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BIOCHEMICAL, HAEMATOLOGICAL AND PARASITOLOGICAL EVALUATION OF NIGELLA SATIVA EFFICACY AGAINST NEMATODE IN SHEEP AS COMPARED WITH ALBENDAZOLE

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SUMMARY

Twenty six balady sheep were used to compare the efficacy of Nigella sativa with albendazole against nematodiasis. The blood and faecal samples were collected from all animals just before treatment and after 7, 14 and 21 days of treatment. Parasitological examination revealed the presence of *Trichostrongylus sp.* (100%), *Haemonchus sp.* (75%), Ostertagia sp. (50%) and Oesophagostomum sp. (25%). The present results revealed that, anthelmintic efficacy was on 14th day for albendazole and on 21st day for Nigella sativa. Nematode infestation leads to significant increases in serum activities of AST, ALT and ALP, in addition to significant decreases in total protein and albumin. However, the parasitism resulted in significant decreases in serum levels of Cu, Fe, Zn, Ca and P as well as significant decreases in RBCs, Hb and PCV values associated with significant increases in TLC, neutrophils, eosinophils and monocytes count with significant decrease in lymphocytic count. These parameters began to corrected toward normality on 7th day post-treatment with albendazole or Nigella sativa.

The data declared a good efficacy of albendazole and Nigella sativa respectively where the derangements were corrected on the 7th day. The use of Nigella sativa in correct dose as anthelmintic drug may reduce egg counts and can overcome parasitic infestation in sheep.

INTRODUCTION

Parasitic infestations are among the major diseases that greatly threaten sheep production, particularly the infestation with nematodes which still constitutes one of the major economic and health problems in Egypt. Diarrhoea, weight loss, low meat and wool production and decline in food in-

take are the common abnormalities in infested animals (Blood and Henderson, 1975). Treatment of the infested animals with medicaments is one of the most reliable method for controlling such infestation. Anthelmintics are neither completely effective against parasites, nor do they retain efficacy by their continuous administration due to the development of resistance. In addition, almost all adversely affect milk and meat production of animals during the course of their treatment, and even for long after their use (Brander et al., 1991).

Herbal drugs have been used since ancient times to cure diseases. Among these, Nigella sativa has been used to treat worm infestation (Nadkarni, 1954 and Akhtar & Makhdoom, 1988). A little systemic work has been conducted to prove their efficacy against nematodiasis in sheep.

The present investigation was designed to throw light upon the efficacy of Nigella sativa compared with albendazole on nematodes in sheep as well as studying their reflection upon some biochemical and haematological parameters.

MATERIALS AND METHODS

Twenty six balady sheep (18-30 months old) belonged to a private farm at El-Qurine, Sharkia Governorate were used in this study. Of these 16 sheep were found naturally infested with different species of gastrointestinal nematodes based on faecal examination and 10 animals were free from internal nematodes by continuous faecal examination and keeping under hygienic measures and served as control group. The infested sheep divided into two equal groups, the first was treated with Nigella sativa powder orally as a single dose (200 mg/kg b.w.) according to the method of Korshom et al. (1998), the second group was treated orally by a single dose of albendazole (2.5% suspension) at a rate of 2 ml/10 kg b.w (Pharma Swede-Egypt) according to Theodorides et al. (1993).

Faecal and blood samples were collected from each animal of all groups just before and after 7, 14 and 21 days of treatment.

Faecal samples were collected individually and directly from the rectum in a clean plastic pages. Each sample was examined parasitologically and the degree of infestation and efficacy of the drugs were determined by egg counting using modified McMaster technique according to Thionepont et al. (1979).

Clear non haemolysed sera were assayed for determination of total serum proteins (Weichselbaum, 1946), albumin (Doumas et al., 1971). Serum alanine aminotransferase (ALT) and aspartate aminotransferase (AST) (Reitman and Frankel, 1957), alkaline phosphatase (ALP) (Kind and King, 1954), blood urea (Fawcet and Scott, 1969), serum creatinine (Husdan and Rapaport, 1968). Determination of calcium (Gindler, 1972), inor-

anic phosphorus (El-Merzabani et al., 1977) and agnesium (Bouon, 1962). Serum level of cop-er, iron and zinc w ere estimated by atomic sorption spectrophotometer (Allian and Mau-s, 1979).

nticoagulated blood samples were used for de-rmination of the total red cell count (RBCs), emoglobin content (Hb), packed cell volume CV), total (WBCs) and differential leucocytic unt (Schalm, 1979). Statistical analysis were rformed according to method of Snedecor and chran (1980).

RESULTS

Parasitological examination revealed the presence of nematode eggs in all faecal samples collected from the 16 infested sheep and the types, numbers and percentages of that infestation are illustrated in Table (1). The efficacy of Nigella sativa and albendazole parasitologically are shown in Table (2). Mean values of biochemical parameters and haematological picture before and after treatment are illustrated in Tables (3 & 4) respectively. All the values were returned to nearly the control values after 14 days from treatment with both drugs.

Table (1): Types, numbers and percentage of nematode infestation in parasitized sheep.

Nematodes species	No.of infested sheep	% infestation
Trichoostronglus sp.	16	100%
Haemonchus sp.	12	75%
Ostertagia sp.	8	50%
Oesophagostomum sp.	4	25%

Table (2): Efficacy of oral administration of Nigella sativa or albendazole on nematode infested sheep

Type of treatment	Before treatment (egg count)	After treatment (egg count)		
		7 days	14 days	21 days
Nigella sativa	600-2000	100-350	30-50	-ve
Albendazole	600-2000	50-200	-ve	-ve

Control = 10 animals
Infested = 16 animals (8 treated with Nigella sativa, 8 animals treated with albendazole)

Table (3): Effect of oral administration of Nigella sativa or albendazole on some biochemical values (Mean ± S.E.)

Parameter	Treatment	Before treatment		After treatment		
		Control	Infested	7 days	14 days	21 days
Total protein (gm/dl)	Nigella sativa	6.89 ± 0.22	5.93 ± 0.21**	5.80 ± 0.34*	6.37 ± 0.46	7.02 ± 0.38
	Albendazole			6.37 ± 0.35	6.22 ± 0.35	6.86 ± 0.37
Albumin (gm/dl)	Nigella sativa	3.55 ± 0.19	2.78 ± 0.09**	2.92 ± 0.18*	3.21 ± 0.23	3.67 ± 0.21
	Albendazole			3.31 ± 0.26	3.23 ± 0.20	3.43 ± 0.18
Globulin (gm/dl)	Nigella sativa	2.90± 0.03	3.15± 0.26	2.87 ± 0.22	3.16 ± 0.27	3.35 ± 0.18
	Albendazole			3.05 ± 0.12	2.98 ± 0.17	3.25 ± 0.24
ALT (U/L)	Nigella sativa	28.70 ± 1.33	35.18±1.32**	32.75± 1.06*	30.12± 1.50	29.50 ± 1.86
	Albendazole			30.25 ± 1.47	30.37 ± 1.56	31.27 ± 2.35
AST (U/L)	Nigella sativa	49.30 ± 2.16	58.37 ±1.90**	57.25 ± 2.55*	54.75 ± 3.10	52.12 ± 3.05
	Albendazole			55.12 ± 2.52	52.87 ± 3.05	53.25 ± 3.40
ALP (U/L)	Nigella sativa	85.60 ± 4.01	107.62±4.60**	105.50±6.16*	89.25 ±5.90	87.25 ±5.09
	Albendazole			97.26 ± 4.45	86.62 ± 5.21	85.37 ± 4.39
Urea (mg/dl)	Nigella sativa	36.00 ± 1.88	35.06 ± 1.31	35.62 ± 1.47	36.12 ± 1.81	35.37 ± 1.96
	Albendazole			34.75 ±1.51	35.37 ±1.51	36.87 ±1.76
Creatinine (mg/dl)	Nigella sativa	1.10 ± 0.06	1.08 ± 0.05	1.11 ± 0.07	1.09 ± 0.07	1.06 ± 0.05
	Albendazole			1.03 ± 0.06	0.99 ± 0.05	1.01 ± 0.04
Coopper (µg/dl)	Nigella sativa	116.70 ± 4.66	79.37± 4.42***	94.62±5.27**	105.37± 5.80	111.87 ± 6.21
	Albendazole			99.50±6.06*	104.50 ± 5.37	114.50 ± 4.71
Iron (µg/dl)	Nigella sativa	127.50 ± 2.78	93.25 ± 3.17**	111.12±4.48**	117.50±6.35	123.12 ± 6.81
	Albendazole			112.75±5.12*	115.62± 5.51	125.51 ± 5.76
Zinc (µg/dl)	Nigella sativa	69.70 ± 3.93	54.18 ± 3.06**	62.87±4.15	66.87±4.48	68.62 ± 4.17
	Albendazole			63.86±3.65	67.63± 3.88	67.37 ± 4.22
Calcium (mg/dl)	Nigella sativa	10.71 ± 0.822	8.45 ± 0.48*	8.97±0.45	9.70 ± 0.55	9.88 ± 0.61
	Albendazole			9.04±0.53	9.62 ± 0.43	10.10 ± 0.60
Inorganic phosphorus (mg/dl)	Nigella sativa	5.49 ± 0.36	4.45 ± 0.25*	4.71±0.34	5.43 ± 0.31	5.62 ± 0.31
	Albendazole			5.11±0.42	5.51±0.35	5.60 ± 0.34
Magnesium (mg/dl)	Nigella sativa	2.64 ± 0.21	2.46 ± 0.18	2.52±0.22	2.66 ± 0.19	2.61 ± 0.20
	Albendazole			2.65±0.22	2.55 ± 0.27	2.60 ± 0.24

Control = 10 animals Infested = 16 animals (8 treated with Nigella sativa, 8 animals treated with albendazole) * P<0.05

Table (4): Effect of oral administration of Nigella sativa or albendazole on haemogram of nematode infested sheep (Mean ± S.E.)

Parameter	Treatment	Before treatment		After treatment		
		Control	Infested	7 days	14 days	21 days
RBCs ($X10^6$ / µl)	Nigella sativa	9.47 ± 0.48	7.60 ± 0.35**	8.23 ± 0.26*	9.20 ± 0.49	9.38 ± 0.48
	Albendazole			8.48 ± 0.34	9.27 ± 0.50	9.36 ± 0.47
Hb (g/dl)	Nigella sativa	10.58 ± 0.50	7.85 ± 0.30***	9.13 ± 0.41*	10.02 ± 0.46	10.22 ± 0.49
	Albendazole			8.97 ± 0.42*	10.08 ± 0.20	10.11 ± 0.52
PCV(%)	Nigella sativa	35.90 ± 1.45	28.31±1.48**	30.87 ± 1.54*	33.12 ± 1.66	34.25 ± 1.57
	Albendazole			31.12 ± 1.52*	34.75 ± 1.60	35.12 ± 1.36
WBCs (10^3 /ul)	Nigella sativa	9.76 ± 0.35	11.42 ± 0.41**	11.20± 0.60*	9.91 ± 0.50	9.77 ± 0.51
	Albendazole			10.58 ± 0.46	9.61 ± 0.43	9.25 ± 0.47
Neutrophils (%)	Nigella sativa	42.90 ± 0.56	45.12 ± 0.56**	44.13 ± 0.91	44.25 ± 0.84	43.62 ± 0.60
	Albendazole			43.37 ± 0.86	43.25 ± 0.86	43.87 ± 0.89
Eosinophils (%)	Nigella sativa	4.60 ± 0.30	5.68 ± 0.27**	5.00 ± 0.37*	4.75 ± 0.31	4.37 ± 0.37
	Albendazole			5.62 ± 0.32*	4.50 ± 0.33	4.25 ± 0.36
Basophils (%)	Nigella sativa	0.80 ± 0.25	0.75 ± 0.19	0.50 ± 0.18	0.62 ± 0.26	0.75 ± 0.25
	Albendazole			0.75 ± 0.16	0.75 ± 0.16	0.62 ± 0.35
Lymphocytes (%)	Nigella sativa	47.90 ± 1.01	44.93 ± 0.94*	46.25 ± 1.09	46.62 ± 0.63	47.25 ± 0.59
	Albendazole			45.50 ± 1.02	47.87 ± 1.09	47.25 ± 1.16
Monocytes (%)	Nigella sativa	3.80 ± 0.38	4.87± 0.31*	4.12 ± 0.54	3.87 ± 0.48	3.75 ± 0.25
	Albendazole			4.75 ± 0.45	4.12 ± 0.29	4.00 ± 0.26

Control = 10 animals
Infested = 16 animals (8 treated with Nigella sativa, 8 animals treated with albendazole)
* $P<0.05$.

DISCUSSION

Results of the present study revealed that the egg count was greatly decreased in faecal samples of sheep treated with ablendazole suspension or Nigella sativa powder by single dose level. Complete reduction for egg count for albendazole on 14th day and for Nigella sativa on 21st day against nematodes. Nath (1983) has reported that Nigella sativa contain negelline, metarbin, melanthin, melanthiginin and sapginin, etc. In addition, it contains fixed oils and volatile oil, which delay its passage and ultimately onset of action (Ghazanvi, 1988). Therefore, maximum efficacy of the drug was recorded on the day 21 post treatment. Similar results have been previously reported by Korshom et al. (1998), Zaki et al. (2003) and Maqbool et al. (2004).

Nematodes infestation resulted in significant decreases in serum levels of total proteins and albumin as well as significant increases in serum activities of AST, ALT and ALP. These findings can be attributed to impairment of food assimilation, absorption and utilization and the excreated parasites toxins affecting liver cells causing its damage (Ismail et al., 1990; Haenlein and Abdellatif, 2004).

The present results showed reduction of the mean values of trace elements copper, iron and zinc concentrations in infested sheep. Kaneko and Cornelius (1970) attributed such reduction mainly to impaired absorption or increased excretion of respective elements. Also, significant decreases in calcium and inorganic phosphorus levels were observed. The hypocalcemia and hypophosphatemia could be attributed to disturbances in digestion and absorption as well as changes occurring in the duodenum toward alkalinity as a result of parasitic infestation which interferes with the absorption of calcium and phosphorus (Ragab, 1975; Zein El-Abdin et al., 1975). After 14 days of medication with albendazole and Nigella sativa, the dysfuncitons were corrected and returned to its normal values confirming a good efficacy of both albendazole and Nigella sativa as antihelmentics drugs against nematodes.

Concerning blood picture, Table (4) showed a significant decreases in RBCs count, Hb content and PCV% in addition to significant increases in WBCs count, eosinophils, neutrophils and monocytes coupled with significant decrease in lymphocytes count in infested sheep. These results were similar to that obtained by Mottelib et al. (1992) and Hamdy and El-Sayed (2004). They reported anaemia with prominent decrease in both erythrocytes and haemoglobin in sheep naturally infested with internal parasites. The occurrence of anaemia was confirmed by the decreased serum iron and copper in the infested sheep. Baker and Douglas (1966) attributed the presence of anaemia associated with parasitic infestation due to

shortening of the life of erythrocytes, impaired erythropoiesis and reduction of the amino acid and some elements essential for erythropoiesis.

The observed leucocytosis associated with neutrophilia in the diseased animals can be due to the toxins of the internal parasites and their effects on liver and intestine (Jubb and Kennedy, 1985). The reported eosinophilia may be due to antibody reaction produced by the keratin of the parasites (Dobson, 1967). Also, the histamine released by antigen antibody reaction was thought to be an additional factor that cause eosinophilia in the same respect monocytosis followed the induced chronic inflammation (Best and Tylor, 1955; Coles, 1986 and Tizard, 1987). The recorded lymphocytopenia may be attributed to the increased activity of the adrenal gland with the tissues invaded by the parasitic toxins (Mottelib et al., 1992). This picture returned back to normal values after 14 days of treatment with albendazole and Nigella sativa.

The obtained results are confirmed by the results obtained by Rakesh et al. (1979) who concluded that the essential oil of Nigella sativa has a good antibacterial and antihelminthic activity.

From the results obtained from this study, it was indicated that both albendazole and Nigella sativa were effective at one dose level, where produced good and satisfactory results in treatment of nematodes in sheep and this encourage the possible use of Nigella sativa in treatment of nematodes in sheep and this need further studies.

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التقييم الكيميائى والدموى والطفيلى لكفاءة حبة البركة كمحاولة لعلاج الاغنام المصابة بالديدان الاسطوانية مقارنة بمستحضر الالبنذازول

عادل على كامل - نجوى أنور حلمى
معهد بحوث صحة الحيوان - الزقازيق

تم مقارنة تأثير مسحوق حبة البركة ومستحضر الألبنداروال على أغنام بلدية مصابة بالديدان الاسطوانية. وتم أخذ عينات براز لعد البويضات ودم للتحليل الكيميائى وكذا لاستبيان صورة الدم من جميع الأغنام ثم بعد أسبوع، أسبوعين ، ثلاثة أسابيع من العلاج ، كانت نتيجة الفحص الطفيلى إصابة تلك الأغنام بديدان ترايكوسترونجيلس ، الهيمونكس ، الاوسترتاجيا والاوسفاجوستومم. وأوضح فحص البراز بعد العلاج إلي الكفاءة العلاجية لكل من مستحضر الألبنداروال ومسحوق حبة البركة علي التوالي حيث أن البويضات اختفت تماما عند ١٤ يوم من العلاج بالنسبة للألبنداروال وعند ٢١ يوم بالنسبة لمسحوق حبة البركة.

أوضحت نتائج التحليل أن الاصابة بالديدان الاسطوانية نتج عنه زيادة في نشاط انزيمات الاسبرتات والالانين أمينوتر انسفيريز والألكالاين فوسفاتيز ، بينما ظهر نقص في نسبة البروتين الكلى والزلال ، إلي جانب وجود نقص فى تركيز العناصر المعدنية النادرة مثل النحاس والحديد والزنك بالإضافة إلى وجود نقص معنوى فى مستويات الكالسيوم والفوسفور الغير عضوي .

كما أوضحت الدراسة إلي اصابة الأغنام بالأنيميا التي تمثلت في نقص عدد كرات الدم الحمراء ونسبة الهيموجلوبين وحجم الخلايا المضغوطة مصحوبة بزيادة فى عدد خلايا الدم البيضاء والخلايا المتعادلة والمضية والخلايا الملتهبة الكبيرة. وصاحب ذلك نقص في عدد الخلايا الليمفاوية، وبدأت هذا النتائج فى الرجوع للقيم الطبيعية بعد سبعة أيام من العلاج لكل من الألبنداروال وحبة البركة ووصلت القيم إلى المعدل الطبيعى بعد أربعة عشر يوما من بداية العلاج.

يتضح مما سبق أنه يمكن استخدام مسحوق حبة البركة في علاج الديدان الاسطوانية لما أبداه من كفاءة فى النقص الواضح فى عدد البويضات وتحسين صورة الدم والخلل فى الوظائف الكبدية ، لذا ينصح باستخدامه ككمضاد لبويضات الطفيليات الداخلية.