزرايبي. يمكن أن نستنتج من هذه الدراسة أن موسم السنة قد أثر بدرجة معنوية على مقاييس الدم وأساليب التنظيم الحراري التى تم قياسها في ذكور الماعز الدمشقي والزرابي ، ومع ذلك ، كانت قيم جميع القياسات تقع ضمن النطاق الفسيولوجي الطبيعى للماعز طبقا لما ورد في الدراسات السابقة.

أسماء السادة المحكمون:

أ.د. ناجى حامد متولى إبراهيم كلية الزراعة – جامعة بنى سويف

أ.د. سعيد سعيد عمـــــر كلية الزراعة – جامعة المنوفية

Table (4): Seasonal variation of Erythrocytes (RBCs), Leukocytes (WBCs), Hemoglobin (Hb) and Packed Cell Volume (PCV %) in males of Damascus and Baladi goats

Season	R.B.Cs, ($\times 10^6$ /µL)			W.B.Cs, ($\times 10^3$/µL)			Hb, (g/dL)			PCV, (%)		
	Damascus	Baladi	Average	Damascus	Baladi	Average	Damascus	Baladi	Average	Damascus	Baladi	Average
Winter	11.7±0.1	11.8±0.1	$11.8\pm.08^{A}$	8.9 ± 0.2^{d}	9.3 ± 0.2^{e}	9.11 ± 0.1^{D}	9.2±0.2	9.6±0.2	9.4 ± 0.1^{A}	30.4±0.6	29.9±0.6	30.9 ± 0.4^{A}
Spring	10.9±0.1	10.9±0.1	$10.9\pm.08^{C}$	11.1 ± 0.2^{b}	11.7 ± 0.2^{a}	11.4 ± 0.1^{A}	8.6±0.2	8.6±0.2	8.6 ± 0.1^{B}	28.5±0.6	28.9±0.6	28.7 ± 0.4^{B}
Summer	9.1±0.1	8.9±0.1	$9.1\pm.08^{D}$	10.0 ± 0.2^{c}	9.3 ± 0.2^{e}	9.6 ± 0.1^{C}	8.1±0.2	8.3±0.2	8.2 ± 0.1^{C}	26.8±0.6	27.4±0.6	27.1 ± 0.4^{D}
Autumn	11.4±0.1	11.5±0.1	$11.5\pm.08^{B}$	10.1 ± 0.2^{c}	10.1 ± 0.2^{c}	10.3 ± 0.1^{B}	8.2±0.2	8.5±0.2	8.3 ± 0.1^{C}	27.9±0.6	27.5±0.6	27.7 ± 0.4^{C}
Average	10.7±0.5	10.8±0.5		10.02±0.1	10.1±0.1		8.5±0.1	8.7±0.1		28.4±0.3	28.4±0.3	

a, b = Values in the same column or row within certain trait with different super scripts are significantly differed ($P< 0.05$).
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