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**SOME BIOCHEMICAL CHANGES IN BLOOD SERUM  
OF BALADY GOATS INFESTED WITH INTERNAL  
AND EXTERNAL PARASITES AT ASSIUT  
GOVERNORATE**  
(With 7 Tables and 2 Figures)

By

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بعض التغيرات البيوكيميائية في مصل دم الماعز البلدي المصابة بالطفيليات  
الخارجية والداخلية في محافظة أسيوط.

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في هذه الدراسة تم اختيار عدد ٥١٥ رأس من الماعز البلدي (٥-١٠ شهور) عشوائيا من ضواحي محافظة أسيوط لدراسة بعض النواحي الطفيلية و الإكلينيكية والتغيرات البيوكيميائية في دم الماعز المصابة بالطفيليات الخارجية والداخلية. أظهرت نتائج تحليل البراز إلى وجود ٣,٣% من الحالات مصابة بالديدان الأسطوانية و ١,٥٥% بالكوكسيديا و ١,١٧% بالديدان الكبدية وكانت النسبة الكلية للماعز المصابة بالطفيليات الداخلية ٤,٨٥%. كما أظهر فحص الطفيليات الخارجية وجود الإصابة بالجرب ١,١٧% والقمل ١,٥٥% بنسبة كلية ٢,٧٢%. هذا بالإضافة إلى وجود نسبة ٠,٧٨% إصابة مختلطة بالطفيليات الداخلية و ٠,٣٩% إصابة مختلطة بالطفيليات الخارجية و ١,٥٥% إصابة مختلطة بالطفيليات الداخلية والخارجية وقد أوضحت نتائج التحليل البيوكيميائي وجود نقص في متوسط تركيز الألبومين في مصل الماعز المصابة بالطفيليات الخارجية والداخلية مما أنتج عنه نقص في قيم البروتين الكلي في مصل الماعز المصابة بالديدان الداخلية والكبدية. ومن ناحية أخرى فقد أظهرت النتائج وجود نقص بدرجات متفاوتة في متوسطات تركيز العناصر المعدنية النادرة مثل الحديد والنحاس والزنك في مصل الماعز المصابة بالديدان الداخلية والخارجية. كما أوضح التحليل الإحصائي أن كل من الطفيليات الداخلية والخارجية له نفس التأثير على البروتين والعناصر النادرة في مصل الدم في الماعز.

**SUMMARY**

To describe some clinical aspects and some biochemical changes in goats infested with internal and external parasites, a total of 515 male Balady goats (5-10 months) were randomly selected from some periurban arias at Assiut Governorate. Results of faecal examination

revealed presence of gastrointestinal parasites (4.85%) including nematodes (3.3%) as *Trichuris* spp., *Trichostrongylus* spp., and *Haemonchus* spp., protozoal parasites (*Eimeria* spp., 1.55%) and liver flukes (*Fasciola gigantica* and *F. hepatica*, 1.17%). External parasitic investigations revealed the presence of mange mite (*Sarcoptic*, 1.17%) and Lice infestation (1.55%) with a total of 2.72%. In addition there were 0.78% mixed gastrointestinal, 0.39% mixed external and 1.55% mixed internal and external parasitic infestation. Biochemical analysis revealed hypoalbuminaemia in all investigated goats, which resulted in hypoproteinaemia in nematode and fasciola, infested goats. On the other hand, the mean values of blood serum trace elements iron, copper and zinc concentrations showed variable degrees of reduction in goats infested with internal and external parasites. Statistical analysis revealed that both internal and external parasites had the same effect (P-value ranged from 0.203 to 0.667) on blood serum proteins and trace elements in goats.

**Key words:** *Iodine, selenium, thyroid function.*

## INTRODUCTION

Parasitic infestations are a major constraint in small ruminant production in tropic and subtropic areas by causing disease, mortality and production losses (Matthews, 1999; Pandey, 1999; Kagira & Kanyan, 2001; Dikmans & Shorb, 2004; Gove, 2004; and Babcock & Cushing, 2004). The epidemiology and the level of parasitic infection in goats are strongly associated to owners management (Cabaret *et al.*, 1984). Also, it has been well established that the regulation of parasitic populations and the ability of the host to withstand the pathophysiological effects of infection are influenced by nutritional status (Cabaret *et al.*, 1989). On the other hand, the intensity of parasitic infestation in small ruminants is negatively correlated to the general health status, milk production and general farm productivity (Coop and Holmes, 1996).

Despite of the importance of goats as a good source of meat and milk all over the world, studies on the factors contributed to health stability are very rare especially in developing countries. The aim of this study was to describe some clinical aspects in grazing Balady goats infested with internal and external parasites and to assess the influence of these parasites on some selected biochemical parameters in blood serum of these animals.

## MATERIALS and METHODS

**Animals:** On a survey of grazing goat flocks at periurban areas, Assiut Governorate, a total of 515 male Balady goats (5-10 months) were randomly selected. These animals were subjected to careful clinical examinations according to Kelly (1984).

**Faecal examination:** Faecal samples from the selected goats were examined by naked eye for consistency, presence of blood, mucous, whole segments or parts of worms. Microscopical examination of faecal samples was done on the same day of collection through direct faecal smear and sedimentation floatation technique. Identification of helminthes eggs was done according to description given by Soulsby (1982).

Skin scraping samples were collected in Petri dishes from the suspected active lesions by help of sharp scalple. The collected samples were processed for mites examination by maceration method. After permounting they were identified (Soulsby, 1982).

Lice were collected from hair of infested goats with help of fine toothcomb and kept in 70% alcohol. After permounting they were identified (Soulsby, 1982 and Coles, 1986).

According to faecal and skin scraping examination, 45 individuals were selected for blood sampling by jugular vein puncture for serum collection. These animals were classified into five groups. The first (control group) consisted of 14 apparently healthy animals which proved to be free from internal and external parasites. The second group was infested by gastrointestinal nematodes (N=11). The third group was infested by coccidiosis (N=8). The fourth group was infested by liver flukes (N=6). The fifth group showed severe signs of mange mite infestations (N=6). The sixth group was heavily infested with lice (N=8). Mixed infections were excluded. Blood serum was used for determination of total protein and albumin (Henry *et al.*, 1974). Total globulin was calculated mathematically according to Thomas (2000a). Blood serum copper, iron and zinc were measured by using a computerized acetylene type atomic absorption spectrophotometer (GBC 923 A.A) according to manufacture instructions. The obtained data were subjected to ANOVA and expressed as mean  $\pm$  SE followed by student "t" test using software program (Prism, 1996).

## RESULTS

**Clinical signs:** The most common signs of gastrointestinal helminths and liver flukes infestations were diarrhoea associated with loss of condition, dullness, inappetance, dehydration, weight loss, tenesmus and signs of anaemia. Goats infested with coccidia showed watery, mucoid, bloody diarrhoea and rectal prolapse. However, some infested cases were without scouring even those showed excessive worm or flukes egg numbers in their stools, but these animals were in poor condition. Some cases of infested goats with either nematodes or liver flukes showed bottle-jaw and/or ascitis in the abdominal region.

The main clinical signs which appeared on goats infested with mange mites (Photo 1) were mild to severe irritation, animals scratching their bodies on each other or against hard objects, hair lost from the affected area resulting alopecia. Skin is thickened and corrugated and sometimes covered with scabs, loss of appetite and the infested goat became depilated. Goats infested with lice showed severe itching, loss of hair, roughly coat and debilitation. Lice were distributed on the neck, abdomen and chest.

**Parasitological findings:** (Tables 1-4 and Photo 2) Results of faecal examination revealed presence of gastrointestinal nematodes as *Trichuris* spp., *Trichostrongylus* spp., and *Haemonchus* spp. either sporadically or in mixed forms. Examination of faeces revealed also protozoal parasites (*Eimeria* spp.) and liver fluke eggs. External parasitic investigations revealed the presence of mange mite (*Sarcoptes scabii*) infestation and lice infestation (*Linognathus* spp., a blood sucking type). The parasitological examination revealed also presence of mixed infection with gastrointestinal parasites and external parasitic infestation.

**Table 1:** Percentages of internal and external parasitic infestation in goats.

No of examined animals	Total infested animals		Internal parasites		External parasites		Mixed infestation	
	N	%	N	%	N	%	N	%
515	59	11.46	35	6.8	16	3.11	8	1.55

**Table 2:** Percentages of internal parasitic infestations in goats.

No of examined animals	Total infested animals	Nematode infestation		Coccidiosis		Fascioliasis		Mixed infestation	
		N	%	N	%	N	%	N	%
515	35	17	3.30	8	1.55	6	1.17	4	0.78

**Table 3:** distribution of eggs of internal parasitic infestations in goats (N=27).

Eggs	Single infestation		Mixed infestation		total infestation	
	N	%	N	%	N	%
Trichuris spp.	6	22.2	2	7.4	8	29.6
Trichostrongylus spp.	7	25.9	1	3.7	8	29.6
Haemonchus spp.	4	14.8	-	-	4	14.8
Fasciola spp.	6	22.2	1	3.7	7	25.9

**Table 4:** distribution of external parasitic infestations in goats.

No of examined animals	Total infested animals		Mange mite infestation		Lice infestation		Mixed infestation	
	N	%	N	%	N	%	N	%
515	14	2.72	6	1.17	8	1.55	2	0.39

**Biochemical findings:** (Tables 5-7 and Figure 1) Results of biochemical findings are presented in tables 1, 2, 3 and figure 1. It was noticed that internal and external parasitic infestation resulted in significant reduction in the mean values of blood serum albumin concentration in goats if compared with control healthy group. The mean values of blood serum globulins were slightly affected by parasitic infestation in goats but the reduction was significant in goats infested with gastrointestinal nematodes. Concomitantly, the mean values of blood total serum protein were reduced significantly in goats infested with gastrointestinal nematodes and Fasciola spp.

On the other hand, the mean values of blood serum trace elements concentrations showed variable degrees of reduction in goats infested with internal and external parasites when compared with healthy animals. Gastrointestinal nematodes, coccidiosis and lice infestation resulted in significant reduction of iron, copper and zinc concentrations. Meanwhile, fascioliasis and mange mite infestation resulted in significant reduction in the mean values of blood serum iron and zinc concentrations without effect of the mean values of blood serum copper concentration in infested goats when compared with healthy animals.

The comparison between the effects of internal and external parasitic infestation in goats revealed that both types of parasitic infestation had the same effect on the mean values of the studied biochemical parameters and the estimated P-value did not revealed any significant variation between the two factors.

**Table 5:** Some biochemical changes in goats infested with internal parasites.

		Control (14)	Nematodiasis (11)	Coccidiosis (8)	Fascioliasis (6)
T. Protein	g/dl	06.14± 0.24	05.11± 0.14**	05.63± 0.20	05.28± 0.22*
Albumin	g/dl	02.92± 0.12	02.33± 0.12**	02.53± 0.12*	02.23± 0.17**
Globulin	g/dl	03.22± 0.18	02.78± 0.07*	03.10± 0.16	03.05± 0.20
Iron	µg/dl	91.50± 3.49	76.82± 3.18**	76.25± 4.94*	78.83± 3.84*
Copper	µg/dl	77.71± 2.81	67.27± 2.84*	66.38± 3.91*	72.33± 5.98
Zinc	µg/dl	69.50± 1.98	58.73± 3.52*	58.63± 4.38*	58.00± 4.21*

Values between parenthesis are the number of animals  
 \*, \*\* Levels of significance than control group at P> 0.05 and 0.01 respectively.

**Table 6:** Some biochemical changes in goats infested with external parasites.

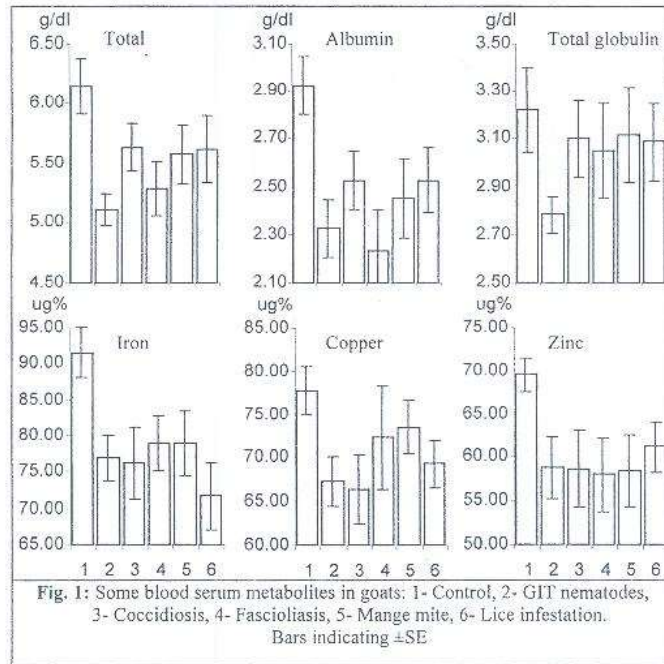
		Control (14)	Mange infestation (6)	Lice infestation (8)
T. Protein	g/dl	06.14± 0.24	05.57± 0.24	05.61± 0.27
Albumin	g/dl	02.92± 0.12	02.45± 0.16*	02.53± 0.14*
Globulin	g/dl	03.22± 0.18	03.12± 0.20	03.09± 0.16
Iron	µg/dl	91.50± 3.49	78.83± 4.46*	71.63± 4.55**
Copper	µg/dl	77.71± 2.81	73.50± 3.13	69.25± 2.70*
Zinc	µg/dl	69.50± 1.98	58.33± 4.12*	61.13± 2.95*

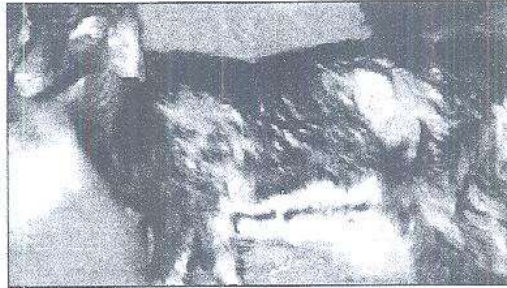
Values between parenthesis are the number of animals  
 \*, \*\* Levels of significance than control group at P> 0.05 and 0.01 respectively.

**Table 7:** the effects of internal and external parasites on some biochemical parameters in goats.

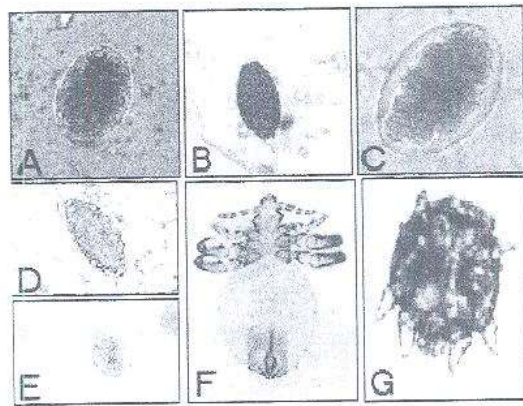
		Internal parasites (25)	External parasites (14)	P-value
T. Protein	g/dl	05.32± 0.11	05.59± 0.18	0.203
Albumin	g/dl	02.37± 0.08	02.49± 0.10	0.335
Globulin	g/dl	02.95± 0.08	03.10± 0.12	0.301
Iron	µg/dl	77.12± 2.22	74.71± 3.26	0.547
Copper	µg/dl	68.20± 2.22	71.07± 2.05	0.348
Zinc	µg/dl	58.52± 2.23	59.93± 2.37	0.667

Values between parenthesis are the number of animals





Goat infested with mixed infection of mange mite and lice



**Fig. 2:** Internal and external parasitic infestation in goats:  
A: *Haemonchus* spp. x40 B: *Trichuris* spp. x40 C: *Trichostrongylus* spp. x40  
D: *Fasciola* spp. egg E. x20 *Coccidia* spp. x40 F: *Linognathus* spp. x5  
G: *Sarcoptic* spp. x100



## DISCUSSION

The clinical signs appeared on infested goats in the present work coincided with the results of faecal and skin investigations. Barragry (1992) and Berriatua *et al.* (1994) found that clinical signs of internal parasitosis in small ruminants occurs when damage to the lining mucosa of the gut is sufficiently severe to cause dysfunction. Our results in this respect coincide with the clinical signs of internal and external parasites in goats recently reported by Matthews (1999), Pandey (1999), Babcock and Cushing (2004), Dikmans and Shorb (2004), Gove (2004), and Haenlein and Abdellatif (2004).

In addition to *Fasciola* spp eggs and *Eimeria zuerni* oocysts, the results of faecal examination revealed presence of gastrointestinal nematodes eggs as *Trichuris* spp., *Trichostrongylus* spp., and *Haemonchus* spp. either sporadically or in mixed forms. *Trichostrongylus* spp. were the highest in percentage. This result coincide with the results obtained by Kedees (1990). This could be due to adaptation and higher resistance of *Trichostrongylus* spp. larvae to stressed environments (Soulsby, 1982). Examination of external parasites revealed the presence of sarcoptic mange in addition to lice infestation. The percentages of these internal and external parasites in the examined goats were lower than those reported by Kagira and Kanyan (2001), Mourad (2001) and Dikmans and Shorb (2004) for sheep infested with these parasites in unmanaged areas. These differences might be as a result of the differences in the management in addition to the differences of the feeding behavior between the two species, as goats prefer to browse on the grasses surface while sheep tend to graze (Gove, 2004). The obtained results were also lower than those reported for internal parasitic infestation in goats by Sohbi (2004), this might probably due to the young age of goats used in the current study.

In the present study the mean values of blood serum albumin concentration were reduced in all infested goats with internal and external parasites. The reduction of the mean values of blood serum globulins was significant only in goats infested with gastrointestinal nematodes. Concomitantly, the mean values of blood total serum protein were reduced significantly in goats infested with gastrointestinal parasites and *Fasciola* spp. These results coincided with those previously reported by Cabaret *et al.* (1984 & 1989), Coop and Holmes (1996), Dikmans and Shorb (2004) and Sohbi (2004). These reports agreed on

the fact that hypoalbuminemia is a classic feature of parasitic infestation in ruminants. This reduction in blood serum albumin reflects the impairment of food assimilation, absorption and utilization. It also a reflection of the impairment of the liver synthesis function. In addition, albumin may be lost with the inflammatory exudate of the damaged tissue (Jain, 1993; Urquhart, *et al.* 1996; Kaneko, 1997; Tenant, 1997; Radostits *et al.*, 2000; Thomas, 2000a,b; Haenlein. and Abdellatif, 2004).

The present results showed also reduction of the mean values of trace elements iron, copper and zinc concentrations in all infested goats with internal and external parasites with exception of copper during infestation with *Fasciola* spp. and mange mites. These results are in agreement with the findings of Dalapati *et al.* (1997), Matthews (1999), Saleh and Ratib (2001) and Babcock and Cushing (2004). Again, malabsorption, stress and impairment of food assimilation in addition to interference of transportation of micronutrient produced by toxins of the parasite (Coop and Holmes, 1996, Galloway, *et al.* 2000; and Gove, 2004) might be responsible for the reduction of these trace elements in blood serum of infested goats.

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