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Study of Hematological and Biochemical Changes of Natural Infection with Gastro-intestinal parasites in Local Cattle in Kirkuk City

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ABSTRACT

This study has been conducted on nearby cows in Kirkuk for the duration from 1st December 2021 to end of May 2022. This examine found out the volume of intestinally - infectious worms in seven exclusive areas of Kirkuk metropolis clinically and laboratory. The survey protected 250 cows, and the entire frequency charge turned into 49.2%. Ten jewelry have been recognized through the infectious and infectious worship all through the contemporary observe and a dissertation of mixture: *Ostertagia SPP Haemonchus SPP, Trichostrongylus Spp.toxocara SPP, Marshallagia SPP, Cooperia SPP, Ascaris SPP, Monezia SPP, Chabritia, Oesophagostomum.*

The maximum tempo of Ostertagia SPP is 23.57% observed via way of means of trichostrongylus intercourse through 20.32% and and then Haemonchus intercourse through 17.07% at the same time as recorded one intercourse of the bar and a monizea and a percent 2.43% in Hayman recorded the bottom peculiarity of Senses Oesophagostomum through 1.62%. The contemporary observe has demonstrated to be damaged through intestinally infectious loss A few in RBC blood cells and an decrease of Hb and (PCV) additionally recorded increased in white blood cells (TLC) in particular acid cells (Esionophils), also chemical requirements have reduced the average Total protein and albumin rate and lack the iron in serum.

1. Introduction

Cows are economically important animals in all countries of the world because of the high productive benefits they bring to society, whether through meat, milk, or other dairy products. According to the Iraqi Directorate of Agricultural Statistics. Most livestock in the world harbor some or many internal worms (stomach and intestinal worms) that infect cows naturally by eating grass or drinking from waters contaminated with eggs or larvae of these worms, and sometimes by eating the intermediate host, which transmits the infected larvae [1], and the number of

worms varies from very few to very many, so they cause significant infection in infected cows, and this infection can be with either liver, tape, or cylinder worms, which is considered the most important [2].Infection with these worms in cows results in great economic losses due to the pathological changes that occur in the infected animals, as these losses have been estimated to be more than 300 million cows infected with liver worms per year around the world according to [3]. The infection with these worms in cows has a great impact on the economic aspect, so many researchers in the world are interested in studying and diagnosing the different species of these worms and the resistance of animals to them, the reason for their spread, the seasons of their outbreak and the different factors that lead to the speed of their epidemic (such as heat and humidity) in the different stages of the life cycle, and how they adapt to environmental conditions and move to the infectious phase [4]Infection with gastric and intestinal worms leads to partly clinical and partly subclinical changes caused by the competition of the infected worms with the host (cows) for food in the intestine, causing clinical signs such as loss of appetite, shaggy hair, weakness of the animal, lack of production, pallor of the mucous membranes, various diarrhea and vomiting. It causes loss of appetite and an increase in the speed of food passage through the gastrointestinal tract, affecting the absorption process [5], as well as some hematological and biochemical parameters that are considered precursors of infection with these worms, including anemia caused by bleeding in the intestine. The intestinal wall as a result of damage caused by infection with these worms during food intake in the stomach and intestines, protein deficiency, iron deficiency and others that occur due to mechanical and anterior defects in the intestinal wall that affect the absorption process from the intestinal villi [6].

Previous studies [7] mentioned that the infection of cows varies according to the season, feeding type, and the spread of this disease depends on the management and improvement of pastures, the provision of good and integrated feed, and the selection of resistant strains. In this regard, and due to the risk of these worms to cows and their impact on the productivity of animals infected with stomach and intestinal worms in Kirkuk governorate

2. Material and Methods:

The study was conducted in the period from the beginning (December 2021) to the end (May 2022) and involved the recording of clinical signs and changes in some blood and biochemical parameters of local cows, collecting 250 fecal and blood samples from cows of different ages (2-5 years) and from seven different areas in the city of Kirkuk (Kirkuk, the Center, Yaji, Al-Sayada, Al-Rashad, Al-Majzarah, Hawija, and Daquq). The study was divided into two groups, the first group included cows infected with gastrointestinal worms, and the second group included the control group free from infections.

Fecal sample (5gm) was taken directly from the rectum and placed in disposable plastic boxes and by the flotation method was used to detect the eggs of nematodes and Cestodes, [1]. Eggs were measured

using the eye lens by extracting the magnification factor According to [8] it is possible to determine the length, size and width of an egg.. The blood samples collected from all study cos according to (Pugh, 2000), from the jugular vein in an amount (7.5 ml), puted in a test tube wit (EDTA) to Hematological exams and without anticoagulant to serum isolation for a purpose the of biochemical values examination, Hematological exams by A complete blood count (CBC) was used to determine total number of red blood cells (TRBC), hemoglobin (Hb), pocked cells volume (PCV), the total Leukocyte (TLCs), and (DLC), (MCV),(MCH) and (MCHC) according to (Yilmaz *et al.*, 2014). Biochemical studies includres Total protein, Albumin, Globulin and Iron Determined by spectrophotometer using an analytical kits from the French company (BIOLABO), [9]. Data were analyzed using the packaged SPSS program for windows version 10.01. presented as mean ± Standard Error (SE). Differences between groups were determined by the T-test. The significance level was set at $P<0.05$. (SPSS, 2000). [10]

3. Results and Discussions

Fecal samples from infection cattles in the city of Kirkuk were tested as part of the study, and the results revealed that the animals had a variety of nematodes and tapeworms in their systems250 fecal samples from cows were examined in total, and 123 samples tested positive, Nematodes and tapeworms made up about 49.2% of these positive samples in the figer (1). Worms of the species Ostertiga spp. followed by Trichostrongylus spp. observed the highest proportion (23.57%), It was (20.32%), whereas infection with Hemonchus spp. worms was (17.07%), whereas infection with Chabertia spp. and Toxocara spp. worms was (12.2%), whereas infection with Marshileigia ssp. Cooperia ssp. and Ascaris ssp was at a rate of 3.25%, 4.87%, 4.06%, respectively, The lowest rate of infection with worms of the genus Oesophagostomum spp. was recorded which was 1.62%, while infection with tapeworms of the genus Moniezia sp.p was 2.43% Table (1).

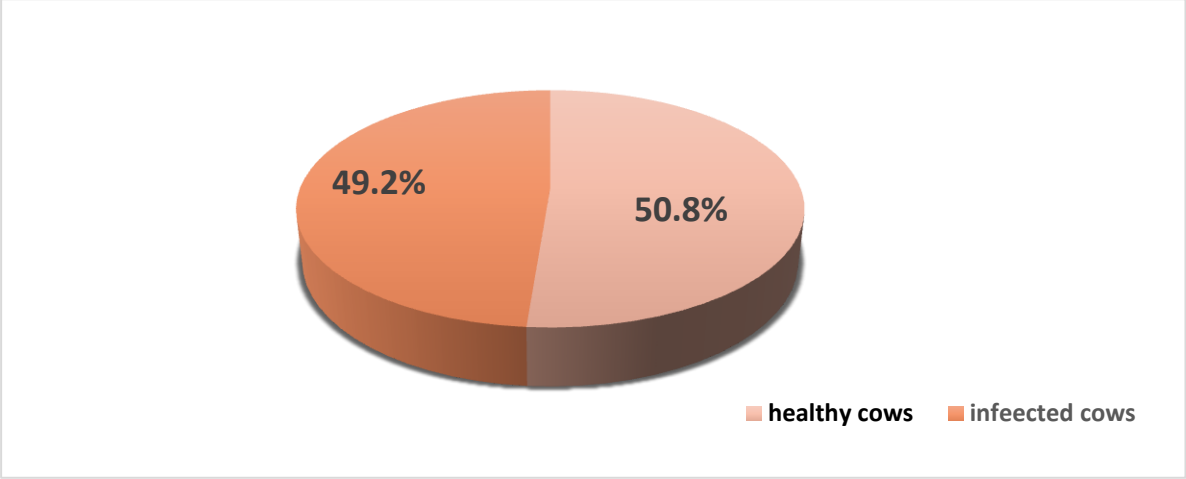

Figure (1) percentage bettween infected and healthy cattales

Table (1) Different worm species numbers in infected cows, along with the perce ntages of each species.

No.	Parasites gens	Cow infectious	infectious Percentage
1	*Ostertagia spp.*	29	23.57%
2	*Heamonchus spp.*	21	17.7%
3	*Trichostrongylus spp.*	25	20.32%
4	*Toxocara spp.*	15	12%
5	*Marshileigia spp.*	4	3.25%
6	*Cooperia spp.*	6	4.87%
7	*Ascaris spp.*	5	4.6%
8	*Monizea spp.*	3	2.43%
9	*Chabretia spp.*	13	11.2%
10	*Oesophagostomum spp.*	2	1.62%
	Total cow infection	**123**	**49.2%**

This result was less than the findings of the researcher [11] in a study conducted in Nasiriyah city, where the rate of infection with worms in the stomach and intestines was about (54.74%), and this study was different from what the researcher [12]in a study conducted in the city of Mosul, where the rate of infection was with these worms, the lowest was 23.34%, as well as different from the percentage in the massacre in the city of Kirkuk, where it was less than what the researchers mentioned [13], where the percentage that was recorded was about 67.17%, While a study by the researcher [14]found that the rate of infection with gastrointestinal worms in cows was 42.33% other studies have found rates as high as 50.5% in three cities in Colombia and Ethiopia. According to [15]the rate of infection in Taiwanese cows with various types of gastrointestinalwormswas 73.2%, which was higher than the rate found in our study,It was 46.25%, close to the findings of this study [16], and the result is consistent with findings from another study carried out in southeast Ethiopia.According to the researcher [17]the rate of infection with gastrointestinal wormsin cows is increasing, It reached 50%, and the reason for this disparity in infection rates with these worms could be due to a variety of factors, including differences in environmental conditions, different areas of study, efforts made in education and management systems, sampling methods and techniques, and the random use of antihelminths .

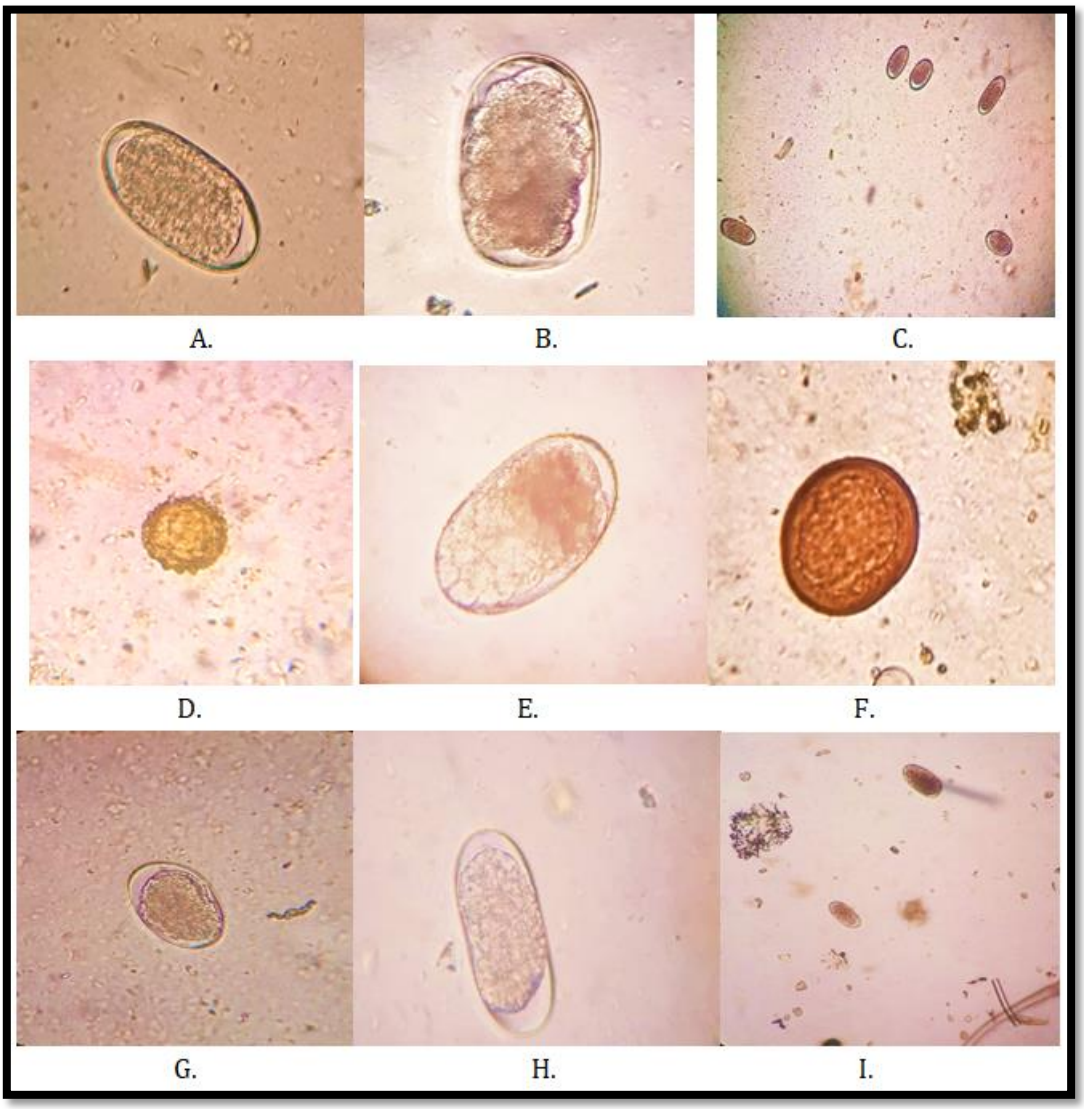

Figure 2. Light microscope view of parasite eggs, Trichostrongylus spp 400x(A), Hemonchus spp 400x(B), mixed infection Ostertagia and Trichostrongylus spp 100x(C), Ascaris spp 400x(D), Chabretia spp400x(E), Toxocara spp400x(F). Oesophagostumum spp400x (G), Cooperia spp 400X (H), Marshaleigia spp & Cooperia spp100x (I).

According to the study areas in the city of Kirkuk, the percentage of infection was equal in the areas of Kirkuk Central and Yaji with a percentage of (53%), while the highest rate of infection was recorded in the Al- Sayada district with a percentage of (69.56%). This was followed by the Daquq area with a

percentage of (67.56%) While Hawija and the massacre's locations roughly reported (34.09%) and (43.75%), Table (2).

Table (2) prevalence and proportions of cows infected with gastrointestinal worms in each of the main locations of Kirkuk.

No.	Location	No. cow	Infected cow	Infected percentage
1	Kirkuk center	15	8	53.33%
2	Yaji	41	22	53.65%
3	Al-Rashad	58	23	39.65%
4	Al-Sayada	23	16	69.56%
5	Kirkuk Slaughter	44	15	34.09%
6	Daquq	37	25	67.56%
7	Al-Haweja	32	14	43.75%
	Total	250	123	49.2%

This study discovered that cows were infected with various types of stomach and intestine worms, with a significant difference in infection rates, with the highest rate of infection with worms of the genus Ostertagia spp appearing, amounting to 23.57%, and this result is consistent with what the researcher stated [18], Where the highest percentage of this genus, Ostertagia was recorded in a study conducted on cows in Canada, while the researcher (Mashayekhi et al., 2013) recorded a lower infection rate with worms of this genus amounting to 11.3%, The researchers [13] has a record ratio of less than this genus amounted to 10.7%, and is calculated by increasing the ratio of the grace of trichostrongylus spp where it reached 20.32%, The ratio of a lower program was recorded by the researcher [11]where the ratio of the framework of these worms was 15.6%, while the researcher [19]portion ratio Above study on this genus amounted to 38.9%,Infection with worms of the genus Heamonchus spp. reached approximately 17.07%, which is higher than what the researchers [13]recorded in a previous study in the Kirkuk slaughter where they mentioned that the rate of infection with this genus reached 9.33%, and the reason for this is that most of The cows brought to the slaughterhouse had previously been fattened with various anthelmintic drug. It agrees with the findings of the researcher [20], who recorded an infection rate of 17.6%, but differs from the findings of [12], who recorded the highest infection rate with this genus in the city of Mosul, which amounted to 27.13%.This study discovered a 12.2% infection rate with worms of the genus

Toxocara spp. during the increase in temperature at the end of the spring season Because of this infection,. This study also differs from the findings of the researcher [21], who found a high rate of infection in the genus Toxocara spp., which amounted to 20%.The incidence of infection for the genus Chabretia spp. was 11.2%, which was greater than the findings of the researcher [12], who found that the rate of infection for cattles of the same genus was 7.06%,While the Ascaris genus recorded a percentage of 4.06%, this percentage is higher than that of the Ascaris genus, which recorded a percentage of 1.24%. The study also revealed differences in the proportion of infection in various study regions, with the Al- Sayada region having the greatest rate of infection with these worms at 69.56%,which agrees with the researchers [11], who found that the Shatrah area in Nasiriyah recorded a high rate of infection in cows due to the closeness of cow breeding with buffalo, whose owners are unwilling to give them repellents due to the difficulties of dealing with them.The Daquq region also had a high rate of 67.56%, which can be attributed to the fact that the samples were taken in the spring and after the rainy season and that the majority of the cows relied on outside grazing, which is similar to what the researcher [22] said about the grazing cows. While Kirkuk Center and Yaji had equal percentages of 53.33% and 53.65%, respectively, the outermost is more susceptible to infection than locally breed cows the fact that samples taken from the Kirkuk center were largely grazing on debris and trash dumps is what caused the infection rate to rise, Al-Rashad region recorded a low percentage of 39.65% compared to the number of cows examined, and the reason for this low percentage was that all the cows have a confined home breeding, without external grazing and without green fodder, whereas the samples that were taken from Yayiji region were mostly grazing in the valleys and nearby areas, The researcher's findings [21], During the study period, it was also divided according to the seasons of the year with a greater infection rate (62.5%) of worms' eggs in the spring and lower rates (33% and 56.86%) in the winter and fall, Table (3).

Table (3) The percentages of worms in infected cows during the study period by the seasons of the year.

No.	the seasons	No. cow	Infected cow	Infected percentage
1	Autumn	103	34	33%
2	Winter	51	29	56.86%
3	Spring	96	60	62.5%
	Total	250	123	49.2

According to what was said the samples were taken in the late spring and the Ascaris worms have a high infection rate because their eggs have a thick grainy shell, that can resist temperatures between 22-25cº [1]. This study found a significant difference in the rates of stomach and intestine worm infection during the study period, with the highest rate of infection (62.5%), which is consistent with the researcher's earlier research [11], showing thatthe rate of infection increases in the spring season,In Nasiriyah,where the infection rate for cows and buffaloes in the spring was 71.2%, a study was done on these animals.The high rate of infection during the spring season may be due to the fact that the cows took the infected larvae during the winter months, as it was shown [22]that the infected larvae are widely found in the rainy winter months, which provided suitable conditions for the development of the infective larvae of the roundworms, and the results of these are similar, The study with the results of [22]. . While the winter season in this study also recorded a high percentage reaching 56.86%, this is different from what was observed by researchers [11], who found that the percentage of infection in the winter season was low, amounting to 23%.The reason for this difference may be attributed to the fact that precipitation with the presence of The appropriate humidity in the winter months creates favorable conditions for the growth and development of the infected third L3 larvae in the winter months [23]This is different from what the researcher [12]recorded where the highest rate of roundworm infection was recorded in the winter months, amounting to 42.10%, and this study revealed a decrease in infection in the fall season by 33%, It was also different from what was recorded [11], where the infection rate was 81%, and the difference may be due to the different environmental conditions and the different regions and breeding systems. which indicated that the dry feed has a lower infection rate than the green feed, are compatible with these findings.While just 34.09% of the carrots were consumed in the Kirkuk massacre region, this is due to the majority of the cows having received various forms of repellant treatments before to receiving their carrots. Compared to other areas, the Hawija region, where samples were gathered in the spring, revealed an incidence of infection of 43.75%.Different breeding and grazing practices as well as the environment throughout the study period are some of the causes of the variance in infection in these places additionally, there were variations in infection rates. The study's findings on hematological changes revealed substantial differences ($P<0.05$) in the average blood cell volume, whereas rates of the total number of red blood cells, PCV volume, and hemoglobin Hb concentration decreased significantly ($P<0.05$) when compared to the control group, According to the study's findings, there was a substantial rise ($P<0.05$) in both the total and differential count of white blood cells.This increase was primarily brought on by the infected cows' much higher eosinophil counts than control cows. Table (4).

Table (4) Hematological examination parameters (Mean ±SE) in Healthy and infected cows.

No.	Hematology Parameters	Mean ± SE	
		Infected cows	Health cows
1	TRBC	B 4.194 ± 0.077	A 6.039 ± 0.147
2	Hb	B 7.84 ± 0.120	A 9.42 ± 0.169
3	PCV	B21.59 ± 0.245	A 26.40 ± 0.315
4	TLC	A12.33 ± 0.118	B10.58 ± 0.176
5	Neutrophil	A 35.18 ± 1.652	A 41.19 ± 2.623
6	Lymphocyte	A 46.89 ± 4.142	A 47.24 ± 4.129
7	Eeonophile	A 13.06 ± 1.605	B 5.92 ± 0.101
8	Monocyte	A 4.374 ± 0.285	A5.84 ± 0.271
9	Basophile	A 0.566 ± 0.025	A0.652 ± 0.029

Different letters horizontally refers a significant difference at the level (P<0.05).

The researchers' findings [24] that the genus Heamochus ssp worms cause hemorrhagic type anemia in acute infections are supported by the finding that TRBC, Hb, and PCV decreased through the study of hematological parameters. If the condition persists without treatment, it may result in Chronic blood loss, which then causes a depletion of the red blood cell stock from the spleen [25] reported that the ability of the sex worms, Haemonchus spp., to absorb blood in significant amounts from the rennet wall, as it absorbs blood, results in Hypochromic Microcytosis anemia, in which Pcv and Hb are lower than the usual level, Every day, each worm sheds 0.05 ml of blood, and as they migrate away from the places where they had been adhering to the abomasum wall, they leave behind temporary bleeding that lasts for a few minutes, Due to hemorrhaging in the stomach and intestines and the rupture of the cytoplasmic membrane between cells, Trichostrongylus, Chabertia, and Heamonchus induce anemia and bottle jaw, respectivelyAccording to [26], TLC and DLC play a significant role in the immune responses to attack stomach worms. This study found a significant increase in TLC in infected cows, which

is directly proportional to the increase in Esinophile cells, which are produced from bone marrow and whose level rises in the blood upon infection with these worms, are one of the most significant types of white blood cells that take part in the immune response to resistance to worms, along with the occurrence of infections in the inner lining of the stomach and intestines, as mentioned , Eosinophil cells have an important role against all phases of worm infection and eliminating them through the secretion of its toxic substances to worms and some enzymes degrading its envelope.being mentioned [4], Esinophile cells play a crucial part in combating all stages of worm infection and getting rid of them by secreting toxins that are harmful to worms and enzymes that break down their envelope. As illustrated in table (5), The biochemical examination results showed a significant decrease (P<0.05) in the levels of total protein , albumin and Iron concentrations.

Table (5) Biochemical examination parameters (Mean ±SE) in Healthy and infected cows.

No.	Biochemical Parameters	Mean ± SE	
		Infected cows	Health cows
1	Total protein (g/dl)	B 5.85 ± 0.0480	A 6.67 ± 0.0928
2	Albumin (g/dl)	B1.87 ± 0.0735	A3.0195 ± 0.0479
3	Globulin (g/dl)	A3.289 ± 0.0257	A4.0545 ± 0.080
4	Iron (µg/dl)	B11.830 ± 0.0728	A 14.18 ± 0.206

Different letters horizontally refers a significant difference at the level (P<0.05).

The concentration of total protein and albumin in infected cows decreased significantly with a significant difference (P 0.05), indicating that gastrointestinal worms had an impact on biochemical parameters, The increase in serum globulins from the amount of normal values happens as a result of increased form ation of immune bodies to resist worms or as a compensatory measure to equalize the osmotic pressure of the blood as a result of the occurrence of Reduction in albumin rate, even though the globulin concentration was within its normal levels with a slight difference [27].As indicated by [28] that cases of infection with stomach and intestinal worms affect the total concentration of proteins and the ratio of albumin to globulin, which is either normal, increased or decreased, and [29] mentioned [30]) The change in plasma proteins is one of the characteristics of infection with gastrointestinal wormsand in general leads to a decrease in the level of albumin and an decrease in the level of total protein and globulin in blood serum [25], added to the

difference in the mechanism of the effect of worms on the loss of plasma proteins in different species, for example, worms of the type Haemonchus contortus and worms of the type Mecistocirrus degitatus suck blood in very large quantities, causing progressive protein deficiency. Based on the study, infected cows had significantly less iron in their blood than healthy cows ($P<0.05$), This insufficiency is caused by hemorrhaging in the intestinal wall's lining as a result of infection, as well as by some worm species feeding on blood, as those in the genus Haemonchus spp. It results in a lack of Hb and Pvc, which ultimately results in an iron deficiency.Which causes anemia of the type microcytic anemia in the case of low PCv rate, and this is consistent with what was mentioned [29]

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دراسة التغيرات الدمية والكيموحيوية للخمج الطبيعي بديدان المعدة والامعاء في الأبقار المحلية في مدينة كركوك

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الملخص

هدفت هذه الدراسة إلى دراسة تأثير ديدان المعدة والامعاء على المعايير الدموية والكيموحيوية في الأبقار في محافظة كركوك ، وذلك ابتداءاً من كانون الأول / 2021 حتى نهاية أيار/ 2022، شملت هذه الدراسة على فحص ديدان المعدة والامعاء في الأبقار في سبع مناطق من كركوك، اذ قسمت حيوانات الدراسة إلى مجموعتين، المجموعة الأولى تضمنت (الأبقار المصابة) بديدان المعدة والامعاء، والمجموعة الثانية (الأبقار غير المصابة) وتضمنت مجموعة السيطرة. تم فحص القيم الدمية عن طريق جهاز تعداد الدم الكامل (CBC) ، اما المعايير الكيموحيوية والتي شملت، البروتين الكلي، الألبومين، الكلوبيولين والحديد فقد تم فحصها بواسطة جهاز المطياف الضوئي باستخدام عدد خاصة بكل نوع. اذ أظهرت نتائج الدراسة أن نسبة الإصابة الكلية كانت 123 بقرة (49.2٪) و 127 بقرة (51.2٪) كانت سليمة غير مصابة بهذه الديدان، حيث كانت الديدان باعلى نسبة من الأنواع *Ostertiga spp.*، تلتها *Trichostrongylus spp.* بنسب (23.57٪) و (20.32٪) على التوالي و*Hemonchus spp.* بنسبة (17.07٪) و *Chabertia spp.* و *Toxocara spp* كان (12.2٪)، *Marshileigia spp*، *Cooperia spp.* و *Ascaris spp* كانت بنسب (3.25٪، 4.87٪، 4.06٪) على التوالي، اما *Oesophagostomum spp.* كانت (1.62٪) بينما كانت الإصابة بـ Moniezia spp. (2.43٪). وتم تقسيم الاصابات خلال فترة الدراسة حسب فصول السنة، فسجلت اعلى اصابة (62.5٪) في فصل الربيع وبمعدلات أقل (33٪ و56.8٪) في الخريف والشتاء على التوالي، وكشفت الدراسة عن انخفاض معنوي في التغيرات الدموية (P <0.05) في اعداد كرات الدم الحمراء و حجم خلايا الدم المرصوصة و الهيموكلوبين وزيادة في كل من العد الكلي والتفريقي لخلايا الدم البيضاء مقارنة مع مجموعة السيطرة وكما أظهرت الدراسة في نتائج المعايير الكيموحيوية وجود انخفاض معنوي (P <0.05) في تراكيز البروتين الكلي والألبومين والحديد. استنتجت الدراسة ان هنالك إصابات كثيرة من ديدان المعدة والامعاء في الأبقار في محافظة كركوك وان لهذه الديدان تاثيرات على القيم الدمية وبعض المعايير الكيموحيوية في الجسم.

الكلمات المفتاحية: ديدان المعدة والامعاء، الدمية، الكيموحيوية.