Comparative Studies On The Efficacy Of Ivermectin , Doramectin And Levamisole In Treatment Of Gastrointestinal Nematodes In Cattle

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ABSTRACT

A study was undertaken to investigate the effect of Ivermectin (Alfamectin)®, Doramectin (Dectomax)®and Levamisole (Ucimisole)® in the treatment of cattle naturally infested with gastrointestinal nematodes in Sharkia province. Thirty male Frezian cattle, 18-24 months age and body weight ranged from 150-180 kgm, they were selected according to the presence of egg of gastrointestinal (GI) nematodes in their faeces.The animals were classified into five equal groups each of 6 animals and treatment were adopted as follows: Group(1) kept as control (non-infested non-treated),group(2)was naturally infested with GI nematodes and non treated , group(3) naturally infested with GI nematodes and treated with ivermectin (1ml/50 kgm Bwt,S/C),group(4) naturally infested with GI nematodes and treated with doramectin (1ml/50 kgm Bwt,S/C)and group(5) naturally infested with GI nematodes and treated with levamisole(0.5ml/10kgm Bwt,S/C).Before treatment (zero day) animals were weighted, then at 2^{nd} ,4^{th} ,6^{th} and 8^{th} week post treatment (PT) blood samples were collected for biochemical and haematological findings, then at 7^{th},14^{th} and 28^{th} day PT faecal samples were collected from each animal to detect the drug efficacy which assessed as a percentage of egg reduction (Faecal egg count reduction percent , FECR%) ,then at 1^{st} ,2^{nd} ,3^{rd} and 4^{th} week PT biochemical, haematological findings and body weight were recorded and compared with infected non-treated control. Both ivermectin and levamisole treated groups revealed more efficient effect than that of doramectin during the experiment. The effect of tested drugs on liver and kidney function and blood picture of tested animals revealed that they are nearly similar except levamisole which showed more significant increase in total proteins ,albumin and globulins (restore them to normal values). Moreover, the effect of tested drugs on body weight revealed that ivermectin treated group showed more significant increase in body weight ,gain /kgm ,gain % and specific growth rate followed by levamisole treated group then doramectin treated group.

INTRODUCTION

Parasitic infestation among farm animals constitutes a major hazard to live stock production. The most important economic losses inflicted upon them have been the retardation of their growth, emaciation ,remarkable decrease in efficiency as well as ,low production of meat and milk *(1)*.

Gastrointestinal (GI) nematodes are one of the most important causes of losses between sheep and cattle because parasites are not like bacteria, as they have special character, of being mostly chronic with no dramatic pathological picture, they exist mostly unnoticed in spite of being actually determental for animal health and production *(2)* .

The species that occur in the abomasum are the most pathogenic because abomasum is the place where digestion and absorption of nutrients take place . The important parasites are *Haemonchus contortus* (long large stomach worms),*Ostertagia ostertagia* and *Trichostrongylus axei*,while the species that occur in the small intestine are less pathogenic *(3)*. **Perry et al.** *(4)* **and Peter & Chandrawathani** *(5)* recorded that *Haemonchus contortus* (red stomach worm, wire worm or Barber's pole worm) is very common parasite and one of the most pathogenic nematode of ruminants. Adult worms are attached to abomasal mucosa and feed on the blood (blood-sucking parasite).Moreover, they found that *H.*

contortus larvae molt several times, resulting in L3 form that is infectious for the animals. They can take up these larvae when eating grass leaves. The L4 larvae, formed after another molt, suck blood in the abomasum of the animal, potentially giving rise to anaemia and oedema, which eventually can lead to death.

McLeod *(6)* revealed that *Trichostrongylus axei* (hairworm) has a direct life cycle typical of nematodes, it is usually part of a mixed infection, so its results are additive. The hairworm irritates and erodes the villi of the gut, damaging the capillaries and lymph vessels within these structures and causing blood loss into the gut. Parasite-induced trauma to the intestinal lining results in characteristic dark, foul-smelling diarrhea. Blood loss can cause anemia, edema, and rapid loss of condition.

Anthelmintics will continue to be the principal method of internal parasite control in short and long term ,efficient use of anthelmintic is an integral part of worm control strategies to prevent production losses from parasitic infections *(7)*. Treatment in most farms depends on availability of money and drugs and not the epidemiology of parasites.

Ivermectin is one of avermectins,it is a broad spectrum antiparasitic drug introduced onto the international animal health market in 1981.The avermectins are a group of chemically related anthelminitics produced by fermentation of an actinomycete named *Streptomyces avermitilis*. It has been identified as a group of macrocyclic lactone derivatives .It has indicated a wide range of efficacy against nematodes , all major GIT and lung nematodes and certain ectoparasites of cattle and sheep. Action of avermectins against parasites related to inhibition of motility of worm by increasing the release of gamma-aminobutyric acid(GABA) from synaptosomes of the nervous system leading to paralysis of the worm and consequently expelled *(8)*.

Doramectin is a novel avermectin with extended persistency, it is antiparasitic compound and it is fermentations from the soil organism *Streptomyces avermitilis* .It can be used for controlled exposure to worms throughout the entire grazing season *(9)*.

Levamisole hydrochloride (Levamisole HCl) is the LEVO-rotatory form (left-handed) of tetramisol, it is an anthelmintic agent commonly used in large livestock such as cattle, pigs and sheep. It affects the neurotransmitters within the parasite and paralyzes the worm (spastic paralysis) , Levamisole HCl has been found to be highly effective in the treatment of mature and developing immature stages of major stomach and bowel worm species in cattle and sheep including gastro-intestinal worms, Levamisole acts on the roundworm nervous system and is not ovicidal. Its broad spectrum of activity, ease of use (being water soluble), reasonable safety margin, and lack of teratogenic effects have allowed it to be used successfully . In ruminants, levamisole is highly effective against the common adult GI nematodes and lungworms and many larval stages *(10)*.

This study was conducted to compare the efficacy (Faecal egg count reduction percent, FECR%) of Ivermectin, Doramectin and Levamisole in treatment of GI nematodes in cattle with special references to their effect on liver and kidney functions ,haematological changes ,body weight in treated animals .

MATERIAL AND METHODS

Material

Animals

The present study was conducted on 30 male Frizian cattle aged from 18-24 months and weighing 150-180 kgm.They were fed on concentrated ration and tiben ,They were belonged to Elbetar farm in Kafr saker ,Sharkia province .

Drugs

1-Ivermectin 1% (Alfamectin)®:is an injectable solution for the treatment of ecto and endo parasites in cattle, sheep and camel, manufactured by Arabcomed Co., each ml contain 10 mg Ivermectin.Its dose level is 1ml/50 kg Bwt ,injected subcutaneously (S/C).

2-Doramectin (Dectomax)®:is injectable solution for the treatment of gastrointestinal nematodes in cattle, sheep and camel, manufactured by Pfizer Co., each ml contains 10 mg Doramectin.Its dose is 1 ml/50 kg Bwt, injected subcutaneously (S/C).

3-Levamisole10%(Ucimisole)®:is an injectable solution for treatment of gastrointestinal nematodes in all species of animals and poultry, manufactured by Amoun pharmaceutical Co., each ml contain 100 mg levamisole.Its dose is 0.5 ml/10 kg Bwt, injected subcutaneously(S/C).

Experimental design

Animals used in this study were grouped into five equal groups (6 animals/each) : 1st group (G1) was non-infested non-treated, 2nd group (G2) was naturally infested with gastrointestinal nematodes and non treated, 3rd group (G3)was naturally infested with GI nematodes and treated with Ivermectin (1ml /50kg Bwt) by S/C injection, 4th group (G4) was naturally infested with GI nematodes and treated with doramectin (1ml/50kg Bwt) by S/C injection, 5th group (G5) was naturally infested with GI nematodes and treated with Levamisole (0.5ml/10kg Bwt) by S/C injection.

Specimens

Before treatment (zero day) animals were weighted, then at 2nd ,4th ,6th and 8th week post treatment (PT) also individual blood samples were collected for biochemical and haematological findings, then at 7th,14th and 28th day PT.Faecal samples were collected from each animal to detect the drug efficacy which assessed as a percentage of egg reduction (Faecal egg count reduction percent , FECR%) ,then at 1st ,2nd ,3rd and 4th week PT biochemical, haematological findings and body weight were recorded and compared with infected non-treated control.

Faecal samples were collected from each animal directly from the rectum in poly-ethylene sacs and examined for detection of the eggs of gastrointestinal nematodes(GI) and counting the eggs to determine the severity of infestation. Faecal samples were examined by direct smear concentration method and egg count by McMaster technique.

Blood samples (heparenized for haematological studies and serum collection for liver and kidney function tests).

Methods

1) Faecal examination include:

Direct smear method *(11)* and Mc Master technique*(12)*

2) Haematological studies include:

Blood cell count *(13),* blood haemoglobin *(14),* packed cell volume (PCV) *(15),* Red blood indices *(16)* and they include Mean corpuscular volume (MCV) & Mean corpuscular haemoglobin (MCH)and Mean corpuscular haemoglobin concentration (MCHC).

3) Biochemical studies include:

Serum transaminases (AST& ALT) *(17),* and serum alkaline phosphatase (ALP) *(18).*

Serum total proteins *(19),* albumin *(20),* while serum globulins were determined by subtracting serum albumin from the amount of total serum proteins and albumin/globulin ratio was also calculated. Serum urea level *(21)* and creatinine were as sayed as previously recorded *(22).*

Statistical analysis

Data were statistically analyzed according to SPSS program *(23)* .

RESULTS AND DISCUSSION

The efficacy of tested drugs on cattle naturally infested with GI nematodes

The results were illustrated in Table 1 which revealed that the mean pre-treatment egg count per gram faeces (epg)of gastrointestinal nematodes(GI) in G3, G4 and G5 at zero time were 2485.15±153.55, 2543.23±186.95and 2481.33 ±161.47 respectively

The results showed that FECR% (Faecal egg count reduction %) of eggs of GI nematodes in group(3) was (90.8 ± 0.53, 96.76

± 0.31, 99.27 ±0.17and 100%), in group(4) FECR% was (87.75±0.25, 92.99±0.37, 98.1 ± 0.41 and 100%), while in group(5) it was (90.97±0.55, 95.83±0.24, 98.98±0.3 and 100%) at 1st ,2nd ,3rd and 4th week PT respectively.

The results were in accordance with that obtained by **Delemer et al.***(24)* who recorded that FECR% of ivermectin against GI nematodes in cattle in Northern Europe in 2006 was between 69-100 % from 7-21 days post treatment . **Borgsteede et al.** *(25)* also revealed that FECR% of ivermectin against *Tricostrongylus* spp.in cattle was 100%. **Ram et al.** *(9)* recorded that the efficacy of ivermectin and doramectin were 96% and 94% against gastrointestinal nematodes of Pashmina goats.

Conder et al. *(26)* recorded that efficacy of doramectin against haemoncus and tricostrongylus was 99.7% ,**Molento et al.** *(27)* found that efficacy of doramectin against haemoncus spp. in cattle was 91.9%, while **Marley et al.** *(28)* recorded that it is 95.3%.Moreover,**Ives et al.** *(29)*recorded that doramectin reduced faecal egg count by more than 98% in cattle infested with gastrointestinal nematodes.

Ikeda *(30)* recorded that efficacy of ivermectin against haemoncus and tricostrongylus,was 98% ,while **Borges et al.** *(31)* found that it was 89.4%.**Couvillion et al.** *(32)* found that Doramectin, at a dosage of 200 microgram/kg, is effective (by 99-100%)in controlling the prevalent gastrointestinal nematodes (adult and L4 stages) found in naturally infected calves. Moreover, **Hooke et al.** *(33)* recorded that the efficacy of Doramectin and ivermectin when administered to nematode-infected cattle in New Zealand, they found that FECR %of doramectin was 99.1% in the first study and 100% in the second study while in ivermectin it was 86.0% and 80% assessed at 14 days post treatment.

Williams and Broussard *(34)* recorded that efficacy of levamisole against GI nematodes in cattle varied from 99.1-100%. Also, **Kerboeuf, et al.** *(35)*found the same results. Meanwhile, **Vanni Chaisanabunthid et al.** *(36)* recorded that a single treatment with levamisole injection in sheep and cattle resulted in a complete (100 %)removal of *Haemonchus contortus* and *Trichostrongylus spp.*

Table 1. The efficacy of S/C injection of Ivermectin (1ml/50kgBwt) , Doramectin (1ml/50kBwt), and Levamisole (0.5ml/10kgBwt) on fecal egg count reduction percent (FERC%) and egg count per gram feces (epg) in cattle naturally infested with Gastrointestinal nematodes (Mean ± SE) n=6

Time / Group	Before treatment (Zero time)		Weeks post treatment							
			1st		2nd		3rd		4th	
	epg	FERC%	epg	FERC%	epg	FERC%	epg	FERC%	epg	FERC%
Ivermectin Treated group	2485.15 ± 153.55	0.0 %	258.33 ± 20.09	90.8 ± 0.53	107.08 ± 7.37	96.76 ± 0.31	27.87 ± 3.95	99.27 ± 0.17	0	100%
Doranectin Treated group	2543.23 ± 186.95	0.0 %	332.24 ± 7.11	87.75 ± 0.25	164.83 ± 8.84	92.99 ± 0.37	41.49 ± 8.99	98.1 ± 0.41	0	100%
levamisole Treated group	2481.33 ± 161.47	0.0 %	222.66 ± 12.88	90.97 ± 0.55	104.83 ± 5.73	95.83 ± 0.24	26.91 ± 7.54	98.98 ± 0.3	0	100%

Means within the same column carrying different litters are significant at $P < 0.05$

Effect of tested drugs on liver and kidney function

The results are illustrated in Table 2,our results revealed that animals naturally infested with GI nematodes showed a non significant effect on serum transaminases (AST&ALT) ,and alkaline phosphatase (ALP), these results were reinforced with those previously obtained *(37)*.A significant decrease was noticed in total proteins, albumin and globulins in animals naturally infested with GI nematodes ,the decrease in total proteins may be attributed to the presence of parasites which interfere with absorption of protein intake *(38, 39)*.Also may be due to edema that resulted from infestation with GIT nematodes *(4, 5)* .

On the other hand, animals naturally infested with GI nematodes showed a significant increase in both urea and ceratinine levels , urea is the major nitrogen-containing metabolic product of protein catabolism ,while creatinine is a non protein nitrogenous substance. They were excreted by glomerular filtration, any abnormality that decrease glomerular filtration rate (GFR) will result in an increase in the concentration of serum urea and creatinine *(40,41)*.

Perry et al *(4)* **and Peter & Chandrawathani** *(5)* revealed that adult worms of *Haemonchus contortus* attach to abomasal mucosa and feed on the blood (blood-sucking parasite)causing anemia and edema due to blood loss. Moreover, **McLeod,** *(6)* found that *Trichostrongylus axei* irritates and erodes the villi of the gut, damaging the capillaries and lymph vessels causing blood loss leading to anemia and edema. **Paterson** *(42)* demonstrated that the effective renal plasma flow, the glomerular filtration rate and the filtration fraction were reduced below normal values in dogs with chronic anemia. Our results were inconsistence with that obtained by **Sromberg et al.** *(43)* who found that there were no significant differences between control and infected groups .

Table 2 showed that total proteins, albumin, and globulins in treated groups (G3,G4 & G5) were significantly increased, while urea and creatinine levels were significantly decreased compared with infected group without differences between them except levamisole treated group which showed more significant increase in total proteins, albumin and globulins levels(restored them to normal values) , that may be due to the immunostimulant effect of levamisole *(44)*.

Haematological results

The obtained results revealed that animals naturally infested with gastrointestinal nematodes showed a significant decrease in RBCs count ,haemoglobin content and PCV % and a significant increase in WBCs count, compared with control group (Table 3).

These results were in the same direction with that previously obtained by **Abd Rabo ,** *(45)*. The decrease in RBCs and haemoglobin might be due to blood loss by parasitism especially haemoncus spp *(4-6)*.As well as reduction of amino acid and impairment in absorption ,utilization and assimilation of some elements essential for erythropiosis *(46)*.On the other hand, the reported increase in WBCs of our study can be explained due to antibody reaction due to parasitism *(47)*.

At 7^{th} day PT the three drugs significantly increase RBCs, haemoglobin content and PCV% without significant differences between them ,while on WBCs count the three drugs gave non significant effect. At 14^{th} day PT both haemoglobin content and PCV% significantly increase without differences between the tested drugs, but the increase in RBCs count was more in ivermectin treated group than doramectin and levamisole treated groups.WBCs count significantly decreased in both ivermectin and levamisole treated groups with non significant effect in doramectin treated group. A significant increase was noticed in RBCs count in the three groups at 28^{th} day PT without significant differences between them but ivermectin and doramectin treated groups were nearly similar to control non infected group.

Table 2. The Effect of S/C injection of Ivermectin (1ml/50kgBwt) , Doramectin (1ml/50kg Bwt), and Levamisole (0.5ml/10kgBwt) on liver and kidney function parameters of cattle naturally infested with GI nematodes (Mean ±SE) (n=6)

Group / parameter	Control Non infested (zero time)	Infested Group (zero time)	Ivermectin treated group			Doramectin treated group			Levamisole treated group		
			7days PT	14 days PT	28 days PT	7days PT	14 days PT	28 days PT	7days PT	14 days PT	28 days PT
AST (U/L)	36.62 ± b 0.23	37.08 ± b 0.52	38.69 ± b 1.24	37.30 ± b 0.54	38.0 ± b 1.22	38.23 ± b 1.37	37.55 ± b 0.47	37.19 ± b 0.16	37.47 ± b 132	37.20 ± b 0.32	37.02 ± b 0.35
ALT (U/L)	30.27 ± a 0.35	30.73 ± a 1.04	29.96 ±a 1.67	30.55 ± a 0.63	30.55 ± a 0.80	29.51 ± a 1.25	29.93 ± a 0.32	30.10 ± a 0.16	30.83 ± a 0.26	29.91 ± a 1.25	30.42 ± a 0.38
ALP (kind & king)	28.63 ± d 0.21	28.24 ± d 0.50	28.04 ± d 2.15	28.05 ± d 0.15	28.38 ± d 0.06	29.02 ± d 1.23	28.67 ± d 0.26	27.52 ± d 0.27	28.27 ± d 0.86	29.90 ± d 1.19	28.87 ± d 0.13
Total protein gm/dl	7.64 ± a 0.09	4.35 ± d 0.17	6.13 ± c 0.53	6.70 ± ba 0.23	6.98 ± a 0.06	6.49 ± b 0.21	6.90 ± a 0.16	7.04 ± a 0.10	6.57 ± b 0.19	6.80 ± ab 0.18	7.31 ± a 0.07
Albumin gm/dl	4.02 ± a 0.05	2.98 ± c 0.06	3.85 ± ab 0.063	3.67 ± ba 0.23	3.87 ± ab 0.02	3.69 ± ba 0.22	3.89 ± ab 0.16	3.49 ± b 0.04	3.73 ± ba 0.20	3.56 ± b 0.17	4.00 ± a 0.04
Globulin gm/dl	3.63 ± a 0.06	2.37 ± c 0.09	2.58 ± c 0.24	3.07 ± b 0.24	3.11 ± b 0.04	2.81 ± c 0.31	3.00 ± bc 0.02	3.10 ± b 0.06	2.85 ± bc 0.22	3.22 ± ab 0.19	3.37 ± ab 0.07
A/G ratio %	0.90 ± b 0.03	0.84 ± b 0.05	1.38 ± a 0.13	1.28 ± a 0.18	1.33 ± a 0.01	1.41 ± a 0.23	1.29 ± a 0.052	1.27 ± a 0.01	1.49 ± a 0.14	1.13 ± a 0.10	1.38 ± a 0.03
Urea mg/dl	42.95 ± a 0.28	58.34 ± d 0.09	52.90 ± c 0.43	49.93 ± c 1.49	45.22 ± b 0.36	53.12 ± cd 0.18	48.69 ± c 0.64	44.99 ± b 0.68	53.56 ± cd 0.15	48.89 ± c 0.15	45.19 ± b 0.08
Creatinine mg/dl	0.74 ± c 0.01	1.19 ± a 0.14	1.08 ±ab 0.04	1.00 ±b 0.03	0.88 ±c 0.02	1.08 ±ab 0.05	1.01 ±b 0.02	0.86 ±c 0.01	1.03 ±b 0.05	0.99 ±b 0.03	0.89 ±cb 0.03

Means within the same column carrying different litters are significant at $P < 0.05$

Table 3. The Effect of S/C injection of Ivermectin (1ml/50kgBwt) , Doramectin (1ml/50kg Bwt), and Levamisole (0.5ml/10kgBwt) on blood picture of cattle naturally infested with GI nematodes (Mean ±SE)(n=6)

Group / parameters	Control Non infested	Infested group	Ivermectin treated group			Doramectin treated group			Levamisole treated group		
			7days PT	14 days PT	28 days PT	7days PT	14 days PT	28 days PT	7days PT	14 days PT	28 days PT
RBCs (10^6 x cu mm)	7.06 ± a 0.06	4.87 ± c 0.17	6.04 ± b 0.05	6.59 ± b 0.05	6.90 ± ab 0.03	5.99 ± b 0.03	6.22 ± c 0.09	6.82 ± ab 0.05	5.97 ± b 0.02	6.35 ± bc 0.04	6.62 ± b 0.08
WBCs (10^3 xcu mm)	8.07 ± b 0.14	9.26 ± a 0.14	9.25 ± a 0.08	8.67 ± b 0.07	8.10 ± d 0.03	9.28 ± a 0.03	9.30 ± a 0.08	8.84 ± b 0.07	9.20 ± a 0.06	8.76 ± b 0.08	8.58 ± c 0.03
Haemoglobin gm%	11.68 ± a 0.09	8.71 ± c 0.13	9.20 ± b 0.02	9.59 ± b 0.04	10.42 ± b 0.12	9.40 ± b 0.10	9.67 ± b 0.08	9.95 ± c 0.04	9.43 ± b 0.04	9.69 ± b 0.05	9.95 ± c 0.03
PCV %	34.37 ± a 0.10	30.18 ± d 0.09	31.77 ± b 0.07	31.99 ± b 0.03	32.42 ± c 0.08	31.18 ± c 0.04	31.80 ± b 0.14	32.82 ± b 0.06	31.05 ± c 0.04	31.73 ± b 0:03	31.98 ± d 0.02
MCV (cu u)	48.63 ± a 0.47	45.80 ± c 0.29	46.98 ± b 0.05	47.57 ± b 0.10	47.96 ± ab 0.02	46.63 ± b 0.08	47.04 ± b 0.02	47.56 ± b 0.09	46.73 ± b 0.12	47.08 ± b 0.089	47.40 ± b 0.04
MCH (u ug)	16.56 ± c 0.27	18.17 ± a 0.10	17.61 ± b 0.02	17.30 ± b 0.04	16.97 ± bc 0.03	17.43 ± b 0.05	17.26 ± b 0.05	16.93 ± bc 0.05	17.64 ± b 0.07	17.39 ± b 0.03	17.04 ± b 0.02
MCHC %	34.04 ± c 0.29	37.71 ± a 0.15	36.70 ± b 0.080	36.24 ± b 0.05	35.44 ± b 0.14	36.79 ± b 0.082	36.09 ± b 0.03	35.89 ± b 0.03	36.49 ± b 0.046	36.11 ± b 0.06	35.89 ± b 0.03

Means within the same column carrying different litters are significant at $P < 0.05$

The effect of tested drugs on body weight

Our results were illustrated in Table 4 which revealed that cattle naturally infested with GI nematodes showed retardation in growth rate , decrease in body weight and emaciation, these results were previously reported by **Loyacano et al.** ***(48)*** who found that calves infested with GI nematodes showed reduction in body weights, reproductive performance and calf weights. Moreover, **Daniel et al.** ***(49)*** recorded that Merino ewes infested with GI nematodes revealed lost body condition score with decreased live body weight compared with control sheep.

Table 4 showed that G3 (ivermectin treated group) revealed more significant increase in body weight, gain /kgm ,gain % and specific growth rate than that obtained by G4 (doramectin treated group) and G5 (levamisole treated group) .Our results were reinforced by **DeRosa et al.** ***(1)***,who found that cattle infested with gastrointestinal nematodes and controlled with subcutaneous injections of either ivermectin or doramectin were heavier and had higher condition scores than that of other anthelimintics .On the other hand ,**Hooke et al.** ***(33)*** recorded greater weight gains (gain, gain % and specific growth rate) for doramectin treated cattle over the 56-day period than those of ivermectin.

Table 4. The Effect of S/C injection of Ivermectin (1ml/50kgBwt) , Doramectin (1ml/50kBwt), and Levamisole (0.5ml/10kgBwt) on body weight of cattle naturally infested with GI nematodes (Mean ±SE)(n=6)

Time / group	Pre treatment (Zero time)	2nd week post treatment			4th week post treatment			6th week post treatment			8th week post treatment			Specific Growth rate
		Mean +S.E	Gain /kg	Gain %	Mean +S.E	Gain /kg	Gain %	Mean +S.E	Gain /kg	Gain %	Mean +S.E	Gain /kg	Gain %	
Ivermectin Treated group	164.50 ± a 4.11	179.16 ± a 4.81	16.81 ± a 0.55	10.21 ± a 0.71	195.50 ± a 3.11	30.98 ± a 0.37	18.81 + a 0.5	209.83 ± a 4.33	45.38 ± a 0.83	27.58 ± a 0.12	238.00 ± a 2.22	73.5 ± a 2.04	44.83 ± a 1.74	0.95 ± a 0.02
Doranectin treated group	170.83 ± a 3.15	178.33 ± a 3.34	7.61 ± a 0.085	4.54 ± a 0.93	192.83 ± a 3.32	22.18 ± a 0.55	12.98 ± a 0.15	198.83 ± b 3.14	28.92 ± b 0.16	16.91 ± b 0.9	213.16 ± b 3.22	42.83 ± b 1.74	24.83 ± b 0.92	0.56 ± b 0.01
levamisole Treated group	168.16 ± a 1.81	176.66 ± a 1.97	8.46 ± a 0.71	5.11 ± a 0.26	188.83 ± a 2.00	20.67 ± a 0.46	12.29 ± b 0.95	198.83 ± b 2.10	30.94 ± b 0.66	18.42 ± b 0.72	213.66 ± b 1.97	45.5 ± b 0.22	26.97 ± b 0.19	0.61 ± b 0.06

Means within the same column carrying different litters are significant at $P < 0.05$

CONCLUSION

Finally, we can conclude that efficacy of ivermectin ,doramectin and levamisole on cattle naturally infested with gastrointestinal nematodes was 100% at the end of our experiment .It is important to say that both ivermectin and levamisole treated groups revealed more efficient effect than that of doramectin during the experiment. The effect of tested drugs on liver and kidney function and blood picture of tested animals revealed that they are nearly similar except in levamisole treated group which showed more significant increase in total proteins ,albumin and globulins (restore to the normal values).Moreover, the effect of tested drugs on body weight of tested animals revealed that ivermectin treated group showed more significant increase in body weight ,gain /kgm ,gain % and specific growth rate followed by levamisole treated group then doramectin treated group.

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الملخص العربى

دراسة مقارنة الكفاءة العلاجية بين الايفرمكتين (الفامكتين) ودورامكتين (ديكتوماكس) وليفاميزول (يوسىميزول) فى علاج الديدان المعوية فى الماشية

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أجريت دراسة لعمل مقارنة بين تأثير آيفرمكتين (الفامكتين) ودورامكتين (ديكتوماكس) ، وليفاميزول(يوسىميزول)في علاج الماشية المصابة طبيعيا بالديدان المعوية في مزرعة تابعة لمحافظة الشرقية.وقدا ستخدم فى هذة الدراسة عدد ثلاثون ذكر بقر فريزيان يتراوح عمرهم من (18-24) شهر،ويتراوح أوزانهم بين (150-180) كجم/حيوان, فى اليوم الأول تم اخذ عينات دم وروث من الحيوانات وتم تحليل الروث لتحديد درجة الإصابة وأيضا تم تحليل الدم وأظهرت نتائج التحاليل الدموية للحيوانات المصابة انخفاضا معنويا فى عدد كرات الدم الحمراء و تركيز الهيموجلوبين و حجم الخلايا المضغوطة و كذلك كان هناك زيادة معنوية فى عدد كرات الدم البيضاء . أوضحت التحاليل البيوكيمائية لمصل الدم لنفس الحيوانات عدم وجود اختلافات معنوية فى وظائف الكبد(AST,ALP ,ALT) بينما أظهرت النتائج نقصا معنويا فى تركيز البروتين الكلى والألبيومين و الأمينوجلوبيولين وارتفاع تركيز اليوريا والكرياتينين(وظائف الكلى) كما أوضحت النتائج أن التغيرات الدموية والكيميائية فى الحيوانات المصابة ماهى إلا انعكاسا لدرجة الاصابه .وقد تم تقسيم الحيوانات بعد وزنها إلىخمس مجموعات كل مجموعة تتكون من 6 حيوانات على النحو التالي : المجموعة الأولى غير مصابة وغير معالجة(الضابطة) ، المجموعة الثانية مصابة وغير معالجة ، المجموعة الثالثة مصابة ومعالجة بالايفرمكتين (1 مل /50 كجم وزن) حقنا تحت جلد الرقبة و المجموعة الرابعة مصابة ومعالجة بالدورامكتين (1 مل /50 كجم وزن) حقنا تحت جلد الرقبةو المجموعةالخامسة مصابة و معالجة بالليفاميزول (0.5 مل /10 كجم وزن) حقنا تحت جلد الرقبة.

تم جمع عينات روث من الحيوانات المعالجة بعد العلاج ب 1،2،3،4 أسابيع وكذلك عينات دم بعد العلاج ب 7 ، 14 ، 28 يوم وأيضا تم وزن الحيوانات بعد 2 ، 4 ،6،8 أسابيع لمتابعة تطور الحالة بعد العلاج ، بعد انتهاء التجربة تم تقييم فعالية الأدوية كنسبة مئوية من الحد من عدد البويضات(الديدان المعوية) فى روث الحيوانات المصابة والمعالجة (FECR ٪). وأظهرت النتائج أن FECR ٪ في المجموعة (3)كانت(90.8 ± 0.53 ، 96.76 ± 0.31 ، 99.27 ± 0.17، 100 ٪) ، في المجموعة (4) FECR٪كانت(87.75 ± 0.25، 92.99 ± 0.37، 98.1.37±0.41 ،100 ٪) ، أما في المجموعة (5) كانت (90.97 ± 0.55 ، 95.83 ± 0.24 ، 98.98 ± 0.3 ، 100 ٪) في الأسبوع 1،2،3،4 على التوالي. ومن المهم أن نقول إن كلا من آيفرمكتين وليفاميزول قد اظهروا كفاءة أكثر من تأثير دورامكتين خلال التجربة.بالنسبة لتأثير العقاقير المستخدمة على وظيفة الكبد والكلى ، بالإضافة إلى صورة الدم كشفت النتائج أنهم قد أدوا إلى تحسين هذه الوظائف بالمقارنة بالمجموعة المعداة والغير معالجة دون اختلافات كبيرة بينهم اباستثناء ليفاميزول الذى اظهر زيادة كبيرة فى تركيز البروتين الكلى والألبيومين و الأمينوجلوبيولين(عادت النسب الى المعدلات الطبيعية تقريبا). أما عن تأثيرهم على وزن الجسم للحيوانات فقط أظهرت النتائج أن آيفرمكتين أظهر زيادة كبيرة فى وزن الحيوانات المعالجة يلية الليفاميزول ثم الدورامكتين.