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LIST OF ABBREVIATIONS

Alb/Glb ratio	Albumin /Globulin ratio
Alb	Albumin
Ald	Aldosterone.hormone
ALT	Alanine aminotransferase
AST	Aspartate aminotransferase
AT	Ambient temperature
BV	Blood volume
CO2	Carbon dioxide
ECF	Ectracellular fluids
ECW	Ectracellular water
Fig.	Figure
Figs.	Figures
g.	Gram
Glb	Globulin
Glu.	Glucose
GV	Gas volume
h.	Hour
HP	Heat production
K	Potassium ion
Kg	Kilo gram
L	Liter
LBW	Live body weight
meq/L	Milliequivalent per liter
mg/dl	Milligram per deciliter
Na	Sodium ion
No.	Number
°C	Cellesios
RH	Relative humidity
RIA	Radioimmuno assay
RQ	Respiratory quotient
RR	Respiration rate
Sig.	Significant
ST	Skin temperature
T₃	Triiodothyronine hormone
TBF	Total body fluids

List Of Abbreviations

Temp.	Temperature
THI	Temperature humidity index
TP	Total protein
TV	Tidal volume
VCo₂	Carbon dioxide production
VO₂	Oxygen consumption
ECF	Extracellular fluid
ICF	Intracellular fluid
ISF	Interstitial fluid
PV	Plasma volume

V. Summary

This study was carried out during the period from January to September 2013 in the Animal Production Research Institute, Animal Production Research Institute, Agricultural Research Center, Mallawi, ElMinia Governorate, Upper Egypt. Where it was used 15-20 animals of every age group and different situations physiological, it was lambs one day of age, one week of age, one month of age, two months of age, adult males 18 months, dry, pregnant and lactating ewes.

The hypothesis of this study was based on assessments of LBW, body fluids, blood metabolites (T. protein, Alb, Glb, Alb/Glb ratio, triglycerides, Glu. and urea), electrolytes (Na and K), enzymes (ALT and AST), hormones (T3, Ald. and testosterone), heat production, RR and RT, which may play an important role in diagnosis of physiological conditions that affect production and reproduction of Farafra sheep. The most revealing results obtained from the present study are as follows:

The results can be summarized as follows:

I. Farafra lambs:

- Mean LBW of lambs two months of age were significantly increased ($P<0.05$) in summer than winter.
- Rectal temperature of the newborn lambs (one day) and one week of age was significantly higher ($P<0.01$) than lambs at two months age. Newborn lambs were influenced significantly ($P<0.01$) by season,
- Respiratory rate values of lambs were influenced significantly ($P<0.01$) with season and age of lambs.
- Concentrations of TP, Alb and Glb as well as Alb/Glb in plasma of lambs as affected by season and age. Concentration of TP in blood

plasma of lambs with one week of age were significantly greater in winter than summer.

- Alb and Glb levels of the lambs was significantly greater in winter than summer. Glb was greater ($P<0.01$) in the lambs with one day, one week and two months of age in winter than summer.
- Glucose concentration of lambs was higher insignificantly in winter than summer. Also, Concentration of glucose was higher ($P<0.05$) in the lambs with first week of age in winter than summer.
- Triglycerides of the lambs at one day age was higher significantly and then decreased to reach to the lowest value one month age, also, No significant difference in summer and winter. The interaction between age and season showed that one week and one month were ($P<0.05$) influenced by season.
- Urea concentration of lambs in one day of age ($P<0.05$) influenced by season where the largest concentration for urea occurred in the lambs with one day of age in winter compared with summer, while it was higher in the lambs with two months of age in summer than winter.
- The lowest level of ALT was observed in one day and then increased significantly ($P<0.01$) to reach to the highest levels at one month of age. ALT was significantly ($P<0.01$) higher in summer than winter. AST concentration was not influenced by age or season.
- Concentration of K was paralleled with Na where the value of K was lower significantly ($P<0.01$) in winter than summer. Lowest concentration of Na was observed in one day age and then increased significantly ($p<0.01$) to the highest values in one month. The lowest concentration of K was in one day old lambs in winter than summer.
- The mean concentration of T_3 increased ($P<0.01$) in one day of age and decreased gradually to reach to the lowest values at two month of age, while T_3 level was higher insignificantly in winter than summer. T_3

concentration increased in the lambs with one day and one week of age in summer then decreased after that in the other ages of lambs.

- Mean concentration of Ald. increased ($P<0.01$) in one day of age and decreased gradually to reach to the lowest values at two month of age, while Ald. level was higher insignificantly in winter than summer season. Largest concentration for Ald. occurred in the lambs at one day of age in summer than winter, while the lowest level for Ald. occurred in the lambs at two months of age in summer than winter.

II. Farafra rams:

- Live body weight of rams was not influenced by season
- RR and RT in rams were influenced significantly ($P<0.05$) by season, where RT were higher in winter than summer but RR was higher in summer than winter.
- T. protein concentration was influenced by season, where the concentration was higher in winter than summer. But, Alb, Glb and Alb/Glb ratio were not influenced by season. Although Alb and Glb concentrations were slightly higher in winter than in summer.
- In general, there was positive correlation between Alb and Alb/Glb ratio in summer ($r= 0.57$; $P<05$). Glb concentration was negatively correlated with Alb/Glb ratio ($r= -0.95$; $P<05$) in summer, while in winter, Glb was negatively with each Alb/Glb ratio ($r= -0.82$; $P<05$).
- Plasma glucose concentration was significantly ($P<0.05$) higher in summer (60.14 ± 2.27 mg/dl) than winter (55.34 ± 3.70 mg/dl).
- Triglycerides concentration was influenced by season, it was ($P<0.05$) higher in winter (34.72 ± 8.14 mg/dl) than summer (31.14 ± 11.00 mg/dl).
- Urea concentration was significantly ($P<0.05$) higher in winter (42.72 ± 4.14 mg/dl) than summer (38.11 ± 1.57 mg/dl).
- ALT and AST were not influenced by season in Farafra rams.

- The concentration of Na and K were influenced by season, where Na was higher in winter than summer; in contrast, the K concentration was higher in summer than winter.
- T_3 and Aldosterone was influenced significantly ($P<0.05$) by season, where T_3 concentrations were higher in winter than summer; in contrast, the concentrations of Ald. was ($P<0.05$) higher in summer than winter.

III. Dry, pregnant and lactating ewes of Farafra:

- LBW of dry, pregnant and lactating ewes were influenced by season, where LBW in pregnant ewes was ($P<0.05$) greater than dry and lactating ewes in summer, also in winter.
- The temperature of Rectal of lactating ewe was significantly higher ($P<0.05$) than dry and pregnant ones. In the same time, RT was elevated ($P<0.05$) winter than summer. The interaction between season and physiological status show that RT degree in dry ($P<0.05$) relatively higher in winter than summer.
- RR of pregnant ewe was significantly higher ($P<0.05$) than dry and lactating ones. In the same time, RR was elevated ($P<0.05$) summer than winter. The interaction between season and physiological status show that RR degree in dry, pregnant and lactating ($P<0.05$) relatively higher in summer than winter.
- Total protein concentration (TP) of dry ewe was significantly higher ($P<0.05$) than lactating ones. In the same time TP was not influenced by season. The interaction between season and physiological status show that TP in dry, pregnant and lactating ($P<0.05$) relatively higher in summer than winter.
- Albumin concentration (Alb) of dry ewe was significantly higher ($P<0.01$) than pregnant and lactating ewes. In the same time, Alb was not influenced by season. The interaction between season and

physiological status show that Alb concentrations in dry and lactating were higher ($P<0.01$) in winter than summer, while Alb was higher ($P<0.01$) in summer in pregnant than winter.

- Globulin concentrations (Glb) were not influenced by physiological status and season. The interaction between season and physiological status of ewes showed that Glb levels were higher ($P<0.05$) in summer than winter, while in pregnant ewes, Glb concentration was ($P<0.05$) relatively higher in winter than in summer.
- Ratio of Alb/Glb was not influenced by season. However, the ratio of Alb/Glb of dry and pregnant ewes were influenced ($P<0.05$) by physiological status. Where, the ratio in the dry ewes was ($P<0.05$) higher than pregnant and lactating ewes. The interaction between season and physiological status of ewes showed that Alb/Glb ratio of dry ewes was ($P<0.05$) higher in winter than summer. On contrary, Alb/Glb ratio of pregnant and lactating ewes were ($P<0.05$) higher in summer than winter.
- Glucose levels were significantly higher ($P<0.01$) in dry and pregnant ewes than lactating ones. Glucose concentration was higher ($P<0.01$) in winter than in summer. The interaction between season and physiological status showed that glucose levels did not differ significantly.
- Triglycerides levels were significantly higher ($P<0.01$) in dry and pregnant ewes than lactating ewes. Triglycerides concentration was higher ($P<0.01$) in winter than in summer. The interaction between season and physiological status showed that triglycerides levels did not differ significantly.
- Urea concentrations of dry and lactating ewes were significantly higher ($P<0.01$) than pregnant ones. However, urea concentration was significantly ($P<0.01$) higher in winter than summer season. Likewise,

ewes were influenced by season and physiological status, where urea levels were higher ($P<0.01$) in dry ewes in summer while pregnant and lactating ewes were higher ($p<0.01$) in winter than summer.

- ALT concentration was higher ($P<0.01$) in dry than pregnant and lactating ewes, while ALT increased ($P<0.01$) in summer when compared with winter. The interaction showed that ALT levels were higher ($P<0.01$) in dry and lactating than pregnant in summer than winter season.
- AST concentration in lactating was higher ($P<0.01$) than dry and pregnant ewes, while the level of AST was higher ($P<0.01$) in summer than winter ones. According to season and physiological status, dry, pregnant and lactating ewes exhibited higher values ($P<0.01$) of AST levels in summer than winter.
- Na concentrations were higher ($P<0.01$) in dry and pregnant ewes than lactating one, where Na concentration was not influenced by season. In the same time Na concentrations were not affected by interaction between season and physiological status.
- K concentrations were higher ($P<0.01$) in dry and pregnant ewes than lactating ewes. In the same time, season had no significant effect on the blood levels of K. Likewise, K concentrations were not affected by season and/or physiological status.
- Triiodothyronine (T₃) concentrations were higher ($P<0.01$) in pregnant and lactating than dry ewes, while winter was higher significantly ($P<0.01$) than summer in the level of T₃ hormone. In the same time T₃ concentrations were increased ($P<0.01$) in lactating ewes in winter than in summer.
- Aldosterone (Ald.) concentrations in pregnant ewes were ($P<0.05$) greater than dry and lactating ones. Season had no significant effect in

the levels of aldosterone. Ald. concentrations were no significant affected by season or physiological status.

IV. Blood gases and heat production as affected by :

1- Age of lambs

- Blood gases changed of lambs as influenced by age and season are presented.
- Heat production of lambs at two months old was significantly influenced by season; it was higher in summer than in winter. Data also indicated that heat production of lambs at one day old was insignificantly lower within summer and winter.

2- Rams:

- Heat production in rams was influenced by season it was ($P < 0.05$) higher in summer than winter. Also the correlation coefficients were highly significant correlated.

3- Physiological status (Dry , pregnant and lactating):

- The current study show that all experimental trials (gas volume, tidal volume, VO_2 , VCO_2 and heat production) were higher significantly ($P < 0.01$) in pregnant and lactating ewes than dry ones while RQ showed as opposite direction which its value was higher ($P < 0.01$) in dry compared with pregnant and lactating ewes. At the same time, season had a significant effect only on tidal volume and VCO_2 which tidal volume was higher ($p < 0.01$) in winter, Volume CO_2 was higher ($P < 0.01$) in summer compared with other season. Tidal volume was higher ($P < 0.01$) in dry and lactating ewes than pregnant ones. RQ percent was higher ($P < 0.01$) in dry in winter while lactating ewes higher ($P < 0.01$) in summer.

V. Body fluids as affected by:

1. Rams

- The percentages of total body fluid (TBF), intracellular fluid (ICF), interstitial fluid (ISF), and plasma volume (PV) were ($P < 0.05$) influenced by season, where TBF, ICF and ISF were not significantly higher in summer than in winter. Otherwise, season did not influence on extracellular fluid (ECF) in rams. TBF was positively correlated with ECF% ($r = 0.85$; $P < 0.01$). Also, ECF was positively correlated with ISF ($r = 0.95$; $P < 0.01$), while negatively correlated with PV%, ICF% and BV%. PV was negatively correlated with ISF% ($r = -0.82$; $P < 0.05$).

2. Physiological status (Dry, pregnant and lactating):

- Percentages of PV%, ISF% and BV% in dry, pregnant and lactating ewes were influenced by season, where PV% and BV% were ($P < 0.05$) higher in winter (5.72 ± 0.35 and 8.42 ± 0.55) than their percentage in summer (4.46 ± 0.29 and 6.17 ± 0.41). Otherwise, percentages of body fluids compartments (TBF, PV, ICF, ISF and BV) were not influenced by physiological status, except ECF%, where it was ($P < 0.05$) higher in dry ewes (24.49 ± 1.33) than their percentage in pregnant and lactating ewes (20.34 ± 1.33 and 20.81 ± 0.69).
- The interaction between season and physiological status showed that percentages of TBF, PV, ICF, ISF and BV did not differ significantly.
- TBF% was positively correlated with ECF% ($r = 0.34$; $P < 0.05$), ICF% ($r = 0.86$; $P < 0.01$) and ISF% ($r = 0.37$; $P < 0.01$); and negatively with PV% ($r = -0.13$) and BV% ($r = -0.12$). ECF% was positively correlated with PV% ($r = 0.10$), ISF% ($r = 0.93$; $P < 0.01$) and BV% ($r = 0.08$); and negatively with ICF% ($r = -0.20$). PV% was positively correlated with BV% ($r = 0.99$; $P < 0.01$); and negatively with ICF% ($r = -0.19$) and ISF% ($r = -0.25$). ICF% was negatively correlated with ISF% ($r = -0.13$) and BV% ($r = -0.17$). ISF% was negatively correlated with BV% ($r = -0.26$).

VI. Conclusion

The hypothesis of this study was based on assessments of body fluids (TBF %, ECF %, ICF, ISF % and PV %), blood metabolites (T. protein, Alb, Glb, Alb/Glb ratio, triglycerides, glucose and urea), electrolytes (Na and K), enzymes (ALT and AST), hormones (T₃, and aldosterone), heat production, RR and RT in summer and winter. These may play an important role in diagnosis of physiological conditions that affect production and reproduction of Farafra sheep.

The results can be concluded as follows:

- Mean LBW of lambs two months of age were significantly increased ($P<0.05$) in summer than winter.
- LBW in pregnant ewes was ($P<0.05$) greater than dry and lactating ewes in summer, also in winter.
- RT of dry ($P<0.05$), rams and lambs ($P<0.01$) were higher in winter than summer, but RR was higher in summer than winter.
- Concentrations of TP, Alb, Glb and Alb/Glb in blood plasma of lambs and rams were significantly greater in winter than summer. Correlated Alb and Alb/Glb ratio in summer positively. Glb concentration negatively correlated with Alb/Glb ratio. TP in dry, pregnant and lactating ewes were relatively higher in summer than winter.
- Alb in dry and lactating ewes were higher in winter than summer, but in pregnant Alb was higher ($P<0.01$) in summer than winter.
- Concentration of glucose was higher ($P<0.05$) in dry, pregnant and lactating ewes and lambs with first week of age in winter than summer. Further, Glucose concentration was higher at one day and one week of age in both summer and winter than the other ages. In rams, plasma glucose concentration was significantly ($P<0.05$) higher in summer than winter.

- Triglycerides of rams was influenced by season, it was ($P < 0.05$) higher in winter than summer.
- Urea concentration was significantly higher in winter than summer of in rams, dry, pregnant and lactating ewes.
- Concentration of ALT was significantly ($P < 0.01$) higher in summer than winter. In winter ALT concentration was larger in the lambs at one week of age than the lambs with other ages.
- ALT and AST was higher ($P < 0.01$) in summer than winter in dry, pregnant and lactating ewes, while, the interaction showed that ALT levels were higher ($P < 0.01$) in dry and lactating than pregnant in summer than winter season.
- Na and K concentration of lambs was lower in winter than summer. The highest concentrations of Na and K occurred in one week old lambs in summer compared with its value in one month old lambs in winter. While the lowest concentration of Na and K was in one day old lambs in winter compared with its concentration in summer. The concentrations of Na and K of rams were influenced by season, where Na concentration was higher in winter than summer; in contrast, the K concentration was higher in summer than winter.
- T_3 concentration were higher ($P < 0.01$) in pregnant and lactating than dry ewes. T_3 concentration increased in winter than in summer in newborn lambs, rams and lactating ewes.
- Ald. concentrations in pregnant ewes were ($P < 0.05$) greater than dry and lactating ones.
- Blood gases changed of ewe lambs as influenced by age and season. Heat production of rams and lambs at two months old was significantly higher in summer than in winter.

Conclusion

- Season had a significant effect only on tidal volume and VCO₂ which tidal volume was higher ($p < 0.01$) in winter, Volume CO₂ was higher ($P < 0.01$) in summer compared to winter. Tidal volume was higher ($P < 0.01$) in dry and lactating ewes than pregnant ones. RQ percent was higher in dry in winter while lactating ewes higher in summer. RQ ratio (%) and Heat Production of newborn lambs was positively correlated ($P < 0.01$) with VCO₂ (L/day/BW^{0.75}).
- Heat production in rams was influenced by season it was ($P < 0.5$) higher in summer than winter. Also the correlation coefficients were highly significant correlated where, there was a positively correlated ($P < 0.01$) between heat production with Tidal volume, VO₂ and VCO₂.
- Season did not influence on ECF in rams. TBF was positively correlated with ECF % ($P < 0.01$). Also, ECF was positively correlated with ISF ($P < 0.01$)
- Percentages of PV %, ISF % and BV % in dry, pregnant and lactating ewes was influenced by season. TBF % was positively correlated with ECF% ($P < .05$), ICF % ($P < .01$) and ISF % ($P < .01$). ECF % was positively correlated with ISF % ($P < .01$). PV % was positively correlated with BV% ($P < .01$).