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PHYSIOLOGICAL RESPONSES AND PRODUCTIVE PERFORMANCE OF GROWING KIDS AS AFFECTED BY BREEDING SEASON IN SOUTH OF EGYPT

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ABSTRACT

The present study was carried out in Hadraba valley, Halayib and Shalateen Research Station, belonging to Desert Research Center, South of Egypt. The study aimed at standing on the effects of changes in seasonal environmental conditions, on physiological, hemato-biochemical responses and growth efficiency of growing kids throughout different seasons of the year.Kids crop of eighty female Baladi goats were distributed randomly in the four seasons of the year (20 does/ each). Changes allover the four seasons in climatic data were studied along with live body weight. Physiological responses, (rectal temperature (RT), respiration rate (RR) and heart rate (HR)) , hematological responses (hemoglobin (Hb), packed cell volume (PCV)) and some blood components, (total serum protein (TP), albumin (AL), globulin (GL), albumin / globulin (A/G) ratio, aspartate aminotransferase (AST), alanine aminotransferase (ALT), glucose, sodium (Na), potassium (K), calcium (Ca), phosphrus (P) and magnesium (Mg)) were also studied .

The environmental conditions were found to be hot along spring, summer and autumn, while winter could be considered as a temperate season, relative humidity was low most of the year. The highest overall means of RT, RR and HR of kids were in the hot seasons (summer and spring and autumn), while the lowest one were at the cold season (winter) . Parameters increased to the plateu level on the days 15 and 30 of age and then decreased significantly with advancing age.

Hemoglobin increased in winter season than in summer .The PCV values showed an oppisit trend. Age significantly affected the Hb and PCV values.The values of TP were higher in spring and summer than in winter and autumn. In winter, the GL decreased; while the AL increased. The trend was reversed in summer. Age showed no significant effect on TP, AL, GL and A/G ratio. The higher overall mean of AST was in spring followed by autumn and summer; the lowest one was in winter. The higher overall mean of ALT was in summer, while the lowest value was in winter. Age significantly ($P<0.01$) affected AST and ALT levels in blood.

Kids showed higher glucose level in spring and summer than in winter and autumn. Glucose level in blood was the highest ($P<0.01$) at birth, then decreased gradually up to weaning. Levels of blood Na and K showed higher ($P<0.01$) values in summer, autumn and spring than in winter season. In the same time levels of Ca and P showed an opposite trend. Meanwhile, Mg did not differ due to season. Only Ca and P increased with advancing age.

Season and sex significantly affected birth and weaning weights and daily gain.

It can be concluded that in Hadraba valley, the hot conditions of summer season exerted heat stress on thermal balance of kids. Moreover, the kids had signs of hemoconcentration during summer. Additionally, liver enzymes increased in summer. Spring season could be considered the best season for raising kids in this region as they showed highest birth and weaning weights and the lowest mortality rate from birth to weaning age in this area.

Keywords: goats, productive performance, season, climate

INTRODUCTION

El-Shalateen-Halayib-Abou-Ramad triangle, located in South of the eastern desert of Egypt is characterized as a subtropical region, and is subjected to extended periods of high ambient temperature. Goats are of economic importance in this region since they are the principal source of meat and milk for local consumption. Under grazing conditions, animals are exposed to wide environmental temperatures ranging from 9°C during winter nights to 50°C or higher in summer days (El-Rayes, 2005) in addition to sustaining intense muscular activity while traveling long distances during feed scarcity. Because the primary nonevaporative means of cooling for the animal (radiation, conduction and convection) become less effective with rising ambient temperature, the animals become increasingly reliant upon evaporative cooling in the form of sweating and panting with increasing air temperature (West, 2003). Goats cannot dissipate sufficient body heat to prevent a rise in body temperature, which is related to decrease dry matter intake resulting in decreasing growth rate of the growing kids, delaying age at puberty and sexual maturity. Kids generate far less metabolic heat than adult goats, have greater surface area relative to internal body mass and would be expected to suffer less from heat stress. There appear to be several factors contributing to slower growth and smaller body size including, greater maintenance requirements during hot weather, poor appetite, and lower quality forages which are influenced by the same environmental conditions that slow growth in goats. However, the effects of changes in environmental conditions due to season on the physiological and productive performance of growing kids in this region were not investigated.

Therefore, the present work was designed to define the effect of different environmental conditions throughout the four seasons of the year, also advancing age on the growing kids from physiologic and productive standpoints.

MATERIALS AND METHODS

The present study was carried out in Hadraba valley, Halayib and Shalateen Research Station belonging to Desert Research Center (DRC), which is located 1400 km south east of Cairo. The study was executed throughout the four seasons of the year on growing kids.

Experimental animals:

The kids crop of eighty Baladi does were used in this study (20 does in each season), in which the number of kids born in each season were 16, 12, 9 and 14 in autmn, winter, spring and summer, respictively . These kids were studied from birth to weaning age, one group in each season of the year. All experimental animals were the product of the main flock which purchased from the same experimental region, so they were expected to be adapted to the local environmental conditions.

Management and feeding:

Kids were kept with their dams in roofed pens with a natural grass and a semi-open yard surrounded by a wire fence. Kids went out daily with dams for grazing the natural pasture for 8 hours in two times. The pasture contained three main plants, namely *Panicum turgidum, Lyicum shawii* and *Acacia tortilis*. An additional 500 gm of concentrate mixture per head was offered to the dams as a supplement. Wheat straw was available *ad lib.* Animals were allowed to drink water twice daily.

Ambient temperature (AT) °C, temperature of solar radiation (TSR) °C and relative humidity (RH) % at the level of the experimental animals were recorded at 07.00 and 14.00 h in pens, simultaneously during recording the physiological responses. Centigrade thermometer, black globe and hygrometer in a weather station near the animals were used to measure the micro-climatic elements.

This study lasted for the four seasons of the year, three monthes from birth to weaning in each season .The experiment was executed to evaluate the physiological, hematological and some blood components responses of the growing kids to the environmental variation in each season as well as to evaluate the productive performance of kids represented by body weight gain.

Measurements:

Growth performance of kids was evaluated through measuring body weight at monthly intervals from the second day of parturition to weaning time using digital balance.

Thermal responses [rectal temperature (RT) in °C, heart rate (HR) in beats per minute; bpm and respiration rate (RR) in resp/min] for each individual kid were recorded biweekly in a previous study (El-Rayes, 2005). Blood samples were taken from all kids on the second day of parturition and at biweekly intervals.

Rectal temperature was measured using a clinical thermometer. Respiration rate was recorded by counting frequency of flank movements per minute; heart rate was measured using a clinical stethoscope.

From each animal two blood samples were taken. The first was for immediate determination of hemoglobin concentration and packed cell volume, and the second for the biochemical analyses.

Hemoglobin concentration (g/dl) was estimated using kits provided by Pasteur Lab. Diagnostic Co., Egypt, while packed cell volume (PCV %) was estimated using microhematocrit tubes containing fresh blood that were centrifuged at 3000 rpm for 15 minutes.

Serum total protein (g/dl) was measured using a clinical refractometer as described by Cannon *et al.* (1974). Serum albumin content (g/dl) was determined using kits provided by Sclavo diagnostics Co., Italy. The concentration of serum globulin (g/dl) was calculated by subtracting serum albumin from serum total protein. Albumin to globulin ratio (A/G) was calculated also.

Alanine aminotransferase (ALT) and aspartate aminotransferase (AST) were determined in the serum using kits provided by Diamond Diagnostics Company (Egypt) according to Reitman and Frankel (1957).

Glucose was analyzed using kits from Pasteur lab. Diagnostic Co., Egypt. The plasma electrolytes in terms of sodium, potassium, calcium, and magnesium and phosphorus concentration in serum were analyzed by kits provided by Biodiagnostic Co., Egypt.

Statistical analysis:

Data were statistically analyzed using General Linear Model (GLM) procedure (SAS, 1998) According to the following model.

$Y_{ijk} = \mu + S_i + A_j + e_{ijk}$,

Where,

Y_{ijk} = any observation,

μ = overall mean,

S_i = the effect of the i^{th} season i = 1-4,

A_j = the effect of the j^{th} ages j = 1-7,

e_{ijk} = residual.

Duncan's new multiple range test was used to compare overall means of body weights in different seasons.

RESULTS AND DISCUSSION

The recorded air temperature (AT) at 14.00 h (the maximum value) was very high during spring, summer and autumn. It ranged from 32.77 to 39.9°C. During winter, it never exceeded 25.11 °C. Relative humidity (RH) was inversely related to AT. Relative humidity reached its highest values during the coldest hours in winter, while it remained low allover the year. This meant that the region was characterized by hot dry environment. The temperature of solar radiation (TSR) was found to augment the environmental heat, especially during hot seasons (spring, summer and autumn). These data revealed that the environmental conditions ranged from hot to very hot during spring, summer and autumn, while winter could be considered as temperate season. Rain fall occurred through November to April, with total amount ranging from 13 to 22mm.

Thermo respiratory responses during different seasons:

Table (1) demonstrates the seasonal changes in RT, RR and HR of kids. Concerning season effect, the highest overall means of RT,RR,HR of kids were in summer and spring (the hot seasons), followed respectively by autumn and winter. Magdub *et al.* (1987) found that RT of kids increased under high environmental temperature. In growing lambs, El-Sherif (1991) found significant positive correlation between RT and AT. Roda *et al.* (1992) reported that season significantly RR of goats, Nandy *et al.* (2001) found seasonal differences (P<0.01) in HR and the values were higher in summer than in winter.

Data also (Table 2) revealed that after kidding the overall mean of RT of kids were at the highest level on days 15 and 30 of age and then significantly decreased with advancing age to reach the lowest values on days 75 and 90 of age). El-Sherif (1991) found significant negative correlation between RT and age in growing lambs. Brody (1945) explained that newly born animals had high metabolic rate due to high growth rate. El-Sherif (1991) found that RR of growing lambs was high within the first month of life, then their morning RR decreased continuously with advancing age, he added that age had more effect on RR than AT, as the newborn lambs need more oxygen to elevate metabolic rate to maintain the vital RT. In the present study, variation in RR of kids indicated only the effect of hot conditions prevailing in summer season. Age of kids significantly (P<0.01) affected their HR. After kidding, overall mean of HR increased gradually, reaching the highest level (90.10 bpm) on day 60, followed by a decrease (81.49 and 80.24 bpm) on days 75 and 90 of age, respectively. Heart rate was stated to primarily reflect the general metabolic level (Reik *et al.*, 1950; Kibler and Brody, 1950; and Thomas and Moore, 1951)

Table (1): Least squares means of rectal temperature (RT), respiration rate (RR) and heart rate (HR) of kids during different seasons

season / measur	Spring	Summer	Autumn	Winter	Overall mean
RR	26.45±0.36	30.48±0.29	28.28±0.32	21.49±0.36	**26.67±0.27****
RT	39.04±0.03	39.09±0.03	38.68±0.03	38.36±0.03	**38.80±0.03****
HR	84.68±0.89	90.26±0.71	83.95±0.79	81.38±0.89	**85.60±0.61****

Adapted from El-Rayes, (2005) ** highly significant (P<0.01)

Table (2): Least squares means of rectal temperature (RT), respiration rate (RR) and heart rate (HR) of kids during different ages

Age / measur	2 wk	4 wk	6 wk	8 wk	10 wk	12 wk	Overall mean
RR	27.01 ±0.41	26.66 ±0.41	25.32 ±0.41	27.53 ±0.41	25.66 ±0.41	27.87 ±0.41	**26.67** ±0.27**
RT	38.96 ±0.04	38.96 ±0.04	38.96 ±0.04	38.96 ±0.04	38.96 ±0.04	38.96 ±0.04	**38.80** ±0.03**
HR	84.88 ±1.01	87.23 ±1.01	85.57 ±1.01	90.10 ±1.01	81.49 ±1.01	80.24 ±1.01	**85.60** ±0.61**

Adapted from El-Rayes, (2005) ** highly significant (P<0.01)

Hemato-biochemical measurements:

Changes in hemato-biochemical measurements of kids in the different seasons are shown in Table (3). Data showed significant differences due to season; only magnesium did not differ due to season. The higher overall means of Hb were in winter (16.51 g/dl) compared with the other three seasons. The present results were in accordance with the findings of Barghout *et al.* (1995) and El-Shafie (1997). Rowlands *et al.* (1979) who reported that blood parameters of cattle were generally high during the coldest months and low during the wormest months of the year. The decrease in Hb value during summer was ascribed to the hemodilution resulting from high water intake under high temperature (Yousef and Johnson, 1985; Reece, 1991; El-Sherif *et al.*, 1995). In the present study, the higher value of Hb in winter compared with the other three seasons may have resulted in changes in water content of the blood and blood viscosity as the total body water decreased with decreasing water intake. The lower water intake during the cold season (winter) would lead to haemoconcentration, which resulted in the relative higher Hb.

Table (3): Least squares means (± SE) of hemoglobin (Hb), packed cell volume (PCV), total protein (TP), albumin (AL), globulin (GL), albumin/globulin (A/G), liver enzymes (ALT,AST), glucose, sodium (Na), potassium (K), calcium (Ca), phosphrus (P), magnesium (Mg) of kids throughout different seasons

Season / Items	Autmen	Winter	Spring	Summer	Overall Mean
Hb	15.46 ± 0.159	16.51 ± 0.179	14.05 ± 0.151	15.67 ± 0.151	**15.50** ±0.100**
PCV	24.59 ± 0.390	23.64 ± 0.4417	29.23 ± 0.468	23.70 ± 0.371	**24.92** ±0.252**
TP	7.04 ± 0.065	7.901 ± 0.074	8.53 ± 0.079	8.18 ± 0.062	**7.86** ± 0.050**
AL	3.07 ± 0.038	3.40 ± 0.0427	3.17 ± 0.045	3.14 ± 0.036	**3.19** ± 0.022**
GL	3.97 ± 0.076	4.50 ± 0.0865	5.17 ± 0.092	5.04 ± 0.073	**4.63** ± 0.051**
A/G	0.80 ± 0.018	0.773 ± 0.021	0.65 ± 0.022	0.65 ± 0.017	**0.72** ± 0.011**
AST	76.86 ± 1.756	62.12 ± 1.987	53.78 ± 2.107	100.44 ± 1.670	**77.44** ± 1.601**
ALT	36.86 ± 0.560	23.10 ± 0.634	21.86 ± 0.672	40.12 ± 0.532	**31.84** ± 0.610**
Glucose	97.80 ± 0.577	64.20 ± 0.653	68.17 ± 0.692	95.47 ± 0.548	**84.46** ± 1.004**
Na	165.81 ± 1.714	146.49 ± 1.939	159.27 ± 2.056	168.26 ± 1.629	**160.91** ± 1.089**
K	8.38 ± 0.110	6.58 ± 0.125	7.89 ± 0.132	9.01 ± 0.105	**8.09** ± 0.083**
Ca	8.59 ± 0.087	10.14 ± 0.098	10.49 ± 0.104	8.76 ± 0.083	**9.30** ± 0.072**
P	5.61 ± 0.137	7.92 ± 0.155	7.48 ± 0.165	5.91 ± 0.130	**6.56** ± 0.106**
Mg	2.59 ± 0.036	2.53 ± 0.040	2.50 ± 0.043	2.51 ± 0.034	**2.53NS ± 0.021**

** Highly significant differences (P< 0.01) NS non significant

Reece (1991) explained that the lower Hb concentration in summer might be a physiological mechanism to decrease the metabolic heat production under high AT through reducing O_2 uptake. In addition, increasing water intake under hot conditions was found to increase body fluid contents resulting in a case of hemodilution (El-Sherif and El-Hassanein, 1996). Table (4) showed that age had significantly ($P< 0.01$) affected Hb level in blood which tended to decrease with age.since the highest values were at birth and two weeks of age (15.71 and 16.15); thereafter, it decreased to the lowest value at weaning age (15.04). The higher Hb concentration in younger ages might be a physiological mechanism to increase the metabolic rate through increasing O_2 uptake during the early postnatal period.

The PCV values (Table 3), showed a reverse trend to that of Hb, were PCV was significantly ($P< 0.01$) higher during spring months (29.23%) than in winter months (23.64%). El-Nouty et al. (1989) stated that the rise in ambient temperature during summer is associated with significant increase in PCV of goats. In the present study, the hot weather of spring and summer resulted in decreasing Hb concentration with slight increase in PCV. This means that the Hb content of the corpuscles decreased by high AT to decreased O_2 uptake and consequently metabolic heat production. This may be due to producing immature RBC_s under heat stress Also data in table, (4) showed that PCV values were significantly ($P< 0.01$) affected by age, in which they increased with advancing age, the highest value was(27.01%)at weaning age (27.01%).

In the present study, values of Hb concentration (14.05 to 16.50 g/dl) were obviously higher than the species' mean reported by El-Shafie (1997) and Badawy (1998), who reviewed values between 10.0 to 14.2 g/dl. However, the values of PCV (23.6% to 29.23%) were lower than the species' average (32.25%) reported by Shebaita (1993). This means that throughout the year hemoglobin content in the red corpuscles increased to compensate for lower PCV. In addition, Hadraba valley lies on high altitude (370 m above the sea level, (Egyptian General Survey Authority, Sheet NF 37 12A); a condition which favors increasing Hb content to face the low air oxygen pressure. Stickney *et al.* (1964) stated that the affinity for oxygen at high altitude increased, as the physical property of the erythrocytes in goats had to improve the oxygen supply to the cells hence the Hb concentration is increased.

Table (3) demonstrated that the differences among means of TP, AL, GL (g/dl) and A/G ratio, due to season were highly significant ($P<0.01$). The values of TP were higher in spring and summer (8.53 and 8.18 g/dl, respectively) than in winter and autumn (7.90 and 7.04 g/dl, respectively). The increase of TP in spring and summer was due mainly to significantly higher GL indicating that heat stress increase GL synthsis. Appleman and Delouche (1958) and More *et al.* (1978) found that plasma TP concentration of goats increased when exposed to high ambient temperature (40 °C). In the present study, overall mean of TP and GL was the highest during spring (8.53 and 5.17 g/dl, respectively), while AL was moderately low (3.17) resulting in low A/G ratio (0.644). Abdel-Barry (1990) demonstrated an increase in GL in summer as an attmept to increase the plasma TP in order to maintain the osmotic pressure. In addition, El-Nouty *et al.* (1989) reported that the exposure to heat increased the production of antibodies (globulin) in different species of domestic animals. Under hot conditions, fluids were reported to be drawn into the circulation causing a decrease in TP concentration (Khalil *et al.*, 1985), but acclimatized animals can manufacture the protein rapidly to restore blood osmotic pressure (Davson and Eggleton, 1962).

In winter, the GL decreased (overall mean was 4.49 g/dl); while the AL increased (overall mean was 3.4 g/dl). The case was reversed in summer where GL was high (5.04 g/dl) and AL was the lowest (3.14 g/dl). As a result, the levels of TP in autumen and winter showed low values, but A/G ratio was the highest in autumn and winter and lowest in spring and summer. Opposite results were found by El-Sherif *et al.* (1996) who reported that exposure to sun rays resulted in significant increase in A/G ratio. Khalifa (1982) suggested that the high A/G ratio in hot season would increase plasma colloid osmotic pressure which might help the animal to conserve water. Albumin was stated to be an important factor in maintaining osmotic equilibrium between blood and the tissue fluids due to its hydrophilic properties (Swenson, 1977). The same author stated that under hot conditions, keeping blood volume is essential, either for high specific heat of water or the need of evaporative cooling of body temperature. The above results may suggest that under high altitude heat stress increased the production of GL in kids may be to increase their immunity.

Table (4) showed that age had no significant effect on TP, GL, AL and A/G ratio from birth to weaning.

The highest overall mean of AST (Table 3) was in summer (100.44 IU/L) which was respectively and significantly followed by autumn (76.86 IU/L), having the lowest values in spring and winter (53.78 and 62.1 IU/L respictively). However, all means were in the normal range as demonstrated by Juma *et al.* (2001). The different levels of AST during the four seasons might be due to the differences in quantity and quality of available roughages in the natural range. Differences in chemical composition of feed stuffs might cause a more release of AST and ALT more than the normal range (Ismail *et al.*, 2003).

The highest overall mean of ALT was in summer (40.12 IU/L), followed by autumn (36.86 IU/L). The lowest overall means were in spring and winter (21.86 and 23.1 IU/L). It was obvious that only summer conditions exerted moderate stress on the liver function of the experimental kids as indicated by the alteration in the levels of ALT and AST.

The increases in hepatic enzymes activity in different animal species due to high ambient temperature or summer hot conditions were reported by Khalil *et al.* (1985), Ashmawy (2000) and Gawish *et al.* (2003) signifying moderate hyper-function of liver. In the present study, the increased level of both enzymes in summer season indicated more than moderate hyper-function of liver. This was due to the stress of hot conditions. Data in table(4) showed that age significantly ($P< 0.01$) affected AST and ALT levels in blood, in which the levels fluctuated with iecreaseing age. This fluctaution might be due to the differences in quantity and quality of available roughages in the natural range

Table (3) illustrated that plasma glucose differed significantly (P< 0.01) due to season, in which autmn and summer showed higher values (97.8 and 95.5, respectively) than that of winter and autmn (64.2 and 68.2, respectively). This might be due to the increase in glucose utilization to produce more heat to avoid cold stress. Also age significantly (P< 0.01) affected glucose level in blood, which showed the highest value at birth (85.75), then decreased gradually to reach the lowest value (78.36) at weaning. This may be due to kids utilize more glucose with advancing age to produce more energy to cover muscular expenditure resulting from the increseang in muscular activity.

(Table 3) showed that plasma Na levels significantly (P< 0.01) differed due to season, which showed higher values in summer, autumn and spring (168.26 and 165.81 and 159.27, respictively) than that of winter season (146.49) which represents the cold months. This may be due to more more water (rich in sodium) in hot seasons. It seems also that the kids have evolved adaptive measures to cope with the variation in the plasma electrolyte with the hot and cold seasons. Also age (Table 4) showed a significant (P< 0.01) effect on Na and K level in plasma, since the lowest values were recorded at birth and two weeks after birth, after this the levels fluctauated up to weaning age. Also plasma K levels showed a significant (P< 0.01) differences due to season . The highest values were recorded in summer, autmn and spring (9.01, 8.38 and 7.89 respictively) while the lowest value was in winter (6.58). This might be due to the equilibrium between Na and K levels in blood. The higher Na and K under hot climate may be an adaptive mechanism to maintain plasma volume in kids.

At the same time, Ca showed an opposite trend in which values in winter and spring (10.14 and 10.49, respectively) were higher than those of summer and autmn (8.76 and 8.59 respectively). Radostitis et al (2000) reported that hypocalcaemia could occur in ewes at the end of drought season when the pasture growth is luxuriantand very low in calcium content. The same trend of calcium was followed by phosphorus since the values in winter and spring (7.92 and 7.48 respectively) were significantly (P<0.01) higher than that of summer and autmn (5.91 and 5.61 respectively). Equilibrium between Ca and P levels in blood might be attriurtable. Also table (4) showes that calcium levels in blood significantly (P< 0.01) increased with increasing age (9.12 at birth and 9.891 at weaning), this might be due to that the new born kids use more calcium for building their bones. Similar trend was found in P where values were affected by age (P< 0.05), the lowest values for were at birth (6.35) after this they increased gradually up to1.5 month (7.13) then fluctuated in narrow range up to weaning age (from 6.87 to 6.57), as an the equilibrium between Ca and P levels in blood. Care (1994), suggested that when sheep were fed a very low calcium diet, there was an increase in the efficiency of absorption of both calcium and phosphorus from the small intestine. Abd El-Hafez, et al (1982),. reported that dietry phosphorus deficiency reduced the efficiency of intestinal calcium absorption. Meanwhile, magnesium did not differ due to season, but showed a fluctuation from birth to weaning (2.44 to 2.71, respictively).

The normal serum mineral values obtained in the present work may be due to the normal concentration of such minerals in forages and water consumed by such animals.

Table (4): Least squares means (± SE) of hemoglobin (Hb), packed cell volume (PCV), total protein (TP), albumin (AL), globulin (GL), albumin/globulin (A/G), liver enzymes (ALT,AST), glucose, sodium (Na), potassium (K), calcium (Ca), phosphrus (P), magnesium (Mg) of kids throughout different ages from birth to weaning age .

Item \ Age	Birth	2 weaks	4 weaks	6 weaks	8 weaks	10 weaks	12 weaks	Overall
Hb	15.71 ±0.206	16.15 ±0.211	15.18 ±0.211	15.31 ±0.218	15.26 ±0.230	15.30 ±0.246	15.04 ±0.251	**15.50** ±0.100**
PCV	25.33 ±0.508	24.17 ±0.519	24.17 ±0.519	25.56 ±0.536	26.50 ±0.568	24.30 ±0.607	27.01 ±0.619	**24.92** ±0.252**
TP	7.87 ±0.085	8.11 ±0.087	7.92 ±0.087	7.90 ±0.090	7.77 ±0.095	7.81 ±0.102	8.00 ±0.104	**7.86^{NS} ±0.050**
AL	3.16 ±0.049	3.20 ±0.050	3.31 ±0.050	3.20 ±0.052	3.18 ±0.055	3.08 ±0.059	3.23 ±0.060	**3.19^{NS} ±0.022**
GL	4.70 ±0.099	4.58 ±0.102	4.61 ±0.102	4.70 ±0.105	4.59 ±0.111	4.74 ±0.119	4.77 ±0.121	**4.63^{NS} ±0.051**
A/G	0.71 ±0.024	0.73 ±0.024	0.75 ±0.024	0.72 ±0.025	0.73 ±0.027	0.67 ±0.028	0.70 ±0.029	**0.72^{NS} ±0.011**
AST	82.47 ±2.285	77.33 ±2.334	73.95 ±2.334	81.13 ±2.412	71.92 ±2.554	67.27 ±2.731	59.04 ±2.785	**77.44** ±1.601**
ALT	29.19 ±0.729	28.89 ±0.744	28.82 ±0.744	31.39 ±0.769	34.00 ±0.814	31.40 ±0.871	29.70 ±0.888	**31.84** ±0.610**
Glucose	85.75 ±0.751	82.063 ±0.767	81.93 ±0.767	82.32 ±0.792	80.95 ±0.839	78.50 ±0.897	78.36 ±0.915	**84.46** ±1.004**
Na	155.83 ±2.230	152.83 ±2.278	167.59 ±2.278	165.30 ±2.353	160.68 ±2.492	159.90 ±2.665	157.58 ±2.717	**160.91** ±1.089**
K	7.91 ±0.143	7.80 ±0.147	8.41 ±0.147	7.92 ±0.151	8.25 ±0.160	7.91 ±0.171	7.54 ±0.175	**8.09** ±0.083**
Ca	9.117 ±0.113	9.15 ±0.115	9.68 ±0.115	9.56 ±0.119	9.59 ±0.126	9.53 ±0.135	9.82 ±0.138	**9.30** ±0.072**
P	6.35 ±0.178	6.96 ±0.182	7.13 ±0.182	6.87 ±0.188	6.66 ±0.199	6.57 ±0.213	6.58 ±0.217	**6.56* ±0.106**
Mg	2.57 ±0.046	2.45 ±0.047	2.54 ±0.047	2.44 ±0.049	2.71 ±0.052	2.53 ±0.055	2.50 ±0.056	**2.53** ±0.021**

*** Significant differences (P< 0.05)   ** highly significant differences (P< 0.01)   NS non significant**

Live Body Weight:

Tables (5 and 6) showed the variation in live body weight (BW) of kids from birth to weaning, and the effects of kidding season and sex on BW and daily gain. Averages of birth weight were 2.16, 2.80, 3.04 and 2.90 kg in autumn, winter, spring and summer, respectively, in which the differences were significant. The corresponding values of daily gain from birth to weaning were 51.4, 54.0, 62.0 and 47.2 g/day, respectively. Weaning weights were 6.79, 7.67, 8.63 and 7.14 kg during autumn, winter, spring and summer, respectively.

Table (5): Least squares means (± SE) of kids' body weights (kg) and daily gain (g/day) from birth to weaning during different breeding seasons

Age \ Season	Autumn	Winter	Spring	Summer	Overall means
Birth (kg)	2.16±0.11[b]	2.80±0.13[a]	3.04±0.14[a]	2.90±0.10[a]	**2.68±0.09**[**]
1[st] month	3.51±0.21[b]	4.73±0.24[a]	5.02±0.26[a]	4.44±0.19[a]	**4.35± 0.17**[**]
2[nd] month	5.33±0.25[b]	6.53±0.27[a]	6.95±0.29[a]	5.99±0.22[a]	**6.09± 0.19**[**]
3[rd] (Weaning month)	6.79±0.25[b]	7.67±0.29[ab]	8.63±0.32[a]	7.14±0.23[ab]	**7.40± 0.19**[**]
Gain from birth to weaning	51.4 ± 2.2[b]	54.0 ±2.5[ab]	62.0 ± 2.8[a]	47.2 ± 2.0[b]	**52.4± 5.50**[**]

** Highly significant differences (P< 0.01)
Means in the same row having the same superscript are not significantly different

Table (6): Effect of sex on the variation of kids' body weight (kg) and gain (g/day)

Age	Sex	
	Male	Female
Birth (kg)	3.07 ± 0.09[a]	2.37 ± 0.08[b]
1[st] month	3.05 ± 0.17[a]	3.76 ± 0.15[b]
2[nd] month	6.87 ± 0.19[a]	5.53 ± 0.17[b]
weaning (3[rd] month)	8.29 ± 0.20[a]	6.83 ± 0.18[b]
Gain from birth to weaning	55.9 ± 3.80[a]	49.2 ± 2.90[b]

Means in the same row having the same superscript are not significantly different

Season affected significantly ($P < 0.01$) live body weight and daily gain of kids allover the experimental period. The highest values of birth and weaning weights and daily gain were recorded in spring, while the lowest weights were in autumn. Mourad, (2001), reported that the effect of season of kidding on birth weight was highly significant. In the same trend Jagtap *et al.* (1988) and Badawy (1998) found that the kids born in winter were heavier than those born in other seasons. Holmes *et al.* (1986) reported that stress in summer had an adverse effect on the birth weight of kids through negative effect on the body contents of nitrogen, fat and ash. Nagpal and Chawla, (1984) reported that the effect of season of kidding on weaning weight was also significant , the main factors affecting weaning weight are reported to be breed, birth weight, sex of kids, type of birth, season, and dams' age and weight.

Male kids showed significantly (P < 0.01) higher birth weight than female (3.07 vs. 2.37 kg), higher daily gain from birth to weaning (55.9 vs. 49.2 g/day) and weaning weight (8.29 vs. 6.83 kg) (Table 6). Roy *et al.* (1989) reported that male kids were always heavier at birth than females. Sandchez *et al.* (1994) reported that sex of kids affecting birth weight by 8.8%. Guha *et al.* (1968) and Haider (1982) attributed the large size and heavier weight of the males at birth to action of the male hormones on the growing fetus during pregnancy.

Nevertheless, the changes in live body weight of kids could not give alone a clear conclusion about the efficiency of kidding season, since the number of kids bom and weaned per doe joined must be considered. In which number of kids born were 16, 12, 9 and 14 in autumn, winter, spring and summer seasons, respectively. Also, number of kids weaned were 9, 7, 7 and 11 in autumn, winter, spring and summer seasons, respectively. Mortality rates were 0.44, 0.42, 0.22 and 0.21 in autmn, winter, spring and summer season respectively. For this it might be concluded that spring season is considered the best season for kidding in which the highest birth and weaning weights and the lowest mortality rate from birth to weaning age were recordedTable 7)..

Tabe (7): Number of kids born, weand and mortality rates in different seasons

Season.	Autumn	Winter	Spring	Summer
No. of kids born	**16**	**12**	**9**	**14**
No. of kids weaned	**9**	**7**	**7**	**11**
Morality rate from birth to weaning	**0.44**	**0.42**	**0.22**	**0.21**

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الاستجابات الفسيولوجية والأداء لأنتاجي للجداء النامية تحت الظروف الموسمية في جنوب مصر

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أجريت هذه الدراسة في وادي حدربة بمحطة خلايب وشلاتين التابعة لمركز بحوث الصحراء في جنوب مصر وذلك بهدف دراسة تأثير التغير في الظروف البيئية نتيجة تغير الموسم وكذلك تأثير العمر علي الأستجابات الفسيولوجية والبيوكيميائية في الدم والكفاءة الأنتاجية (الزيادة في الوزن) للجداء النامية خلال المواسم المختلفة للسنة.

استخدم في هذه التجربة محصول الجداء لعدد 80 عنزه وزعت علي أربعة مواسم (20 عنزه لكل موسم).

أظهرت النتائج أن الظروف المناخية كانت حارة خلال مواسم الصيف والربيع والخريف بينما فصل الشتاء يعتبر معتدل وكذلك الرطوبة كانت منخفضة معظم السنة.

الأستجابات الفسيولوجية (حرارة المستقيم والتنفس ومعدل ضربات القلب) سجلت أعلي المتوسطات خلال موسمي الصيف والربيع بينما كانت اقل في فصلي الشتاء والخريف وكذلك كانت أعلي المتوسطات بعد الميلاد ثم تناقصت معنويا بعد ذلك بتقدم العمر حتي الفطام.

تأثر الهيموجلوبين و نسبة المكونات الخلوية (PCV) معنويا بتغير الموسم حيث ان قيم الهيموجلوبين كانت اعلي في موسم الشتاء عن الصيف بينما قيم ال PCV كانت العكس. وكذلك كان هناك تأثير للعمر علي الهيموجلوبين و نسبة المكونات الخلوية (PCV) حيث يقل بتقدم العمر.

تاثرت قيم البروتينات الكلية والالبيومين والجلوبيولين بالموسم حيث كانت البروتينات الكلية اعلي في الصيف والربيع عن فصلي الشتاء والخريف. وكذلك قيم الجلوبيولين تناقصت في الشتاء بينما زاد الالبيومين. وكذلك نسبة الالبيومين الي الجلوبيولين كانت أعلي في فصلي الشتاء والخريف مقارنة بالصيف. ولم يظهر العمر تاثير معنوي علي البروتينات الكلية والالبيومين والجلوبيولين.

تأثرت انزيمات الكبد معنويا بالموسم حيث سجلت اقل قيم في فصل الشتاء وكذلك كان هناك تاثير معنوي للعمر علي انزيمات الكبد.

تاثر تركيز الجلوكوز في الدم معنويا بالموسم حيث كانت اعلي القيم في موسم الصيف مقارنة بالشتاء وكذلك كان هناك تأثير للعمر علي تركيز الجلوكوز في الدم. ايضا كلا من الصوديوم والبوتاسيوم تاثروا معنويا بالموسم والعمر حيث كانت اعلي القيم في مواسم الصيف والخريف والربيع مقارنة بموسم الشتاء. بينما الكالسيوم والفسفور كانت القيم اعلي في الشتاء والربيع مقارنة بالصيف والخريف. بينما تركيز الماغنسيوم في الدم لم يتاثر معنويا بالموسم.

أظهرت الدراسة ان وزن الميلاد والفطام والزيادة اليومية في وزن الجداء تأثرت معنويا بالموسم حيث سجلت أعلي النتائج في موسم الربيع عنها في باقي المواسم. وكذلك كان هناك تاثير للجنس حيث سجلت الذكور اعلي اوزان سواء الميلاد أو الفطام أوالزيادة اليومية في الوزن.كذلك أنخفضت نسبة النفوق في موسمي الصيف والربيع عنها في موسمي الشتاء والخريف.

يمكن الاستنتاج من الدراسة أن الظروف البيئية الحارة خلال فصل الصيف سببت اجهاد حراري اثر علي التوازن الحراري للجداء النامية ونتج عنها زيادة تركيز مكونات الدم مثل البروتينات الكلية بالاضافة الي انخفاض نسبة الالبيومين الي الجلوبيولين مشيرا الي نقص القدرة علي الحفاظ علي حجم سوائل البلازما. وكذلك يمكن الاستنتاج ان موسم الربيع يعتبر احسن المواسم لانتاج الجداء حيث سجل اعلي وزن للميلاد والفطام وأعلي زيادة في الوزن وأقل نسبة نفوق من الميلاد حتي الفطام وذلك في جنوب مصر.