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RESEARCH PAPER

Effect of Zirconium Oxide Nanoscale on the Vitality and Phenotypic Characteristics of Fasciola Gigantica

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ABSTRACT

Worms belonging to the genus Fasciola cause two types F.hepatica and F.gigantica disease known as openwork disease resulting in significant economic losses, as it affects domestic animals, especially cows, sheep and goats, and may infect humans with this disease accidentally. From the results of the research, there were significant differences in the lengths, width and total area of the body of the worms when compared with the control, as they were less valuable in the lengths of worms for the extract of zconium oxide at a concentration of 0.0015 and this indicates that it is more effective, While the largest value is zirconium oxide at a concentration of 0.01, this indicates that it has the lowest effect. As for the vitality of worms, the lowest value of zirconium oxide was 0.0015. While the highest value was zirconium oxide at a concentration of 0.01, as it reached 8.333, which indicates that it has the highest effect on the vitality of the parasite.

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INTRODUCTION

After Fasciolosis is one of the parasitic diseases widespread in the tropics and subtropics, which is caused by a parasitic infection with one of the species of the genus Fasciola sheep liver openwork Fasciola hepatica and giant liver openwork Dalton [1]. Its life cycle includes two hosts, namely the final host represented by cows, sheep, goats and many other ruminants, and the middle host is the water site, especially that of the family Lynndeidea, especially the genera, so this disease spreads Fossaria, Galba, Lymnaea in areas where grazing and irrigation are widespread and water marshes where there is a lot of snails belonging to the genus Lymmaea Gayo *etal*. This type of worms targets the bile ducts of the liver and the symptoms of the disease appear in the forms of edema, anemia, loss of appetite and general weakness, and there are different clinical patterns between chronic, acute and similar to acute and may lead to death deat if the injury is severe and the resulting damage is significant [2].This disease affects animals of economic importance to humans, such as livestock, causing economic losses up to the stage of collapse of the national income of countries that depend on these animals for the source of income, such as Australia, New Zealand, as it causes a decrease in livestock products or a decrease in the quality of those products and the quality of their meat, and may lead to a decrease in livestock products or a decrease in the quality of those products and the quality of their meat, and may lead to the

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death of those animals [3]. In human infection, the parasite causes significant damage to the liver and then causes liver dysfunction in humans, and in some cases infection with this parasite may lead to secondary infection with bacteria such as Bacillary hemoglobinuria in livestock and resulting from infection with genera of bacteria such as Closteridium [4].

For several decades, the health authorities have adopted in the field of combating perforated liver disease the use of chemotherapy, which is one of the most important treatments used to control this injury, which prevents the formation of parasitic microtubules of the body wall, leading to the exposure of the parasite tissues and then its death, as well as other treatments with a wide impact in eliminating the liver openwork and reducing its damage [5].

However, the indiscriminate and excessive use of manufactured chemotherapy treatments caused pollution and damage in many environmental aspects when used to control intermediate hosts, as well as the emergence of resistance to chemotherapy by the parasite itself, which led to the need to search for more toxic pesticides and more effective methods of control, which encouraged researchers to reduce dependence on chemical treatments and search for new alternatives, so attention turned to plants [6].

Nanometer size has a wide range of medical targets including diagnostics and therapeutic applications in modern medicine, visualization, medical instruments, and vaccinations [7]. Nanoparticles have a small size ranging from 1 to 100 nm where nanoparticles are useful due to the high rate surface size and individual physical and chemical properties, allowing the small size of the nanoparticles to pass through a wide range of biological surfaces to reach the target sites [8]. Zirconium oxide nanoparticles are among the most promising and exciting metal nanomaterials, whose properties differ significantly from those that exist. Zirconium is a transition metal element belonging to the titanium family. Zirconium nanooxide has high antimicrobial efficiency, antifungal, antioxidant and anticancer effects, with high chemical stability and corrosion resistance [9-13].

MATERIALS AND METHODS

Zirconium Oxide Diagnosis by (XRD)

The crystal structure and phase purity of the Zirconium Oxide effect ZrO prepared by X-ray diffraction as shown in Fig. 1 matches the X-ray diffraction spectrum of zirconium oxide Database (1451-36) ZrO JCPDS) ZnO crystal formation detected by diffraction peaks at (31.78 34.42, 37.47, 45.71, 63.00, 56.71, 69.16, 68.09, 66.49) No other impurities were observed in the X-ray

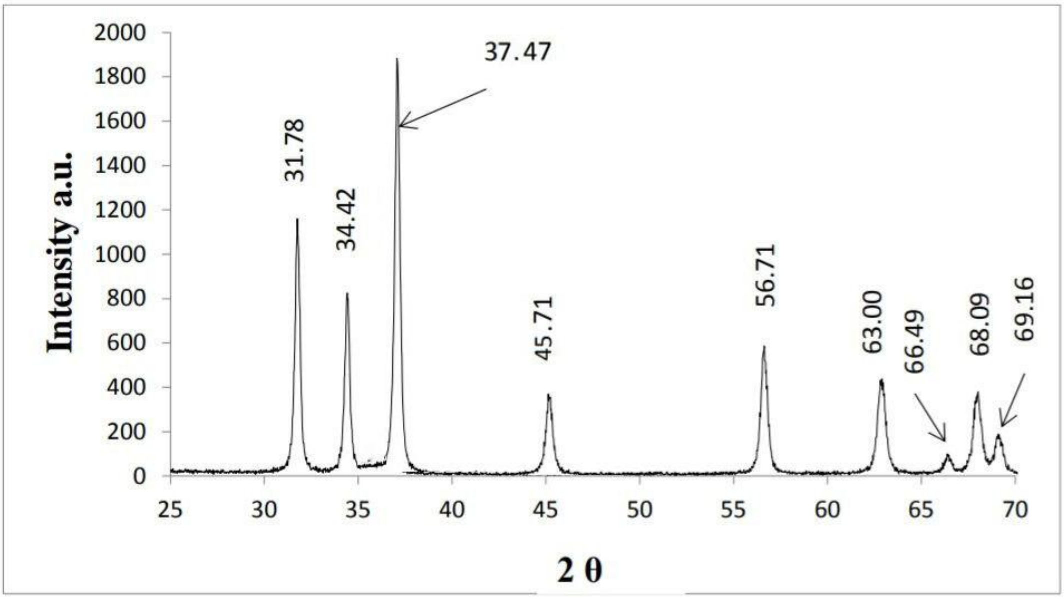

Fig. 1. X-ray diffraction spectrum No zirconium oxide nanoparticles.

diffraction spectrum of ZrO The average crystal size was calculated at 27.41 nm using the Debye-Scherer formula.

Zirconium Oxide Nanoparticles Diagnosis by (SEM)

The morphological and structural structures of zirconium oxide nanooxide were studied using scanning electron microscopy (SEM). Fig. 2 shows SEM images indicated that some nanoparticles were well separated from each other while most were present in a lumpy form. This agglomeration is due to electrostatic effects in addition to the hydrolyzed effect This is consistent with behavior similar to the agglomeration of nanoparticles in previous studies.

Sample collection

In this study, 500 cattle and sheep livers were examined from butchers who slaughter outside the massacre in Diyala, taking the private information of each infected animal. Then the infected samples were transferred to the work laboratory by plastic bags, as the affected organs were well covered with water to get rid of blood, impurities and suspended materials resulting from the slaughter process and put the liver in a sterile dish and the knowledge of the outer surface of the liver and then the liver was dissected to investigate worms The percentage and severity of the injury were calculated. As it is based on the following two equations:

% Infection rate = Number of infected livers divided by the total number x100

Severity of infection = number of worms divided

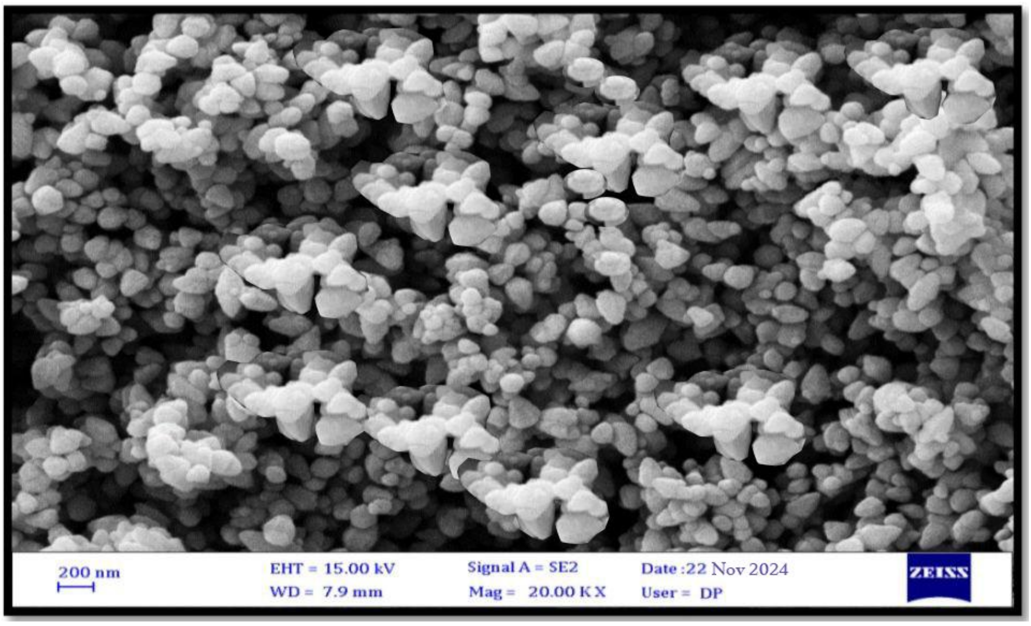

Fig. 2. Zirconium Oxide Diagnosis by SEM.

Table 1. Effect of Zirconium Oxide on Parasite Length Averages (cm) *Fasciola gigantica.*

	Duration (hours)			
Average transaction	6	3	0	Transactions
3.699 c	3.701 D	3.615 D	3.780 D	Comparison
3.352 D	3.425 F	3.250 g	3.380 fg	NanoOz0.0015
3.370 D	3.711 D	3.500 ef	2.900 h	Oxide ZrNano0.0025
3.879 b	4.211 b	3.700 D	3.725 D	Oxide Zr Nano0.0050
4,204 Per cent	4.412 A	4.250 b	3.950 c	NanoOxide0.01
	3,892	3.663 App	3.547 b	Average time

Similar letters mean there is no significant difference between them at the probability level of 0.05.

by the number of infected animals.

Insulation of worms

The worms were isolated from infected livers by the process of autopsy and search for infection by opening the bile duct and investigating the worms according to the number of worms in one liver, and the usual diagnostic procedure used samples based on phenotypic and anatomical characteristics to calculate measurements related to each worm, as the length, width and area of the worm were recorded.

RESULTS AND DISCUSSION

It is noted from Table 1 that the lowest value in the average lengths of worms at a concentration of 0.0015, as the average lengths of worms (3.352) while the highest value of zirconium oxide at a concentration of 0.01, i.e. it is the least impact on the length of the parasite, as the average length of worms (4.204) compared to the average lengths of worms in the total control, which amounted to (3.699). As for the exposure period, it was noted that the lowest value at the time was zero, as the average duration was (3.547) and the highest value was after 6 hours, as the average duration was (3.892), i.e. the greater the exposure time, the greater the effect.

In the analysis of the overlap between the average concentrations of the coefficients and the duration of exposure, it is noted from the table that there is a significant difference between the averages of the coefficients if the concentration was given 0.01 zirconium oxide and the duration of 6 hours the highest interference value was (4.412). The lowest value in concentration is 0.0025, which reached (2.900).

It is noted from Table 2 that the lowest value in the average width of the coefficients is zirconium oxide at a concentration of 0.0015, i.e. it is the most influential on the average width of worms among other averages, as the average width of worms was (0.5533), while the highest value was for zirconium oxide nanotechnology with a concentration of 0.0025, i.e. it is the least affecting the width of the parasite, as the average width of the parasite was (0.8683) compared to the average width of worms in the control group, which amounted to (0.7157).). As for the exposure period, it was noted that the lowest value in the time was 3 hours, as the average duration was (0.5630) and the highest value was at the time of zero, as the average duration was (0.8570) and in the analysis of the overlap between the average supply concentrations of the treatments and the duration of exposure, it is noted from the table that there is a significant difference between the averages of the coefficients and durations, as the concentration was given 0.0025 for zirconium oxide and the duration of 3 hours

Table 2. Effect of zirconium oxide on parasite width averages (cm) *Fasciola gigantica.*

Average transaction	Duration (hours)			Transactions
	6	3	0	
0.7157 A	0.815 Ab	0.721 Ab	0.611 bc	Comparison
0.5533 A	0.450 cd	0.260 min	0.949 A	Oxide ZrNano0.0015
0.8683 Per cent	0.911 Per Cent	0.744 Ab	0.951 A	NanoOz0.0025
0.6247 A	0.250 min	0.800 Ab	0.824 Ab	OxideZr Nano0.0050
0.5633 A	0.450 cd	0.290 min	0.950 A	NanoOxide0.01
	0.5752 b	0.5630 b	0.8570 A	Average time

Similar letters mean there is no significant difference between them at the probability level of 0.05.

Table 3. Effect of Zirconium Oxide on Average Surface Area of Parasite (cm^2) *Fasciola gigantica.*

Average transaction	Duration (hours)			Transactions
	9	3	0	
3.4623 c	3.732 cd	3.555 D	3.100 fg	Comparison
2.9483 D	3.315 ef	3.150 F	2.380 h	NanoOz0.0015
3.4033 c	3.710 cd	3.550 D	2.950 g	NanoOz0.0025
3.8433 b	4,200 Ab	3.690 cd	3.640 cd	OxideZr Nano0.0050
4.1167 A	4,400 A	4.150 b	3.800 c	Oxide Zr Nano0.01
	3.8714 A	3,619 Per cent	3.174 b	Average time

Similar letters mean there is no significant difference between them at the probability level of 0.05.

Table 4. Effect of Zirconium Oxide on Fasciola *gigantica Biology.*

Average transaction	Duration (hours)			Transactions
	6	3	0	
1.2220 d	2.000 h	1.666 i	0.00 g	Comparison
1.4443 D	2.333	2.000 h	0.00 g	Oxide Zr Nano0.0015
1.8887 c	3.000 F	2.666 g	0.00 g	Oxide ZrNano0.0025
4.1107 b	5.333 c	4.333d	2.666 g	OxideZr Nano0.0050
6.2217 A	8,333 Per cent	6.666 b	3.666 E	NanoOxide0.01
	4.1998 A	3.4662 b	1.2664 c	Average time

Similar letters mean there is no significant difference between them at the probability level of 0.05.

was the highest interference value of (0.951). The lowest interference value was (0.250) between the concentration of 0.0050.

It is noted from Table 3 that the lowest values in the average surface area of the parasite are at a concentration of 0.0015, which is the most influential among other treatments, as the average length of the parasite was (2.9483) compared to the averages of control samples, which amounted to (3.4623) i.e. worm shrinkage, and this is consistent with the study conducted by Hawsah et al. (2023), in which the appearance of worm body shrinkage in the treated groups compared to the control group, while the highest value was zirconium nanooxide with a concentration of 0.01, i.e. it is the largest area, as the average surface area of the parasite was (4.1167) compared to the average surface area of samples, i.e. an increase in the surface area of worms, and this is not consistent with the above study, as it is noted in which the shrinkage of the size of the worms is observed. As for the exposure period, it was noted that the lowest value at the time was zero, as the average duration was (3.174) and the highest value was after 6 hours that the average duration reached (3.8714), i.e. the greater the exposure time, the greater the effect.

In the analysis of the overlap between the average concentrations of the coefficients and the duration of exposure, it is noted from the table that there is a significant difference between the average coefficients, as the highest concentration is 0.01 for zirconium oxide and the duration of 6 hours is the highest interference value of (4.400). The lowest value in the interaction of the coefficients was (2.380) at a concentration of 0.0015. This is consistent with the study Duang Jan et al. (2019) to investigate the effect of interference between Anacardium occidentale extracts And the duration of exposure on the body area of worms, as the surface area of the body was measured on the eighth day, the surface area of the worms shows a significant difference when compared to the control group.

It is noted from Table 4 that the lowest values in the killing averages are at a concentration of 0.0015 among the other coefficients, as it reached (1.4443) compared to the averages of the control samples, which amounted to (1.2220), while the highest value was zirconium oxide with a concentration of 0.01, which amounted to (6.2217) compared to the control group, and the best time for killing was 6 hours, where the average time was (4.1998). . In the analysis of the overlap between the average concentrations of the coefficients and the duration of exposure, it is noted from the table that there is a significant difference between the mean coefficients, as the concentration was 0.01 for zirconium oxide and the duration of 6 hours, the highest interference value was (8.333). The results were similar to a 2013 study by Gherbawy et al., which suggests that silver nanoparticles have anti-fasciola activity. The results of the study converged with what Nawar et al. 2024 stated about the effect of bitter melon extract and bandazole in the parasite Fasciola gigantica.

CONCLUSION

The study demonstrates that zirconium oxide exhibits significant effects on the morphology and size of parasitic worms, with varying concentrations and exposure times influencing their average length, width, surface area, and mortality rates. Notably, a concentration of 0.01 zirconium oxide over a six-hour exposure period yielded the most pronounced impact on the parasites, suggesting its potential as an effective treatment option.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interests regarding the publication of this manuscript.

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