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Milk composition, ovarian hormones and serum biochemical profile of apparently healthy female dromedary camels during early lactation.

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Healthy camel usually have good reproductive performance and produce more meat and milk, so regular inspection and laboratory finding is necessary for diagnosis of any susceptible disease and to determine physiological state of the animal. Milk and blood considered as a mirror of animals health they can provide information regarding health and sickness of animals and reflect the status of body organs. In the present study a total of 25 milk samples and 25 blood samples were collected from 25 apparently healthy female dromedary camels reared at different villages of Aswan province Egypt during early lactation to investigate the chemical milk constituents, SCC, ovarian hormones and serum biochemical profile. The result revealed that the Mean ± SE of chemical milk constituents were, 3.62±0.06% Protein, 3.91±0.24% Fat, 0.67±0.04% Ash, 87.58±0.15% Moisture, 12.45±0.13% Total solid, 4.18±0.13% Lactose, and 8.55±0.17% Solid not fat. The Mean ± SE of SCC were 98 ± 0.75(×1000cells/ml). The Mean ± SE of ovarian hormones were 263±78.1 (pg/ml) Estrogen and 2.5±0.15 (ng/ml) Progesterone. The Mean ± SE of serum biochemical parameters were 1.62±0.075 (mmol/l) Ph, 2.23±0.03(mmol/l) Ca, 1.06±0.03(mmol//l) Mg, 176±10.7(mg/dl) Glucose, 117.1±2.6(U/l) AST, 5.8±0.08(g/l) T.P, 3.47±0.19(g/l) Globulin, 2.4±0.06(g/l) Alb, 0.88±0.07(mg/dl) Creatinine, 34±2.1 (U/l) GGT, 68.4±4.07 (U/l) ALP, 24.7±2.6 (mmol/l) BUN, 113.3±1.2(U/l) CK and 2.79±0.43 (ug/dl) Cortisol. Since such study are rare in Egypt, the data presented, could be used as a reference guide for female dromedary camels during early lactation.

Keywords: Milk composition, Ovarian hormones, Dromedary camels, Early lactation.

INTRODUCTION

Around 26.99 million camel population, spread across 47 countries, African populations represent 83% of world camels that inhabits mainly the Northern and Eastern Africa while the rest are present in Middle East and India, Most of these animals are one humped camels (Singh et al., 2017). In Egypt, their numbers were previously estimated as 230.000 camels (Kamoun and Jemmali, 2014). Nearly total camel population inside Egyptian villages are 66228 camels, Aswan villages considered as one of the highest camel's density villages in Egypt (Elfadaly, 2016).

Camel is very important to daily life for desert people in Africa and Asia as a source of meat, milk and means of transportation (Gader et al.,

2016). In arid zones and under harshly environment camel can produce more milk for a longer period of time than any other domestic animals (Jilo and Tegegne, 2016). The lactation period in female dromedary camels has gained very little attention relative to that of dairy cattle in Egypt, this may be due to that Egyptians consume buffalo's and cow's milk regularly more than camel milk. Most people are unaware about the health benefits and nutritional facts of camel's milk (Ahmed et al., 2014). Camel milk considered as white gold of the desert and differs from other ruminant milk because it contains low sugar, low cholesterol, high minerals (potassium, sodium, iron, copper, magnesium and zinc), high protective proteins like as lactoperoxidase, lactoferrin, lysozyme immunoglobulins and high vitamin C (Yadav et al., 2015). Also camel milk has been used since ancient times as medicines for treatment of many diseases such as jaundice, dropsy, anti-hypertensive, leishmaniasis and asthma (Yardav et al., 2015, Gader et al., 2016).

Healthy camel usually have good reproductive performance and produce more meat and milk, so regular inspection and laboratory finding is necessary for diagnosis of any susceptible disease and to determine physiological state of the animal. Blood and milk considered as a mirror of the animals health as they reflect the status of body organs and provide information's regarding health and sickness of the camel (Momenah, 2014). Consequently, the study of blood composition and serum biochemical profile is an important advice for assessing the physiological status and health of the camel (Sajedi,et al., 2015). Analysis of ovarian hormones level in serum samples can be a pathway to define the physiological status of females. Ovarian hormones in early lactation can be used a diagnostic aid for some pathological infertility problems, ovarian structures status and improving fertility in subsequent pregnancies (Kamoun and Jemmali, 2014).

Milk chemical composition and somatic cell count (SCC) reflect the general heath of the body and udder especially in case of subclinical mastitis. The important target of the camel breeders is to obtain more milk with high quality, so they apply hygienic and proper milking processes and routine subclinical mastitis examinations in the herds. SCC is commonly used as an important parameter to detect quality of raw milk in lactating animals and can be advised to camel breeders (Salehand Faye, 2011).

In Egypt, only limited data on camel milk composition, and blood biochemical parameters were available. So present study aimed to investigate milk chemical composition, SCC, milk minerals contents, ovarian hormones and serum biochemical profile of female dromedary camel during early lactation at Aswan province Egypt.

MATERIALS AND METHODS

Animals:

Twenty five apparently healthy lactating dromedary She-camels reared at different villages of Aswan province Egypt, having 410-530 kg live body weight, 9-12 years old. The camels were considered clinically healthy on the basis of physical examination of lungs, heart, intestine and rumen.

Feeding system:

Animals feeding were differ from animal to another but daily basal diet usually contain 2.5-3 Kg berseem hay, 3-4 Kg concentrate feeding mixture and 2.5 to3 Kg rice straw. Drinking water was offered all day time.

Clinical examination of animals:

Thoroughly clinical examinations were conducted according to (Radostitis et al., 2007).

Blood sampling:

Ten milliliter of blood was collected via jugular vein puncture from each animal using vacutainer without anticoagulant to obtain serum. Clear sera were collected from the plain tubes after centrifugation at 3000 rpm for 15 minutes .thenaliquoted and kept frozen at -20 C°. Subsequent biochemical analyses were done using commercial test kits. For the calcium, phosphorus, magnesium, total protein, albumen and creatinine, commercial test kits used were (Ref: CAL103100, PH123100, MG122050, ALB100250, TP116250 and CRE106100) respectively supplied by Bio Med Egypt. For AST, GGT, ALP and Cholesterol, commercial test kits used were (Ref: AST260001; GGT246001, ALP214001 and CHOL230001), respectively supplied by Spectrum Egypt. For estradiol and cortisol commercial test kits used were (Ref: KGE014 and KGE008B), respectively supplied by Parameter TM USA. For BUN commercial test kits used was (Ref: BSU117100) supplied by BioScien Egypt. For creatinine kinase, commercial test kit used was (Ref: Z5030048) supplied by Bio Chain USA. For Progesterone, commercial test kit used

was (Ref: EA 74) supplied by Oxford Biomedical Research USA. All kits were used according to the standard protocols of suppliers.

Milk samples:

She-camels were hand milked. 25 Milk samples were collected individually (500 ml of each) in screw-capped bottles, then were transferred in ice box to Animal Health Research Institute laboratories, Doki, Giza, Egypt to be examined. Milk samples were kept frozen tell be examined. Chemical milk constituents as fat, protein, carbohydrates, lactose, moisture and ash were measured by Lactoscan SL (Chappalwar et al., 2014). Mineral contents as sodium (Na), magnesium (Mg), calcium (Ca), Zinc (Zn), potassium (K), copper (Cu) and chloride (Cl) were measured using atomic absorption, Unicam 929 according to (AOAC, 1980). Phosphorous (P) was determined in the ash colorimetrically according to (AOAC, 1980). Milk somatic cell count (SCC) was counted automatically using somatic cell counter according to (Kamal et al., 2014).

Statistical analysis:

Data were analyzed using SPSS (Statistical Package for Social Science) program version 20 (SPSS Inc, Chicago, Illinose, USA). Data were entered as numerical or categorical, as appropriate. Quantitative data were presented as mean and Standard Error (SE).

RESULTS AND DISCUSSION

Laboratory findings can detect sick animals and identify herds at a potential risk of having reproductive and metabolic disorders (Ebissy et al., 2019). Blood is an index for several metabolic processes of the body, any deviation from normal serum biochemical profile may indicate animal health problem. In the present study a total of 25 blood samples were collected from apparently healthy female dromedary camel to be examined for serum biochemical profile and some ovarian hormones. The result reported in table (1) revealed that The Mean ± SE of serum biochemical parameters were 1.62±0.075 (mmol/l) Ph, 2.23±0.03(mmol/l) Ca, 1.06±0.03(mmol//l) Mg, 176±10.7(mg/dl) Glucose, 117.1±2.6(U/l) Aspartate aminotransferase (AST), 5.8±0.08(g/l) T.P, 3.47±0.19(g/l) Globulin, 2.4±0.06(g/l) Alb, 0.88±0.07(mg/dl) Creatinine, 34±2.1 (U/l) Gamma-Glutamyl transferase(GGT), 68.4±4.07 (U/l) ALP, 24.7±2.6 (mmol/l) BUN, 113.3±1.2(U/l) creatine kinase (CK) and 2.79±0.43 (ug/dl) Cortisol, the nearly similar result were reported by Wernery et al., (1999), Osman and Al-Busadah (2003).

Table1: Ovarian hormones and serum biochemical profile of dromedary she-camels during early lactation.

Biochemical parameters	Minimum concentration	Maximum concentration	Mean ± SE
Ph (mmol/l)	1.19	2.00	1.62±0.075
Ca (mmol/l)	2.10	2.41	2.23±0.03
Mg (mmol//l)	0.91	1.22	1.06±0.03
Glucose (mg/dl)	120	231	176±10.7
AST (U/l)	98	130	117.1±2.6
T.P (g/l)	5.56	6.3	5.8±0.08
Globulin (g/l)	2.8	5.07	3.47±0.19
Alb (g/l)	2.2	2.8	2.4±0.06
Creatinine (mg/dl)	0.4	1.25	0.88±0.07
GGT (U/l)	25	42	34±2.1
ALP(U/l)	50	89	68.4±4.07
BUN (mmol/l)	15.9	41.2	24.7±2.6
CK (U/l)	105	120	113.3±1.2
Est (pg/ml)	69	760	263±78.1
Progesterone (ng/ml)	1.9	3.3	2.5±0.15
Cortisol (ug/dl)	1.32	5.3	2.79±0.43

The Mean ± SE of ovarian hormones were 263±78.1(pg/ml) Estrogen and 2.5±0.15(ng/ml) Progesterone. Estrogen increases production of prolactin hormone that necessary for female after labor, also inhibit testosterone production (Ibrahim et al., 2017). Ayoub et al.,(2003) reported in his study that, Estrogen level ranged between 16.04±7.45 pg/ml: 20.36±13.47 pg/ml in early lactation period. while, progesterone level ranged between 1.88±1.19ng/ml : 1.19 ±0.38ng/ml, in early lactation period. The physiological conditions had more influence on hormonal and biochemical rather than hematological indices in camel raised under traditional conditions (Muhammad et al. 2011). The pattern of secretion of ovarian hormones has been reported in buffalo, cattle, mare, sheep, goat, and pig but is limited and less well understood in the camel. Rhythmic secretion of these hormones has a definite correlation with sexual behavior and receptivity of the male by females in other species of livestock (Abdulkareem et al., 2015).

Camel milk composition varies due to genetic variations, difference of geographical origin, physiological stage, feeding conditions, year of publication of the published data, seasonal or physiological variations, and health status of camel (Konuspayeva et al.2009). In general the average amount of camel's milk components is protein 3.4%; fat 3.5%; lactose 4.4%; ash 0.79%, while water covers 87% (Jilo and Tegegne, 2016). Inspection of table (2) pointed out that the Mean ± SE of chemical milk constituents were, 3.62±0.06% Protein, 3.91±0.24% Fat, 0.67±0.04 % Ash, 87.58±0.15% Moisture, 12.45±0.13% Total solid, 4.18±0.13% Lactose, and 8.55±0.17% Solid not fat. The nearly similar result were reported by Fahmy and Mohamed (2010), Ahmed et al., (2014), Khalifa and Zakaria (2019) as reported in table (3).

Table 2: Chemical milk constituents and somatic cell count of dromedary she-camels during early lactation (mg/ 100g).
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	Minimum concentration	Maximum concentration	Mean ± SE
Protein%	3.12	3.91	3.62±0.06
Fat%	3.41	4.35	3.91±0.24
Ash%	0.62	0.73	0.67±0.04
Moisture%	86.84	88.11	87.58±0.15
T.S%	11.92	12.87	12.45±0.13
Lactose%	3.76	4.63	4.18±0.13
SNF%	8.10	8.93	8.55±0.17
SCC (×1000cells/ml)	45	113	98 ± 0.75

Table 3: Comparison between chemical milk composition in the present study and other reported Egyptian studies.`
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	Present study	Khalifa and Zakaria 2019	Ahmed et al., 2014	Fahmy and Mohamed 2010
Protein	3.62±0.06	3.01 ±0.02	4.02 ± 0.1	3.55±0.01
Fat	3.91±0.24	3.22 ±0.05	2.84 ± 0.2	5.65± 0.0l
Ash	0.67±0.04	0.68±0.02	----------	0.98± 0.01
Moisture	87.58±0.15	----------	89.5 ± 0.4	----------
T.S	12.45±0.13	11.46 ±0.1	10.8 ± 0.3	14.31 ±0.38
Lactose	4.18±0.13	4.53±0.01	3.8 ± 0.1	4.24± 0.01
SNF	8.55±0.17	8.24 ±0.05	7.9 ± 0.2	----------
SCC (×1000 cells/ ml)	98 ±0.75	----------	----------	112.5 ± 0.01

SCC of camel milk is commonly used as a reliable parameter for raw milk quality. In spite of the highest number that had been declared as 400000 cells/ml for cow milk by EU directives, this number was reported to be 250000 cells/ml for camels, any increase in SCC level than normal level may indicate presence of mastitis or subclinical mastitis (Abbood, 2016). In the present study the Mean ± SE of SCC were 98 ± 0.75(×1000cells/ml). the nearly similar result were reported by Fahmy and Mohamed (2010).

The normal level of minerals in camel milk is 0.60 to 1.0% (Konuspayeva et al., 2009). Changes in minerals level may be due to the differences in breed, feeding and water intake (Jilo and Tegegne, 2016). Camel milk is rich source of different minerals like Na, Ca, K, P, Zn, Mg, Fe and Cu (Onjoro et al.,2003). The mean values of mineral contents for potassium, zinc, magnesium, manganese, iron, sodium, and calcium in camel milk (100g-1) are 156, 0.53, 10.5, 0.05, 0.29, 59, and 114 mg respectively(Abas et al., 2013). In the present study data reported in table (4) pointed out that The Mean ± SE of Milk minerals contents for Na, K, Mg, Cu, Cl, Ca and P were 60.02±0.9, 167.82±1.4, 7.32±0.11, 0.054±0.0061, 115.23± 0.115, 121.1±3.41 and 79.81±2.9 mg/100g respectively. The nearly similar result were reported by Soliman (2005), Fahmy and Mohamed (2015).

Table 4: Milk mineral contents of dromedary she-camels during early lactation (mg/ 100g).

	Minimum concentration	Maximum concentration	Mean ± SE
Na	55.45	61.9	60.02±0.9
K	152.31	173.1	167.82±1.4
Mg	6.86	7.98	7.32±0.11
Cu	0.050	0.059	0.054±0.0061
CL	107.68	120.84	115.23± 0.115
Ca	109.45	130.2	121.1±3.41
P	71.28	85.31	79.81±2.9
Ca/P	1.53	1.52	1.52±0.02

Table 5 : Comparison between milk minerals contents in the present study with other reported Egyptian studies (mg/ 100g).

	Present study	Fahmy and Mohamed 2015	Soliman, 2005
Na	60.02±0.9	72.00± 1.99	57.84± 1.22
K	167.82±1.4	91.00± 0.45	156.32±2.85
Mg	7.32±0.11	----------	6.70±0.14
Cu	0.054±0.0061	----------	0.061±0.0023
Cl	115.23± 0.115	152.00± 1.89	----------
Ca	121.1±3.41	154.57± 0.51	111.36±4.36
P	79.81±2.9	116.82± 0.66	81.17±3.08
Ca/P	1.52±0.02	1.51±0.01	1.37±0.01

CONCLUSION

Although camel has great values specially for desert peoples as a source of meat, milk and a means of transportation, it's very less appreciated. There's lack of information about biochemical blood parameters and milk composition of dromedary she camel under Egyptian condition. The data present in this study demonstrated a profound serum biochemical profile, ovarian hormones, chemical milk composition and somatic cell count for apparently healthy dromedary she camel reared at Aswan province Egypt during early lactation. This data presented can be used as a reference guide for further studies. More studies are required to establish Egyptian standard for she camel during pregnancy and lactation.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

AUTHOR CONTRIBUTIONS

All listed authors have made substantial contributions to the research design, the acquisition, analysis, or interpretation of data; and to drafting the manuscript or revising it critically; and that all authors have approved the submitted version.

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